U.S. Dairy Export Council®

REFERENCE MANUAL FOR U.S. CHEESES

TABLE OF CONTENTS

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This reference manual is designed to guide and educate international buyers and end-users on purchasing and using U.S. cheese. It is an information resource that includes:

- A description of the U.S. cheese industry.
- Definitions of cheese varieties.
- Descriptions of the processes used to produce and handle cheeses, as well as properly merchandise them at the retail and foodservice level.
- Discussions of the functional and nutritional properties of cheese.
- Applications for the wide variety of U.S. cheeses.

Dairy Management Inc.

U.S. DAIRY EXPORT COUNCIL

U.S. Dairy Export Council

The U.S. Dairy Export Council (USDEC) is an independent membership organization that represents the interests of U.S. milk producers, cooperative dairy companies, dairy processors, export marketing and trading companies, and suppliers to the dairy industry. USDEC's members represent the vast majority of U.S. milk production and include companies with the widest varieties of dairy products available anywhere in the world.

A function of USDEC is to unify the U.S. dairy industry's international market development efforts, so that the United States can be a more responsive supplier to international markets. USDEC works with U.S. suppliers to help them maximize all of the benefits the industry has to offer: size, efficiency, consistency, high-quality products, and state-of-the-art technology.

USDEC's activities fall into three broad categories: provide on-going service to trade partners; try to bring potential buyers and sellers together to facilitate trade; and to educate and support both U.S. dairy exporters and end-users of U.S. dairy products.

The U.S. Dairy Export Council provides support to international buyers and end-users of dairy products by:

- Working closely with trade partners and end-users around the world to develop and nurture business relationships.
- Providing information about U.S. suppliers, their products and capabilities.
- Supporting end-users and the trade with conferences and technical seminars aimed at providing training and guidance on the use of U.S. dairy products.
- Furnishing applications and usage ideas for U.S. dairy ingredients.
- Helping drive the sale of U.S. dairy products by creating and supporting in-store and foodservice promotions.
- Creating point-of-sale materials highlighting the benefits of purchasing U.S. dairy products.

The U.S. Dairy Export Council facilitates communication between international buyers of dairy products and U.S. suppliers by:

- Acting as a central contact point for international buyers and U.S. exporters, matching prospective buyers with potential sellers.
- Compiling and maintaining comprehensive lists of buyers and sellers, which are available to overseas customers and members.
- Circulating product inquiries from international buyers to a concentrated list of U.S. suppliers to generate price quotations.
- Hosting international buying delegations to familiarize end-users with the size and scope of the U.S. industry.
- Coordinating trade missions and participating in trade shows in overseas markets to help U.S. suppliers better understand the needs of these markets.

The Council's headquarters are in Arlington, Virginia (adjacent to Washington, D.C.) and can be contacted at:

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In addition, USDEC has set up a number of international offices with representatives in Japan, South Korea, Southeast Asia, China, Taiwan, Mexico, South America, the Middle East and Europe. Please contact USDEC for further information and contacts.

The U.S. Dairy Export Council provides access to suppliers of the largest, safest milk supply in the world. USDEC has a global staff in place to provide potential buyers with a direct communication link to U.S. dairy products suppliers.

DAIRY MANAGEMENT INC.

Dairy Management Inc.

Dairy Management Inc.™ (DMI) is the nonprofit domestic and international planning and management organization responsible for increasing demand and sales for U.S.-produced dairy products on behalf of America's dairy producers, who are its funders. DMI works proactively, and in partnership with leaders and innovators, to increase and apply knowledge that leverages opportunities to expand dairy markets. DMI manages the American Dairy Association,® National Dairy Council® and U.S. Dairy Export Council.®

DMI helps drive innovation in the industry by:

- Assisting dairy, food and beverage companies' growth through innovation by supporting cutting-edge dairy product and nutrition research, ingredient applications development and by providing technical assistance in the development of new products using dairy.
- Assisting dairy processors in creating and introducing new and/or improved dairy products, ingredients, processes and packaging such as innovative cheese products and cheese ingredients that meet consumer demand. DMI also provides the latest information on consumer trends, marketing and nutrition.
- Helping U.S. food manufacturers, dairy processors and exporters to find new uses and markets for cheese, whey, dry milk powder and other dairy ingredients.
- Working with dairy manufacturers and retailers to feature the 3-A-Day of Dairy™ logo on more than 2.5 billion dairy product packages, and with health professional organizations to encourage three servings of dairy a day, as per the federal government's dietary guidelines.

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3
BOW

1.1 OVERVIEW OF THE U.S. DAIRY INDUSTRY

The United States is the world's largest cow's milk producer, producing over 77 million mt of milk per year, close to 20% of the world's milk supply. U.S. dairy farmers produce two-and-a-half times more milk than any European country and six times as much as Australia or New Zealand.

Each year, U.S. manufacturers process about 27 million mt of fluid milk products, 4 million mt of cheese, 1 million mt of whey and lactose, 732,000 mt of milk powders, 1.4 million mt of yogurt, 611,000 mt of butter and 3 million mt of ice cream and frozen dairy products in over 1,100 processing plants, making the United States the largest dairy processing country in the world.[1]

The United States has been able to achieve its current milk output through a combination of scientific and management advancements at all levels of production, processing, regulation and marketing. In the past 10 years, the country has increased milk production at an average of 1 million mt per year, and currently has unlimited potential for growth.

On the farm, management techniques, including expanded use of balanced feed rations, have been instrumental in increasing milk output per cow. Between 1980 and 2004, average annual yield per cow increased from 5,400 kg to about 8,600 kg, while cow numbers decreased from over 10.8 million to 9.0 million during the same period. This type of production efficiency demonstrates the industry's ability to maximize its resources to meet the growing demand for dairy products worldwide.

Advanced U.S. technologies ensure efficient delivery of the highest quality milk products. State-of-the-art milking and milk handling equipment, including automated milking systems, have improved the speed of cleaning, sanitizing, and cooling products, as well as delivering them to the processing plants.

Dairy farmers and dairy processors alike abide by strict U.S. sanitary standards. In addition to self-imposed sanitary guidelines, dairy farmers are visited routinely by government regulatory agencies, which conduct quality assurance and safety inspections at the farms. These inspectors confirm herd health, oversee veterinary practices, monitor sanitation of the facilities and milking equipment, and verify that the milk is being rapidly cooled and properly stored until delivered to processing facilities.

At the processing facilities, milk moves through sanitized stainless steel pipes, vats and tanks as it is transformed into more than 400 varieties and styles of cheese, 100 flavors of ice cream and frozen yogurt, 75 flavors and set-types of yogurt, various milk powder and whey products, and numerous blends of butter and cultured products. Virtually all U.S. dairy processing plants employ quality management programs, such as HACCP (Hazard Analysis Critical Control Points) or ISO (International Organization for Standardization), to ensure that the finished products meet the highest attainable standards. Halal and Kosher certifications of product are also available.

[1]Source: U.S. Department of Agriculture, Dairy Facts 2005

The U.S. industry has made continued, large investments in new, state-of-the-art dairy manufacturing facilities. During the past decade, such developments have enabled a 45% reduction in the number of manufacturing facilities while average output per plant has more than doubled. Continued investment will mean still lower processing costs and higher milk volumes.

Employees at these facilities do more than manufacture dairy products. Through research and development laboratories, they generate new products and devise new uses for milk and its components. Dairy technologists and food scientists work together to discover how the functional properties of milk components can be preserved or modified by fractionation and other processing procedures. State-of-the-art equipment for drying milk, manufacturing cheese and processing whey has enabled the industry to create a wide variety of new products such as differentiated milk powders, low-carb milk, aseptic milk and a wide variety of high-value whey fractions. These new products have been developed to meet the expanding global demand for highly nutritious dairy products and ingredients.

As trade agreements continue to open global markets, other countries are able to benefit from using U.S. dairy products. These provide excellent value by combining product quality, functionality, price and service. International food manufacturers are able to import large quantities of U.S. dairy ingredients, including butter, anhydrous milkfat, skim milk powder, whole milk powder, cheese, lactose and whey, for use in the formulation of pizza, bread, beverages, infant formula, nutrition bars and hundreds of other food products. U.S. manufacturers are aware of the special needs of export customers and are able to customize dairy products for individual use.

Darigold, Inc.

Currently, the United States offers the greatest number and largest variety of dairy product suppliers. With more than 800 U.S. dairy manufacturers of cheese, fluid milk, whey, milk powders, yogurt, butter, ice cream and other dairy products, buyers can choose from a myriad of suppliers – big or small – to meet their precise needs.

Additional information on specific cheeses is available from the suppliers of the products. The U.S. Dairy Export Council has available the contact information for U.S. companies processing and/or marketing any type of cheese.

1.2 DAIRY EXPORT INCENTIVE PROGRAM (DEIP)

The Dairy Export Incentive Program (DEIP) was created to stimulate exports of products by offering Commodity Credit Corporation (CCC) bonuses. Announced by the United States Department of Agriculture (USDA) in May 1985, the program was reauthorized by the Food, Agriculture, Conservation and Trade Act of 1990, the Uruguay Round Agreements Act of 1995, the Federal Agriculture Improvement and Reform Act of 1996, and the Farm Security and Rural Investment Act of 2002.

The major objective of the U.S. DEIP program is to develop export markets for U.S. dairy products where U.S. products are not competitive due to price subsidies from other global sources. As part of its World Trade Organization (WTO) commitments resulting from the Uruguay Round Agreement on Agriculture, the United States has established annual export subsidy ceilings by commodity, with respect to maximum permitted quantities and maximum budgetary expenditures. The program enables U.S. entities to make competitive sales in eligible countries of not less than 150,000 mt of dairy products annually, including 3,030 mt of cheese.

DEIP enables exporters of U.S. dairy products to meet prevailing world prices for targeted dairy products and destinations. As a result, the program allows the U.S. dairy industry to demonstrate the high quality of its products to interested international buyers. Any exporter interested in participating in DEIP must undergo a qualification process. The information that the exporter must submit as part of this process includes:

- Documented experience of selling dairy products for export within the preceding 3 calendar years.
- An office and agent for services of legal process in the United States (names and addresses).
- A description of business structure (how and where incorporated).
- A statement describing participation, if any, during the past 3 years in U.S. government programs, contracts, or agreements.
- In addition to being qualified for DEIP participation, exporters are required to post a performance security before submitting a request for a bonus.

The varieties of U.S. cheese specified as eligible for export under the applicable invitation are as per the U.S. Food and Drug Administration (FDA) Standard and Identity as referenced in the Code of Federal Regulations, Title 21 and include:

- Cheddar
- Colby
- Cream Cheese
- Gouda
- Monterey Jack
- Mozzarella
- Process American
- Swiss and Emmentaler

Countries may be recommended for participation in DEIP by USDA program experts, members of the U.S. agriculture community, foreign government officials, and others. All sales facilitated using DEIP are made by private sector companies, not the government. A prospective buyer must select a company from which to purchase dairy products. Prospective buyers should note that a company selling under DEIP must register, or qualify, to participate in DEIP and that registration is not an endorsement by the U.S. government.

For further information about the Dairy Export Incentive Program, contact:

Operations Division, Export Credits
Foreign Agricultural Service, United States Department of Agriculture
14th and Independence Avenue, S.W.
Washington, D.C. 20250-1000, USA
Tel: + 1-202-720-6122
Fax: + 1-202-720-0938

1.3 COOPERATIVES WORKING TOGETHER (CWT)

Cooperatives Working Together (CWT) operates within the structure of the National Milk Producers Federation (NMPF), the membership organization for America's dairy cooperatives. CWT's funding comes from U.S. dairy farmers and participation in the program is open to all U.S. cooperatives.

Export Assistance Program

CWT provides an incentive to dairy manufacturers and exporters to sell to foreign commercial markets. Export bids are accepted from member organizations to export eligible products. The range of dairy products eligible under this program is: cheese (see below for eligible varieties), butter, anhydrous milkfat and whole milk powder (WMP to Mexico only).

Cheese Varieties Eligible for Export Assistance

- Asiago
- Cheddar
- Colby
- Gouda
- Monterey Jack
- Mozzarella (low-moisture, part-skim, low-moisture/part-skim)
- Parmesan
- Romano
- Swiss

Eligible Packaging

- Bulk and retail packaging styles are eligible under CWT

Eligible Destinations

- Worldwide

CWT does NOT take ownership of any product. The export assistance activity generated by CWT is independent of and a complement to the U.S. government's operation of the Dairy Export Incentive Program (DEIP).

For more information on CWT, please visit **www.cwt.coop**

2.1 OVERVIEW

World's Largest Cheese Producer

The United States has the largest milk supply in the world, along with an abundance of land and considerable investment in research and development, it presents the U.S. cheese industry with an unrestrained growth potential to meet customer demand. More than 25% of the world's cheese production is manufactured at more than 450 plants in the United States, making the U.S. the largest cheese producer in the world. In 2005, over 4 million mt of cheese were produced. These factors, together with strict sanitary and quality standards, year-round production, and a growing international focus have helped the U.S. dairy industry position itself as a premium cheese supplier to the world.

The United States is one of the world's most efficient producers of milk where production is year-round. This guarantees product availability at any time of the year, including the winter season. Over the past decade, with state-of-the-art production facilities, the U.S. industry has doubled cheese output per plant while increasing production by over 1 million mt. U.S. manufacturers have the ability to adapt their production to meet customers' needs, thereby offering buyers the right product for their market.

U.S. Cheese Making Tradition

The U.S. cheese industry is an international center of cheese making excellence and innovation. The earliest U.S. cheese makers were pioneer immigrants who brought cheese making skills from Europe. Since then, U.S. cheese makers have developed new technology, unsurpassed capacity and a strong focus on the specific needs of their customers.

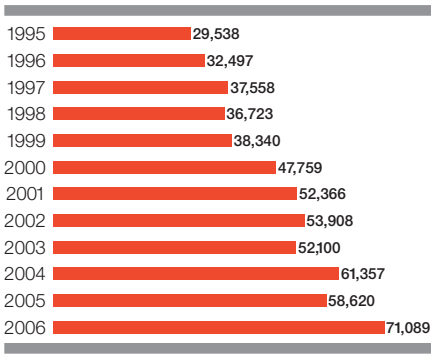
Variety at Your Fingertips

In the last several years, the U.S. cheese industry has enjoyed a renaissance of specialty cheese making. Over 400 varieties, types and styles of cheese are available from skilled U.S. cheese makers. These selections range from familiar favorites such as mozzarella, cheddar and cream cheese to American Originals like monterey jack. Many of these products are made only in the United States. With hundreds of cheese types and flavors, buyers and end-users will find the cheese product that meets their exact specifications.

World's Strictest Sanitary and Quality Standards

Product safety is the key to protecting consumer health, and U.S. dairy products are the safest in the world. The United States Department of Agriculture (USDA) and the U.S. Food and Drug Administration (FDA) ensure that U.S. cheeses meet the strictest sanitation and quality standards in the world. From the time the milk leaves the cow until the cheese is shipped to the user, it is subject to continuous monitoring and numerous quality assurance tests.

U.S. Cheese Exports (mt)



Source: U.S. Department of Agriculture

A Growing Export-Oriented Industry

The continuing long-term trend in U.S. cheese exports attests to the high quality of our cheese. The U.S. Dairy Export Council (USDEC) and the U.S. cheese industry are equipped for today's fast paced business, focused on the future and willing to serve overseas customers as their partner in trade.

Because of the excellent value offered by the U.S. dairy industry's high productivity and efficiency, cheese exports have increased dramatically over the past decade. Exports have skyrocketed from just over 12,000 mt in 1991 to over 71,000 mt in 2006. This rapid growth is a testament to the world's demand for high quality, efficiently produced cheese.

U.S. Natural Cheese Production Trend By Major Type

Types of Cheese (Natural Cheeses)	Production (in 1,000 Metric Tons) 1990	2000	2005
Cheddar	1,079	1,283	1,384
Mozzarella	785	1,195	1,370
Other Italian Cheese	216	307	355
Other American	233	402	345
Neufchâtel & Cream	195	312	314
Swiss	118	104	133
All Others	121	142	122
Total	**2,747**	**3,745**	**4,023**

Source: U.S. Department of Agriculture

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Innovations in the Plant and in the Research & Development Lab

The U.S. cheese industry is well recognized for its advancements in cheese making research and technology. For example, by applying American know-how to the cheese making process, the U.S. industry invented IQF, or Individually Quick Frozen cheese, several years ago.

Manufacturers of IQF cheese shred high quality cheese at its peak performance age, and then freeze each piece individually. This process locks in the freshness and stops the aging process, providing foodservice and industrial users with a consistent, high-quality product. IQF cheeses are well-suited for pizza toppings and unique cheese blends. Foodservice operators simply scoop the free-flowing cheese directly from the box as needed. Innovations such as these enable U.S. suppliers to develop new products to meet the latest consumer trends – or start new trends – keeping customers ahead of the competition.

International Awards

In international competitions, U.S. specialty cheeses take top honors as among the best in the world for flavor, body and appearance. In 2006, at the World Cheese Awards in London, U.K., specialty cheeses from the United States earned 12 gold medals, 14 silver and 17 bronze. The United States is justifiably proud of the heritage, craftsmanship and quality of the cheese made by its industry.

Geographical Indications

A geographical indication (GI) is a name or sign used on certain products, which corresponds to a specific geographical location or origin (e.g. a town, region, or country). The use of a GI may act as a certification that the product possesses certain qualities, or enjoys a certain reputation, due to its geographical origin.

World Trade Organization (WTO) members are increasingly looking at geographical indications as a marketing tool in today's competitive global market. Some governments, especially the European Union (EU), wish to insert in WTO negotiating texts a mandate for an extension of the current GI provisions in wine and spirits to also include food products. The EU has sought to include virtually all foods in the range of products given special protection based on their geographical origin. The list of products proposed by the EU includes 13 cheese names. To date, the U.S. has prevented such a mandate.

The December 2005 Hong Kong Ministerial text included a note indicating that negotiations on the topic of a multilateral GIs registry would be concluded at the WTO Doha Round. Discussions on GIs are likely to intensify once the larger issues of market access, export subsidies and domestic support are nearing agreement.

2.2 SAFETY OF U.S. CHEESE AND DAIRY PRODUCTS

By DEAN SOMMER
Wisconsin Center for Dairy Research, Madison, WI

The United States has a long and enviable history of manufacturing safe cheese and dairy products. This is a responsibility U.S. dairy farmers, dairy processors, as well as processing equipment manufacturers and ingredient suppliers working together with state and federal regulatory agencies have taken very seriously. Cooperating together, they ensure safe and wholesome cheese and dairy products for consumers to enjoy.

The U.S. dairy industry is a highly regulated industry. The Food and Drug Administration (FDA) has overall regulatory authority for the production of safe foods, including cheese, in the United States. Additionally, most cheese manufacturers voluntarily participate in a program administered by the United States Department of Agriculture (USDA) whereby cheese plants are regularly inspected and approved by that federal agency. Lastly, individual states also perform regulatory oversight of cheese manufacturing facilities as well as dairy farms.

As long ago as 1924, the United States Public Health Service recommended pasteurization as a means of controlling disease causing bacteria found in raw milk. Additionally, at that time the Public Health Service working with the dairy industry developed the Pasteurized Milk Ordinance (PMO) to serve as a model milk regulation. The PMO has been widely adopted and continues to be regularly updated through the efforts of the Public Health Service/FDA working together with state and local milk sanitation and regulatory agencies, dairy farmers, dairy processors, equipment manufacturers, and educational institutions. The PMO is regarded as the United States national standard for milk sanitation to provide for the protection of public health.

The United States cheese industry maintains a proven arsenal of safety promoting technologies. These include milk quality management, pasteurization

or heat-treatment of milk for cheese making, lactic culture technology, adoptions of good manufacturing practices (GMPs), and widespread implementation of the food safety system known as HACCP (Hazard Analysis Critical Control Points).

Safe milk begins on the farm with healthy cows in clean environments. The vast majority of milk produced in the United States is classified as Grade A. Grade A requirements include a maximum aerobic plate count (APC) of 100,000 colony forming units per ml, and a maximum somatic cell count (SCC) of 750,000 per ml. Commonly, most milk at the farm would have an APC of less than 20,000 per ml and a SCC of less than 300,000 per ml. Milk must be cooled to 7°C (45°F) within 2 hours of completion of milking. Additionally, all shipments of raw milk must be tested for antibiotics, with any loads testing positive being destroyed. Typically, other raw milk quality tests are performed by the dairy processor including odor, acidity, sediment, and presence of added water.

Pasteurization remains a widely used and effective processing step for the production of safe cheese. The vast majority of cheese made in the United States is made with pasteurized milk (milk is heated at 72°C (161°F) for 15 seconds minimum). Some hard and semi-hard cheeses are made with a sub-pasteurization thermalization step known as heat treatment, where typically milk is heated to between 63 and 68°C (145 and 154°F) for 15 seconds or more. Cheeses made with this heat treatment must be held for 60 days at not less than 1°C (34°F) prior to sale. The combination of the sub-pasteurization thermalization together with the 60 day hold has over many years been proven to be an effective technique for the production of safe cheeses.

Advancements in lactic culture technology have also contributed to the production of safe cheeses. The use of lactic cultures in defined strain blends has greatly improved the consistency of lactic acid production in cheese, with the resulting drop in pH to levels that are inhibitory to many pathogenic bacteria. The combination of low pH, metabolic competition provided by the lactic cultures, relatively high salt, and reduced water activity provide considerable barriers in cheese, to the growth of unwanted microorganisms, resulting in a product with remarkable resiliency with respect to safety.

The FDA has promulgated Good Manufacturing Practices (GMPs) that food companies, including cheese companies, are obligated to follow in order to produce safe products. GMPs outline practices for the safe handling of milk and cheese products throughout the entire production process. All cheese plant employees are trained in GMPs to prevent the post-pasteurization contamination of milk and to ensure the production of safe cheese.

Additionally, the principles of HACCP have been widely adopted in the U.S. cheese industry on a voluntary basis. HACCP is a food safety system designed to produce the safest food supply possible. It includes steps to identify potential hazards, identify critical control points, establish preventative measures, monitor techniques and corrective actions, and to develop verification systems. HACCP has provided the U.S. cheese industry with a powerful tool to ensure the safety of their products.

The FDA governs the limits for the presence of undesirable bacteria and other substances in cheese. For example, the FDA maintains a zero tolerance for bacterial pathogens such as *Salmonella* sp., *Listeria monocytogenes*, and *Enteropathogenic* E. *coli*. Additionally, cheese plants typically maintain specification sheets for all their cheeses, which include limits for indicator organisms such as coliforms (often less than 100/g) as well as for spoilage organisms such as yeast and mold (often less than 100/g).

Most U.S. cheese companies have also addressed the issue of allergens. Keys to their allergen plans include monitoring of allergens in a food-processing environment, avoiding cross-contamination with known allergens, and manufacturing products containing allergens at the end of a run.

Lastly, biosecurity has been a critical issue for the U.S. cheese industry since September 11, 2001. The U.S. government subsequently passed the Bioterrorism Act in 2002. As a result, all cheese and other food manufacturers have to register their plants with the U.S. government. Cheese manufacturers have taken many steps to safeguard their processes and products. Some examples include controlling the security of milk tankers picking up milk on the farm or delivering milk between processors, tightly controlling access to dairy plants, screening and positively identifying visitors to cheese plants, screening new employees, protecting water supplies, securing and sealing finished product trucks, and developing systems to rapidly trace their ingredients and products.

The United States maintains an enviable record with respect to cheese safety. The process of governmental regulatory agencies working together with a committed dairy industry has resulted in an overall food safety system that provides wholesome, safe dairy products for the world to enjoy.

2.3 TECHNOLOGY AND INNOVATION

By DR. WILLIAM HAINES
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Farmer-funded dairy research centers are developing new ways to satisfy the consumer's love for cheese with new cheese prototypes and processes that let cheese makers better control production, melt, flow, stretch, flavor and fat content.

Using Pilot Production Equipment to Prototype Alternative Cheeses

In commercial settings, cheese is typically manufactured in closed machines that hold up to about 31,000 liters (70,000 lb) of milk. While production on this scale supports a high level of efficiency, it can also discourage experimentation and innovation. Testing a different blend of ingredients can mean losing several tons of milk if the formulation is unsuccessful.

The University of Minnesota and Scherping Systems, a Minnesota-based equipment manufacturer, collaborated to address this issue. They developed an exact but much smaller replica of the machine used in commercial cheese production that perfectly mimics the processes of commercial cheese making while using a fraction of the raw material. This pilot system thereby reduces the risks and expense of prototyping new cheese varieties.

Researchers at the Minnesota-South Dakota Dairy Foods Research Center are now using the pilot system to explore new protocols for making favorite products in larger systems. Their work demonstrated that cottage cheese, which is traditionally made using open-vat processes, can be produced with a high level of quality in a closed-vat system.

Dairy Management Inc.

Producing Mozzarella Cheese in "Vatless" Conditions

Researchers at the Northeast Dairy Foods Research Center at Cornell University have developed a "vatless" system for making mozzarella cheese. By using microfilters to capture valuable dairy proteins at the beginning of production, this process gives dairy processors an additional product to sell while reducing byproducts.

The vatless process calls for milk to be filtered before entering a coagulator in order to harvest soluble milk proteins and other nutrients. Food manufacturers use these ingredients to meet growing consumer demand for higher-protein products and nutraceuticals. The remaining concentrated cheesemilk is mixed with rennet and starter culture in the coagulator, where it becomes a solid curd that can be cooked, salted and stretched. The resulting cheese tastes and performs like traditional mozzarella, but leaves behind very little or no whey, depending on the concentration used.

Limiting Moisture Migration in 290 kg (640 lb) Cheddar Cheese Blocks

Current production methods for cheddar produce giant blocks of cheese that each weigh 290 kg (640 lb). Before they can be cut into smaller chunks for retail sale, these blocks must chill in a refrigerated space for several days.

In the chilling process, however, moisture in the blocks tends naturally to migrate from the warmer center toward the cooler outer sections. The result can be inconsistent quality and texture throughout the block, rendering some of the finished cheddar of lesser quality.

Researchers at the Northeast Dairy Foods Research Center have devised a solution that blocks moisture migration in these 640 lb blocks as they cool. Adding carbon dioxide (CO_2) to reduced-fat milk before cheese production drops the rate of moisture migration from 6 to 1%. This shift is enough to eliminate undesirable inconsistencies in the 290 kg (640 lb) block, ensuring production of more high-quality, consistently textured cheddar.

New Techniques for Controlling Process Cheese Quality

As process cheese grows in popularity, manufacturers work to keep up with demand for varieties with very specific melting, slicing, shredding and flavor characteristics. Their efforts are challenged, however, by the unpredictability of process cheese, which is sensitive to natural variations in basic ingredients and processing conditions.

To ease the guesswork, researchers investigated the impact of various components and processes on process cheese outcomes. For instance, they evaluated the effect that varying the levels of filtration, casein fractions and processing temperature can have on melting point and texture, as well as the impact of using different emulsifying salt blends.

Researchers also developed new techniques for assessing cheese qualities. One such technique uses a machine already familiar to starch manufacturers for testing viscosity in a substance called the Rapid Visco Analyzer (RVA). The RVA can produce tiny lots of process cheese that accurately represent the qualities present in a larger, commercially produced batch of process cheese. This capacity for rapid, easy prototyping of a particular formulation makes it easier for process cheese manufacturers to assess new ingredients and ingredient blends.

Currently, ongoing research is focusing on developing technology to lower the amount of emulsifying salts required in the formulation and will serve to facilitate the manufacturing of reduced-sodium process cheese. Other research efforts include the utilization of rheological techniques to understand the effect of cooling on the microstructure and functionality of process cheese.

Removing Fat from Aged Cheddar Cheese

Researchers at the Northeast Dairy Foods Research Center have found a way to produce a reduced-fat version of sharp cheddar that tastes more like the traditional, full-fat version than ever before.

Their method leverages the discovery that aged cheddar's flavor resides not in its oils, but in its water content. This insight has led to a process of removing the oil from cheddar at a moment in the aging process when optimum flavor has developed and cheese consistency can be adjusted without losing the desired taste.

The process relies on centrifugal force to mechanically extract fat. Adjusting the temperature affects the amount of oil extracted, but the average amount is 7.7 kg (17 lb) of oil per 45 kg (100 lb) of cheese. The resulting reduced-fat cheddar is softer than full-fat varieties, which makes it an excellent table cheese.

Accelerated Ripening of Parmesan via Selected Bacteria

Tradition says that parmesan cheese needs at least 10 months to fully develop its complex flavor. A process currently in development at the Wisconsin Center for Dairy Research at the University of Wisconsin-Madison may support more rapid production of high quality parmesan-style cheese using selected strains of bacteria to create aged parmesan flavor in a fraction of the time.

Certain adjunct lactic acid bacteria naturally generate particular chemical compounds as they participate in cheese ripening. These compounds approximate the complex mix of volatile fatty acids, ethyl esters and other compounds that go into fine parmesan's taste and aroma. While the exact flavor chemistry of aged parmesan is not completely understood, researchers have been able to identify strains of bacteria that successfully imitate this natural formulation.

Ingredient Solution to Retarding Calcium Lactate Crystals

Calcium lactate crystals are small white spots that can be observed on the surface of cheese. These crystals are not present immediately after manufacture, but typically develop during the first 2 to 6 months of ripening. Consumers often mistake these crystals for mold. Consequently, calcium lactate crystals formation is a serious defect that results in a significant financial loss.

Researchers at the University of Minnesota in collaboration with a Minneapolis-based company called Nutricepts have developed a new ingredient called CrystalBan™ that can be utilized to increase the solubility of calcium lactate. This ingredient is added during the salting step of cheese manufacture and can be easily incorporated into a typical cheese making procedure. In pilot and full scale production trials, CrystalBan™ has been demonstrated to prevent the formation of calcium lactate crystals.

Developing Specialty Cheeses for Niche Markets

With the goal of increasing the appeal of U.S. cheeses to the Korean consumer, researchers at the Wisconsin Center for Dairy Research, in collaboration with the U.S. Dairy Export Council, incorporated KimChi and green tea into cream cheese and monterey jack cheese. Prototypes were developed and are being evaluated at present.

Another class of specialty cheese, developed at Wisconsin Center for Dairy Research, was "fun-flavored" cheese. Research on incorporating kids' flavors and colorings, such as bubble gum and green apple, have allowed the development of a line of cheeses with appeal to children. Currently, the technology enables the manufacture of fun-flavored in both string cheese and process cheese types.

By F. TRACY SCHONROCK
Schonrock Consulting,
Fairfax Station, VA

3.1 UNITED STATES DEPARTMENT OF AGRICULTURE INSPECTION PROCESS AND STANDARDS

When you buy U.S. graded or inspected cheese, you are assured it is a wholesome, high quality product. The United States Department of Agriculture (USDA), Agricultural Marketing Service (AMS), Dairy Grading Branch provides this assurance. The U.S. Grade Standards, U.S. Specifications, and Commercial-Item-Descriptions used, and the inspection and grading services provided by the USDA aid in the orderly marketing of cheese products. USDA-licensed inspectors and USDA cheese graders are assigned by the AMS to conduct these services, which include: 1) plant survey services, 2) laboratory services and 3) product inspection and grading services. All of these services are performed at the plant where the cheese is produced or at a plant controlled warehouse facility.

These services guarantee both the cheese maker and the cheese buyer that the product meets specific grade or contract requirements, has uniform quality, and has good keeping quality. In order to have cheeses graded or inspected, the manufacturer must have their production facilities surveyed by the USDA.

3.2 PLANT SURVEY SERVICES

An experienced, highly trained USDA-licensed dairy inspector conducts the plant survey, at least twice a year. The survey involves detailed checks of more than 100 items.

Some of the items on the dairy inspector's list include:

1. The plant surroundings must be clean to prevent bacterial or environmental contamination and maximize product safety.
2. Facilities must be of sound construction.
3. Areas such as the raw milk receiving, ingredient receiving, manufacturing, pasteurizing, packaging, supply storage and warehousing must have adequate lighting to facilitate inspection of products and the proper cleaning of equipment and facilities.
4. Incoming raw product is graded on a regular basis.
5. Incoming milk must be regularly analyzed to ensure high quality and product safety.
6. All processing equipment must be of a sanitary design, be properly maintained, and be properly cleaned to assure the buyer that the cheese is protected from contamination.
7. Product handling practices, employee practices, and process controls must be maintained to assure product quality and safety.
8. Packaging and storage practices must be maintained to assure that product quality and safety are maintained for the buyer.

All incoming milk is tested for:

- *Appearance and odor* – Milk should not show abnormal conditions, such as coarse sediment and curdling. Odor should be sweet and pleasing.
- *Somatic cell content* – Milk is rejected if somatic cell count exceeds 750,000 cells per ml.
- *Antibiotic residue* – Milk is rejected if antibiotic residues are detected.
- *Bacterial estimate* – Milk is rated "Undergrade" when its standard bacteria plate count exceeds 500,000 organisms per ml. Undergrade milk is not to be used to make cheese.

Only after the milk is tested and approved can the cheese be produced. This guarantees a safe, fresh final product for the cheese buyer.

During this ongoing program, the inspector reviews records of the plant's cheese production process, which U.S. government regulations require cheese makers to create and retain for at least 3 months.

After a plant survey is complete, the inspector reviews the results with the plant management. Any deficiencies observed are noted on the inspection report, discussed and corrected before approval is granted to the plant. All plants noted as having deficiencies are re-inspected prior to any certification.

Only plants that meet these requirements are granted an "Approved Status" and are eligible for grading, quality control, and certification services. Cheese manufacturing plants that have been granted an "Approved Status" are listed in the quarterly published booklet, "Dairy Plants Surveyed and Approved for USDA Grading Service." It is available from the United States Department of Agriculture:

Agricultural Marketing Service
Dairy Programs, Dairy Grading Branch
Room 2746-South Building
Stop Code 0230,
1400 Independence Avenue, S.W.,
Washington, DC 20250-0230, USA.
Tel: +1-202-720-7473
Fax: +1-202-720-2643
www.ams.usda.gov/dairy/grade.htm

Plants, which are routinely surveyed, retain their "Approved" title as long as they continue to meet or exceed these stringent USDA standards.

3.3 PRODUCT INSPECTION AND GRADING SERVICES

The USDA offers many inspection and grading services to provide assurance of wholesome and high-quality products. These services include but are not limited to confirmation of grade, compositional analysis, condition of container examination, test weighing, and dispute resolution. The grader assures the integrity of all samples and examines each sample to determine conformance to the grade standard or contract specification. The results of the evaluations for products that comply with the standard or specification are documented on an official USDA certificate.

To receive Product Inspection and Grading Services, the cheeses must be produced in a plant that has successfully conformed with the Plant Survey Service requirements and is found by the AMS to use satisfactory and sanitary manufacturing practices, equipment and facilities.

Once the cheese is produced, its moisture and fat (on a dry basis) are tested to ensure that they comply with U.S. government regulations, standards and specifications. After inspection cheese is packaged under stringent U.S. government regulated standards.

Because of their large volume, monterey jack, colby, cheddar and swiss/emmentaler cheeses are routinely graded by the U.S. government. Grades are based on nationally uniform standards developed by experts in the AMS.

These four cheeses may be assigned a U.S. Grade of AA, A, B or C on the basis of their flavor, body and texture, color, and finish and appearance. These grades certify that the product achieves an identified level of quality based on criteria developed for the specific variety of cheese. If these cheeses meet the U.S. grade standard requirements, they may display a USDA Grade shield on the packaging.

If, as in the case of all other cheeses, there is no established U.S. grade, the AMS can administer quality testing using AMS developed U.S. Specifications or Commercial-Item-Descriptions (CID), which ensures the safety and quality of these cheeses. If these cheeses meet the U.S. Specification requirements, they may display a USDA "Quality Approved" shield on the packaging.

USDA Cheese Grades

Grade AA

Product meets exacting standards, has a fine, highly pleasing flavor, a smooth, compact texture, uniform color and attractive appearance.

Grade A

High quality product with pleasing flavor. There may be slightly more variation in flavor and texture versus Grade AA products.

Quality Approved

Cheese varieties covered by a U.S. Specification, such as mozzarella cheese or cottage cheese. They must meet exacting requirements specific to the type of cheese.

3.4 EXPORT CERTIFICATION SERVICES AND LABORATORY SERVICES

Export Certification Services

Export certifications or attestations are routinely required by importing countries to document that products are fit for human consumption, produced under sanitary wholesome conditions, free from animal diseases, and are federally inspected. The USDA will issue a Sanitary Certificate only for cheeses produced in "Approved" plants. This Sanitary Certificate documents the name of the plant, the products that the plant is exporting, and that the United States is free from the following herd diseases: Rinderpest, Foot and Mouth Disease, and Contagious Bovine Plural Pneumonia. A cheese buyer/importer may request a copy of this Sanitary Certificate from the exporter. The USDA can provide export certifications meeting the requirements of most importing countries. The USDA Dairy Grading Branch is the authorized certification authority for dairy products destined for the European Union.

Laboratory Services

Laboratory services consist of analytical and quality control tests, including all chemical and bacteriological determinations essential for evaluation of class, quality, condition, and keeping properties. Exacting laboratory tests guarantee the quality and wholesomeness of the product.

Personnel

The men and women who perform these services are experienced, well-trained, and under the supervision of the USDA. Many product graders and plant inspectors are college graduates with majors in dairy manufacturing, food science or food technology, and have held responsible jobs in the dairy industry.

These stringent monitoring services ensure that the cheese buyer will receive a consistent product of the quality and functionality they desire. Any quality control deficiencies found during any phase of production must be corrected prior to receiving a grade or approval rating.

Resident Grading and Quality Control Service

Under certain circumstances, AMS may assign a resident grader to a cheese manufacturing facility. "Resident" means that a full-time USDA-licensed dairy inspector/grader is located in the plant to closely monitor the entire cheese making process on a daily basis. This program is a combination of the plant survey service, the laboratory service, and the inspection and grading service.

Only plants that have been granted approval through a plant survey and have adequate laboratory facilities are eligible for the resident grading and quality control program.

3.5 CHEESE QUALITY CRITERIA

The following table provides a brief description of the important quality information of the most popular varieties or types of cheeses available. Body characteristics are determined by pulling a small piece of cheese or "plug" from a block of cheese or in the evaluation of a slice for sliced types. This is not intended as an all-inclusive listing. To obtain the complete U.S. Grade Standards, U.S. Specifications, or Commercial-Item-Description (CID) you may go to **www.ams.usda.gov/dairy/stand.htm**.

Quality Information of Popular Varieties or Types of Cheeses

Cheese Variety or Type Evaluation Criteria	Quality Designations	Age at Evaluation
Monterey Jack		
Flavor; Body and Texture; Color; Finish and Appearance	U.S. Grade AA U.S. Grade A U.S. Grade B	Minimum of 5 days of age and held at no lower than 10°C (50°F)
Colby		
Flavor; Body and Texture; Color; Finish and Appearance	U.S. Grade AA U.S. Grade A U.S. Grade B	Minimum of 10 days of age and held at no lower than 10°C (50°F)
Cheddar		
Flavor; Body and Texture; Color; Finish and Appearance	U.S. Grade AA U.S. Grade A U.S. Grade B U.S. Grade C	Minimum of 10 days
Swiss/Emmentaler		
Flavor; Body; Eyes and Texture; Color; Finish and Appearance (including eye development and distribution)	U.S. Grade A U.S. Grade B U.S. Grade C	Minimum of 90 days
Mozzarella (including whole milk, part-skim, low-moisture, and low-moisture/part-skim types)		
Flavor; Body and Texture; Color and Appearance; Milkfat; Moisture; pH; Salt; Meltability	Quality Assurance	5 days at 5.5°C (42°F)
Cottage Cheese		
Flavor; Body and Texture; Color and Appearance; Milkfat; Coliform; Psychothophics; Yeast and Mold	Quality Assurance	Fresh
Pasteurized Process Cheese (including cheese food and cheese spread)		
Flavor; Body and Texture; Color and Appearance; Milkfat; Salt; Meltability	Quality Assurance	24 to 48 hours after cheese has cooled to storage temperature
Cream Cheese (including Neufchâtel and related products)		
Flavor; Body and Texture; Color and Appearance; Milkfat; Moisture; pH; Coliform (E.coli); Yeast and Mold	Quality Assurance	*
Shredded Cheeses (including pizza blend, mozzarella, cheddar, reduced-fat cheddar)		
Flavor; Body and Texture; Color and Appearance; Milkfat; Moisture; pH; Salt; Meltability; Fines	Quality Assurance	*
Reduced-Fat Cheeses		
Must contain ¼ to ⅓ less fat than the traditional variety	Quality Assurance	*

*The cheeses shall meet the basic salient characteristics and age at evaluation of the identified varietal cheese.

3.6 ORGANIC CERTIFICATION

To satisfy the increasing desire of many consumers to purchase organically grown products, the USDA, AMS, Transportation and Marketing Programs, administers the voluntary National Organics Program. The National Organics Program website, **www.ams.usda.gov/nop/indexnet.htm**, provides a simple, single source for review of the program regulations and policies, identifying qualified certifying agents, organic products producers, handlers and processors, and links to obtain state information. Organic products which conform to the requirements may display the official USDA Organic Shield.

3.7 KOSHER AND HALAL CERTIFICATIONS

Suppliers can obtain voluntary kosher or halal certification from internationally recognized certification organizations. Due to the religious significance and sensitivity of the requirements for kosher or halal certification, buyers are encouraged to contact suppliers well in advance so that appropriate sources of cheese, with particular emphasis on the coagulation enzymes used, can be obtained. For additional information, please contact your supplier.

Kosher

3.8 STATE DEPARTMENTS OF AGRICULTURE

Entities at the state level also certify processing plants. For additional information please contact your supplier.

3.9 QUALITY ASSURANCE OF U.S. CHEESES

Quality begins on U.S. dairy farms, which are inspected and approved by State regulatory officials with monitoring by the United States Department of Agriculture (USDA) and the United States Food and Drug Administration (FDA). Fresh milk, directly from the cow, passes through sanitized pipelines and is quickly cooled in refrigerated tanks to just below 4.5°C (40°F).

After it is sampled for microbial and quality analysis, the chilled milk is transported to dairy processing plants, where it is sampled and tested for safety, quality and freedom from antibiotics, before being unloaded from the truck.

Once inside the plant, the milk moves through sanitized pipes, tanks and vats as it is transformed into cheese and other dairy products. Virtually every U.S. cheese plant employs quality management programs to ensure that the finished product meets the highest attainable standards. Working cooperatively with USDA, finished products must strictly adhere to rigorous quality assurance programs to assure consumers receive the safest and highest quality dairy products in the world.

The USDA has established U.S. Grade Standards, U.S. Quality Specifications and Commercial-Item-Descriptions (CID) for the majority of most popular varieties of cheese to provide quality evaluations. All of these documents can be used by cheese buyers and brokers to assure they are receiving the level of quality they desire. All of these documents can be viewed at **www.ams.usda.gov/dairy/stand.htm**.

U.S. Grade Standards are available for cheddar, colby, monterey jack and swiss/emmentaler cheese. Cheese produced by a USDA-approved plant and which has been officially graded by a trained government grader may have a USDA grade shield placed on the product packaging to clearly identify that it has been inspected and graded and attest to its quality.

U.S. Specifications are available for loaf and shredded lite mozzarella cheese; shredded cheddar cheese; loaf, sliced, shredded and diced muenster cheese; cottage cheese and dry curd cottage cheese; cream cheese, cream cheese with other foods, and related products; reduced-fat cheddar cheese; ricotta cheese; and mozzarella cheeses. Cheese produced by a USDA-approved plant and which has been officially evaluated by a trained government grader may have a USDA quality assurance shield placed on the product packaging to clearly identify that it has been evaluated for quality.

CIDs are available for pizza cheese blends, reduced-fat cheddar cheese, lite mozzarella cheese, cottage cheese, and cream cheese, neufchâtel cheese and related products. Cheese produced by a USDA-approved plant and which has been officially evaluated by a trained government grader may have a USDA certificate issued to identify that the product has been evaluated.

U.S. dairy products meet strict sanitation standards. From the time the milk leaves the cow until cheese is shipped to the consumer, U.S. dairy products are subjected to continuous monitoring and numerous quality assurance tests conducted by the cheese maker and state and federal regulatory officials that help assure its performance and shelf life.

Domestic and international end-users recognize the quality of U.S. cheese because they can count on rigorous testing and standards for quality.

3.10 ANALYTICAL TESTS

To ensure conformance to a standard of identity, the Food and Drug Administration (FDA) specifies certain analytical tests to be performed on a dairy food. The AOAC International has also developed various analytical tests to ensure that cheeses meet company and federal standards in terms of quality, safety and composition.

The following standard methods are commonly employed for cheese (AOAC International):

- *Moisture content* AOAC method 926.08
- *Milkfat content* AOAC method 933.05

For more information please contact your U.S. cheese supplier or the U.S. Dairy Export Council.

3.11 U.S. FEDERAL STANDARDS OF IDENTITY

U.S. Federal Standards of Identity are established by the U.S. Food and Drug Administration (FDA). They include a much broader variety of cheeses compared with the U.S. Department of Agriculture (USDA) grade standards and ensure that U.S. cheeses meet the minimum requirements for major categories of cheese (e.g., hard, semi-soft) and also to qualify as specific varieties of cheese. U.S. Federal Standards of Identity help assure buyers around the world that they are getting the appropriate flavor, functionality and nutrient content they expect from specific cheese varieties. (Individual cheeses may vary somewhat depending on raw milk composition and manufacturing process. However, U.S. Federal Standards of Identity help ensure minimal variation in major components.) The Standards of Identity can be viewed by searching the appropriate section numbers at **www.gpoaccess.gov/cfr**.

Federal Standards of Identity for U.S. Cheeses (Major Cheese Categories)

Cheese	Maximum Moisture	Minimum Milkfat in Solids	Minimum Age
Hard Grating	34%	32%	6 Months
Hard (Firm)	39%	50%	60 Days
Semi-Soft	39%< – <50%	50%	60 Days
Semi-Soft Part-Skim	50%	45%< – <50%	60 Days
Soft-Ripened		50%	60 Days
Asiago (Fresh)	45%	50%	60 Days
Asiago (Medium)	35%	45%	6 Months
Asiago (Old/Aged)	32%	42%	1 Year
Blue	46%	50%	60 Days
Brick	44%	50%	60 Days
Brie*	50%		
Camembert*	50%		
Cheddar	39%	50%	60 Days
Low-Sodium Cheddar	39%	50% 96 mg maximum sodium per lb.	60 Days
Colby	40%	50%	60 Days
Low-Sodium Colby	40%	50% 96 mg maximum sodium per lb.	60 Days
Cottage	80%	4.0%	
Low-Fat	82.5%	0.5–2%	
Dry Curd	80%	0.5%	
Cream Cheese	55%	33%	
Double Cream Brie*	50%	60–74%	
Edam	45%	40%	60 Days
Gorgonzola	42%	50%	90 Days
Gouda	45%	46%	
Gruyère	39%	45%	90 Days
Havarti*	36–39%	37–38%	
Limburger	50%	50%	60 Days
Monterey Jack	44%	50%	
Mozzarella	52%< – <60%	45%	
Low-Moisture	45%< – <52%	45%	
Low-Moisture/Part-Skim	45%< – <52%	30%< – <45%	
Part-Skim	52%< – <60%	30%< – <45%	
Whole Milk*	52%< – <60%	45%	
Muenster	46%	50%	
Neufchâtel	65%	20%< – <33%	
Parmesan	32%	32%	10 Months
Pasteurized Process Cheese	43%	47%	
Process Cheese Food	44%	23%	
Process Cheese Spread	44%–60%	20%	
Provolone	45%	45%	60 Days
Romano	34%	38%	5 Months
Swiss	41%	43%	60 Days
Triple Cream Brie*	50%	+70%	

Source: Code of Federal Regulations, Title 21, Part 133
*Typical, not official composition

4.1 MILK: THE PRIMARY INGREDIENT

By WILLIAM SCHLINSOG
Cheese Specialist and Consultant, Middleton, WI

Fresh, clean milk is the most important ingredient in the cheese making process. The milk must be produced under the most sanitary conditions and must not contain any contaminants or inhibitory substances.

Cheese is a concentrated form of milk, containing milk protein, milkfat and water. The general process of making a simple cheese consists of the coagulation of the milk into a gel-like state, which is then followed by a separation of the curds (cheese) and the liquid called whey. The cheese curd can then be manipulated by heating, stretching, packing, etc. to be formed into the variety of cheese being produced.

Many other dairy products also result from the transformation of fresh milk. (See Figure 1. Food Products from Milk.)

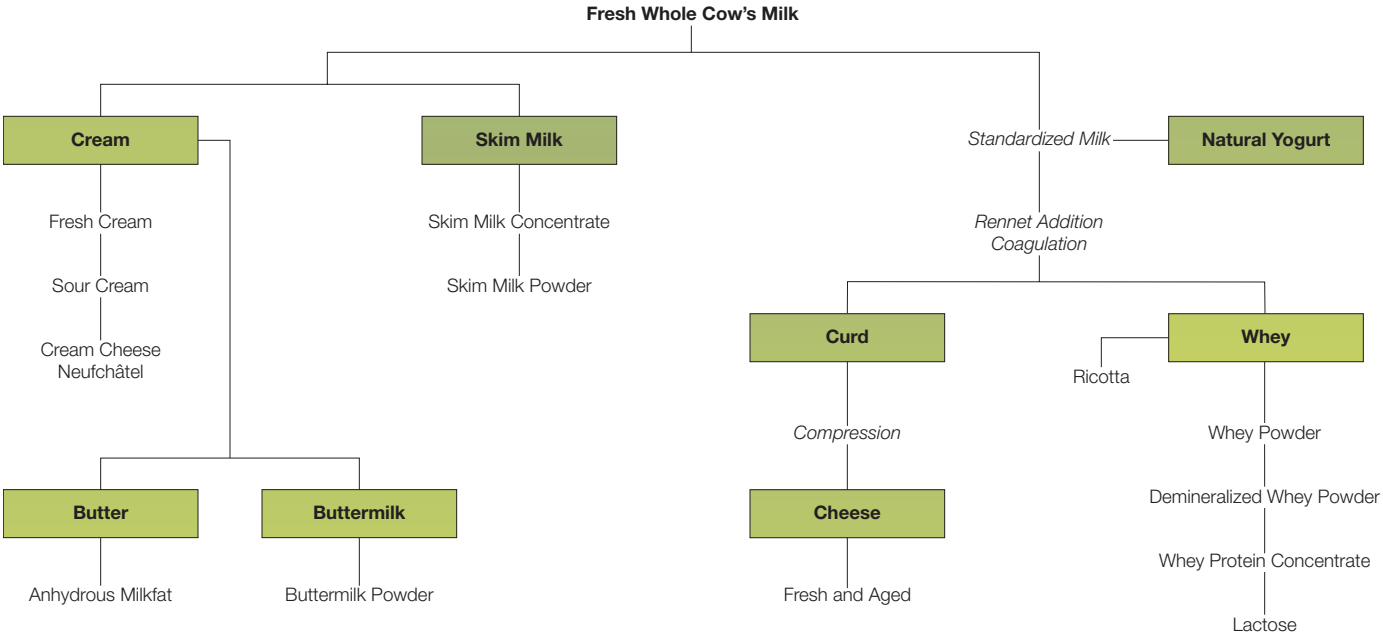
Testing and Control

Federal Standards for the composition of milk and milk products are contained in the Code of Federal Regulations (CFR) 21, Parts 100 to 169. These regulations contain tables and technical composition data for a wide range of dairy products and are updated and revised as needed to ensure a safe and healthy source of milk and dairy products.

All milk is tested when it arrives at the manufacturing plant. It is weighed and tested for milkfat and other components for payment to the producer. Quality tests are performed for any off flavors, excessive bacterial counts or foreign substances.

Stringent U.S. government regulations require cheese makers to record the entire cheese making process, and maintain these records for at least 3 months after the cheese is manufactured. By doing this, United States Department of Agriculture (USDA) licensed inspectors can check that all required quality tests were performed and documented.

Figure 1. Food Products from Milk



4.2 THE CHEESE MAKING PROCESS

By WILLIAM SCHLINSOG
Cheese Specialist and Consultant, Middleton, WI

Transforming Milk into Cheese

Standardization of Milk

Depending on the type of cheese being produced, the milk may be adjusted for fat and protein levels for consistency. Cream can be added or taken away to adjust the fat content of the cheese. Nonfat dry milk may be added to obtain the desired levels of protein.

Cheddar cheese is one of the most common types of cheese produced; following are the steps used in its manufacture. Other cheese types will vary from this standard, with changes in starter organisms, temperatures, and handling of the curds.

The entire cheddar cheese making operation takes about 4 hours to complete, from the time the milk enters the vat to the time the cheese can be put into forms for pressing. Cheddar and other cheeses can also be aged to enhance flavor development. The chart below shows aging times for flavor development for cheddar.

	Aging Times
Mild	1 to 3 months
Medium	3 to 6 months
Sharp	6 months to 1 year
Extra Sharp	1 year or more

In the cheddar manufacturing process shown here, open-type vats are depicted. Many smaller plants and specialty cheese operators use the open-vat style. Most large operations today use entirely enclosed systems where there is limited viewing opportunity. All operations must meet the same standards of sanitation in equipment and ingredients.

Pasteurization of Milk

While all cheese is not made from pasteurized milk, most U.S. cheeses are. Cheese made from raw or unpasteurized milk must be aged for 60 days prior to sale. Pasteurization is the process of heating milk to a temperature where all pathogens are eliminated. The variations of time and temperatures to pasteurize milk are from 72°C (161°F) for 15 seconds to 63°C (145°F) for 30 minutes. After pasteurization, the milk is then pumped into the cheese vat and heated to the temperature corresponding to the cheese being made. If colored cheddar is being made, annatto is then added to the milk.

Addition of Starter Culture

Starter cultures, which are favorable bacteria, are added to help curdle the milk. They also help determine the final flavors in the cheese being produced.

Addition of Rennet

Rennet, a milk-clotting enzyme is added to solidify the milk into a gel-like mass. After the milk has congealed and is of the proper consistency, the mass is cut with wire curd knives into small cubes. At this time, the liquid called whey separates from the curd and the mass is then gently stirred and heated.

Heating the Curds and Whey

The curds and whey are heated to the proper temperature and stirred until the desired firmness is achieved. Then the whey is drawn off and used for other purposes. The longer the curds and whey are stirred, the more whey will be expelled from the curd and the firmer the curds will be.

Matting the Curds, Cheddaring

Cheddar cheese has the distinction of having a step in the cheese making process called cheddaring. First, the curd is allowed to settle to the bottom of the vat underneath the whey, which is later removed as the curd begins to knit together. The curd is then cut into slabs, which are turned, stacked and rotated one on top of the other. This results in a stretching of the curd into a meaty-type body. The purpose of this is to produce cheese that has a close-knit texture and a waxy body with good slicing property. This cheddaring process takes approximately 1 to 2 hours.

Milling the Cheese

Milling the slabs of curd is done with the aid of a curd mill, which cuts the slabs of curd into cubes about the size of a domino. After milling, the cheese curds are mixed and stirred with mechanical forks. This keeps the pieces of curd from matting together.

Salting the Cheese

Salt, ranging from 1 to 2% of the cheese weight, is added to improve flavor, suppress the growth of undesirable microorganisms, control moisture of final cheese by drawing out whey from the curd, and assist in regulating the ripening process.

Hooping and Pressing

The cheese curds are moved into hoops (containers) to be formed and pressed into a compacted mass. Types of forms used are cylindrical forms ranging from 5 kg (11 lb) to 35 kg (78 lb), or 18 kg (40 lb) blocks, 227 kg (500 lb) barrels, and large blocks of 290 kg (640 lb).

Other Types of Cheese Making Procedures

Process Cheese, Process Cheese Food, and Process Cheese Spread

Process cheese is a cheese produced by mixing, with the aid of heat and emulsifying salts, one or more natural cheeses into a homogeneous mass. During its preparation, pasteurized process cheese is heated for not less than 30 seconds at a temperature of not less than 72°C (161°F). This produces a shelf stable cheese that can be kept without refrigeration. It can be sliced or spread, and melts well for many uses in cooking and other food preparation.

Cold-Pack Cheese, Cold-Pack Cheese Food

This is a cheese product made by combining a single cheese, or a group of cheeses with optional ingredients like vinegar or citric acid. This is done without the aid of heat, and produces a homogeneous mass used as a spread. This is a cheese that has not been heated to stop the aging and ripening process. Many types of condiments, such as wine, peppers, horseradish, spices and herbs, can be added to create different varieties.

4.3 CLASSIFICATION AND STANDARDS

By REGI HISE
Foodtrends, LLC,
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- A **category** is a family of cheeses that share similar characteristics.
- **Varieties** or **types** represent individual cheeses within the families.
- **Styles** refer to cheese shapes and sizes.

Cheese can be classified in a number of ways including milk type, flavor and rind, origin by country or region, and degree of hardness.

Degree of Hardness

Categorizing cheese by the degree of hardness is the most universal method. U.S. Federal Standards of Identity dictate the tolerances of moisture and milkfat that can be contained in cheese. Since the amount of moisture and fat in cheese significantly controls the properties of the cheese, using degrees of hardness stands on a legal definition.

Federal Standards of Identity

The Federal Standards of Identity for cheese and cheese products are defined by the Food and Drug Administration (FDA), and the Department of Health and Human Services (HHS). The standards for cheese are found in Title 21 Food and Drugs, Chapter I, Subchapter B Food for Human Consumption, Part 133, Cheese and Related Cheese Products.

These Standards of Identity describe the major varieties of cheese and identify the procedures by which they are manufactured, the ingredients they may contain, and their moisture and milkfat. For types of cheese not defined by a generic name in these standards, provisions are made for cheeses to be identified by their degree of hardness.

Cheese Grading

Factors, which help determine all cheese grades, are categorized in one of four areas – flavor, body and texture, color, and finish and appearance.

Flavor

The overall cheese flavor must be pleasing and be free from undesirable flavors and odors.

Body and Texture

The cheese must meet the required standard and characteristics for the particular variety or category, such as soft, semi-soft, hard, pliable and resistant, waxy, supple, open or closed, grainy or coarse.

Color

The cheese may be "uncolored," the natural cream milk color or a natural color specified by the FDA – usually a golden hue. If color is added, it may be to any degree that is recognized or requested in the market.

Finish and Appearance

The cheese must have an appropriate coating to protect the cheese from damage or deterioration. The coating must also be characteristic of the product and present a good image to the buyer or consumer.

4.4 CHEESE STYLES AND PACKAGING TYPES

U.S. cheese manufacturers produce cheese in a variety of shapes, sizes and packaging styles. Some of the more popular styles available are highlighted in this section. For more detailed information about specific products, please contact your U.S. cheese supplier.

Styles of Cheese

A. Barrel
Natural cheese curds usually packed in barrels weighing 227 kg (500 lb). Available for cheddar, colby and monterey jack.

B. Block
Rectangular-shaped cheese weighing 18 kg (40 lb). Available for a variety of cheeses such as cheddar, colby, monterey jack, swiss and mozzarella.

C. Daisy
Cylinder-shaped cheese weighing approximately 9 kg (20 lb). Available for cheddar.

D. Flat
Cylinder-shaped cheese, 37 cm (14.5 in) in diameter, weighing from around 14 to 18 kg (30 to 40 lb). Available for cheddar.

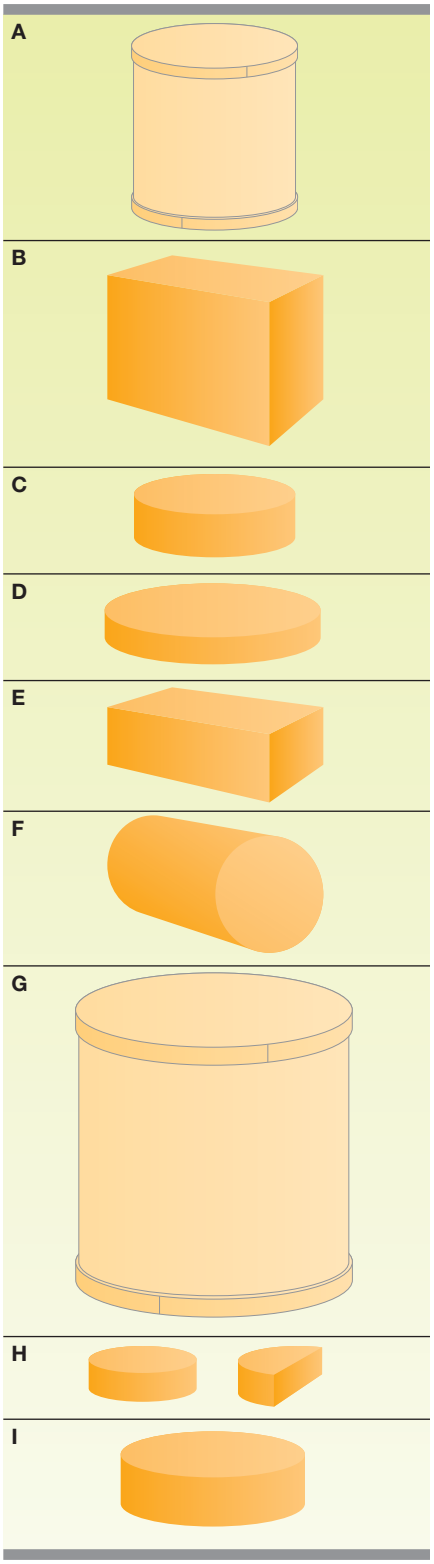
E. Loaf
Blocks are cut into 2.27 kg (5 lb) pieces. Available for a variety of cheeses including cream cheese, pasteurized process cheese, brick, mozzarella and muenster.

F. Longhorn
Cylinder-shaped cheese weighing 5.90 kg (13 lb). Available for a variety of cheeses such as cheddar, colby and monterey jack.

G. Mammoth
Largest style of cheese; cylinder-shaped cheese weighing from around 45 to 431 kg (100 to 950 lb). Available for cheddar.

H. Moon
A cross-section slice of a longhorn style (half moon is a half slice of a cross-section); thickness and weights can vary. Available for a variety of cheeses such as cheddar, colby and monterey jack.

I. Wheel
Round-shaped cheese available for a variety of cheeses such as blue, gorgonzola, swiss and romano.

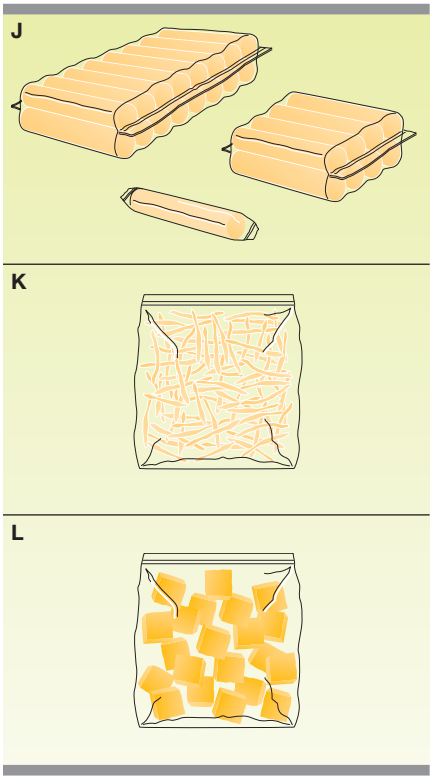


The following styles of cheeses are also available from U.S. suppliers. These are value-added cheese products designed for the convenience of the end-user, especially at retail and foodservice.

J. String Cheese
Style of cheese extruded in the shape of a stick (3 g/1.5 oz). Convenient for pizza crust filler or as a snack. Available for a variety of cheeses such as mozzarella, cheddar, colby, among others.

K. Sliced, Shredded, Grated Cheese
Many cheeses are offered sliced, shredded, or grated by U.S. cheese manufacturers. They are available in retail or bulk foodservice packaging for a wide variety of cheeses including semi-soft, edam and gouda, mozzarella, provolone, cheddar, swiss, hard cheeses, and process cheeses.

L. Cubed, Crumbled, Unique Shapes
U.S. cheeses are also available cubed (semi-hard cheeses such as cheddar, colby), crumbled (blue cheese, feta), grated (hard cheeses such as parmesan) or custom-shaped (kids snacks).



Packaging Options

The packaging of all cheeses at the plant is a critical step for U.S. manufacturers to ensure the integrity of the products and protect the cheese during handling.

In the United States, the packaging process is under stringent standards. A USDA-licensed cheese inspector must inspect and approve a dairy plant's packaging process before a cheese can be assigned a U.S. grade or approval rating. These USDA-licensed inspectors assigned by the Dairy Division, a branch of USDA's Agriculture Marketing Service (AMS), observe representative samples of the product packaging to ensure that cheese is packed under sanitary conditions. They also confirm that the weights recorded on the packages are accurate.

Vacuum Packaging
Various types of heat-shrink bags are used to package a wide variety of bulk cheeses. This helps reduce mold growth, and in cheddar it has been shown to prevent lactate crystal formation on the surface during aging.

Film Packaging
Plastic films provide excellent barriers to oxygen and moisture. Sometimes used as an alternative to wax for ripened cheeses, plastic films for this application can help save on cheese losses.

Wax Coatings
Paraffin wax is used to coat wheels and blocks of many U.S. cheese varieties, including cheddar, brick, Italian-style hard cheeses and others. Specific colors of wax are sometimes used to indicate the age of the cheese. A second, flexible wax overlay is sometimes applied on top of paraffin wax.

Resealable Packaging
Resealable bags are often used for consumer and foodservice packages of shredded or cubed cheeses. Cream cheese is commonly offered in resealable cups or tubs. They offer extra convenience and help reduce waste or storage losses.

This table only serves as a guideline and does not constitute an exhaustive list of the cheese styles and packaging types available from U.S. cheese suppliers. Contact your supplier for more information.

Table 1. Typical U.S. Cheese Packaging Types

Cheese	Style	Weight		Packaging Type	Market Segment: Foodservice/ Industrial	Market Segment: Retail
Asiago	Wheel	9.08 kg	20 lb	shrink-wrapped, wax	•	•
		R/W* cuts		shrink-wrapped		•
	Half wheel	4.54 kg	10 lb	shrink-wrapped	•	•
	Wedge	227 g	8 oz	shrink-wrapped		•
	Grated/shredded	4.54 kg	10 lb	tub, bag or carton	•	
		2.27 kg	5 lb	tub, bag or carton	•	
		227 g	8 oz	tub		•
		113 g	4 oz	tub		•
Baby Swiss	Wheel	4.5 kg	10 lb	shrink-wrapped	•	
		2.27 kg	5 lb	shrink-wrapped	•	
		908 g	2 lb	shrink-wrapped	•	•
		R/W* cuts		shrink-wrapped		•
	Loaf	4.54 kg	10 lb	shrink-wrapped	•	
		2.27 kg	5 lb	shrink-wrapped	•	•
		R/W* cuts		shrink-wrapped		•
Blue	Wheel	5.45 kg	12 lb	shrink-wrapped	•	
		2.72 kg	6 lb	shrink-wrapped	•	•
	Wedges	227 g	8 oz	shrink-wrapped		•
	Crumbled	4.54 kg	10 lb	bag	•	
		2.27 kg	5 lb	bag	•	
		227 g	8 oz	bag	•	
		113 g	4 oz	bag		•
Brick	Loaf	4.54 kg	10 lb	shrink-wrapped	•	
		2.72 kg	6 lb	shrink-wrapped	•	
	Stick	227 g	8 oz	shrink-wrapped		•
Brie	Wheel	3 kg	6.6 lb	breathable wrapping in box	•	
		2 kg	4.4 lb	breathable wrapping in box	•	
		1 kg	2.2 lb	breathable wrapping in box	•	•
		400 g	14 oz	breathable wrapping in box		•
		227 g	8 oz	breathable wrapping in box		•
	Half wheel	113 g	4 oz	breathable wrapping in box		•
	Wedge	28 g	1 oz	individual portion/breathable wrapping	•	
Camembert	Wheel	1 kg	2.2 lb	breathable wrapping in box	•	•
		227 g	8 oz	breathable wrapping in box		•
	Half wheel	113 g	4 oz	breathable wrapping in box		•

*R/W: random weight cuts

Typical U.S. Cheese Packaging Types (continued)

Cheese	Style	Weight		Packaging Type	Market Segment: Foodservice/ Industrial	Market Segment: Retail
Cheddar	Block	290 kg	640 lb	shrink-wrapped	•	
		18.1 kg	40 lb	shrink-wrapped	•	•
	Barrel	227 kg	500 lb	shrink-wrapped	•	
	Wheel	16 kg	35 lb	called "flat," shrink-wrapped	•	•
		10 kg	22 lb	called "daisy," shrink-wrapped	•	•
	Longhorn	5.45 kg	12 lb	shrink-wrapped	•	•
	Print	4.54 kg	10 lb	shrink-wrapped	•	•
	Loaf	2.27 kg	5 lb	shrink-wrapped	•	•
	Shreds, cubes	4.54 kg	10 lb	bag	•	
		2.27 kg	5 lb	bag	•	
		454 g	1 lb	bag		•
		908 g	2 lb	bag		•
	Stick	227 g	8 oz	shrink-wrapped		•
		28 g	1 oz	individually wrapped portion		•
	Wedge	227 g	8 oz	shrink-wrapped		•
Colby	Block	18.1 kg	40 lb	shrink-wrapped	•	
	Longhorn	5.45 kg	12 lb	shrink-wrapped	•	•
	Loaf	2.27 kg	5 lb	shrink-wrapped	•	•
	Shreds, cubes	4.54 kg	10 lb	bag	•	
		2.27 kg	5 lb	bag	•	
		454 g	1 lb	bag		•
		227 g	8 oz	bag		•
	Horn	454 g	1 lb	shrink-wrapped		•
	Wedge	227 g	8 oz	shrink-wrapped		•
Cold-Pack	Spread	2.27 kg	5 lb	tub	•	
		454 g	1 lb	tub	•	•
		227 g	8 oz	tub		•
		113 g	4 oz	tub		•
Cottage		22.7 kg	50 lb	pail	•	
		4.54 kg	10 lb	pail, bag	•	
		454 g	1 lb	tub		•
		227 g	8 oz	tub		•
		113 g	4 oz	tub		•
Cream Cheese	Block	13.6 kg	30 lb	shrink-wrapped	•	
	Loaf	1.36 kg	3 lb	shrink-wrapped	•	
	Bar	454 g	1 lb	aluminium foil/box or tub		•
		227 g	8 oz	aluminium foil/box or cup		•
		113 g	4 oz	aluminium foil/box		•
		85 g	3 oz	aluminium foil/box		•
	Portion control	28 g	1 oz	cup	•	•
Edam	Block	18.1 kg	40 lb	shrink-wrapped	•	
	Loaf	2.27 kg	5 lb	shrink-wrapped	•	
		R/W* cuts		shrink-wrapped		•
	Ball	1.36 kg	3 lb	wax	•	
		908 g	2 lb	wax		•
	Disc	227 g	8 oz	shrink-wrapped		•

*R/W: random weight cuts

Typical U.S. Cheese Packaging Types (continued)

Cheese	Style	Weight		Packaging Type	Market Segment: Foodservice/ Industrial	Market Segment: Retail
Feta	Block	15.9 kg	35 lb	pail	•	
		4.54 kg	10 lb	pail	•	
		2.27 kg	5 lb	pail	•	
		454 g	1 lb	tub		•
		227 g	8 oz	tub		•
	Crumbled	227 g	8 oz	bag, tub		•
		113 g	4 oz	bag, tub		•
Gorgonzola	Wheel for young/creamy Wheel for aged/crumbly	6.80 kg	15 lb	aluminium foil, shrink-wrapped	•	•
		5.45 kg	12 lb	aluminium foil, shrink-wrapped	•	•
		2.72 kg	6 lb	aluminium foil, shrink-wrapped	•	•
	Wedge	227 g	8 oz	shrink-wrapped		•
	Crumbled	2.27 kg	5 lb	bag	•	
		227 g	8 oz	bag, tub		•
		113 g	4 oz	bag, tub		•
Gouda	Block	18.1 kg	40 lb	shrink-wrapped	•	
	Loaf	2.72 kg	6 lb	shrink-wrapped	•	
		R/W* cuts		shrink-wrapped		•
	Wheel	4.08 kg	9 lb	wax	•	
		227 g	8 oz	wax		•
		R/W* cuts		shrink-wrapped		•
	Stick	227 g	8 oz	shrink-wrapped		•
Gruyère	Wheel	34 kg	75 lb	in rind	•	•
		9.08 kg	20 lb	shrink-wrapped	•	•
		R/W* cuts		shrink-wrapped		•
	Loaf	4.54 kg	10 lb	shrink-wrapped	•	•
		R/W* cuts		shrink-wrapped		•
	Shreds	2.27 kg	5 lb	bag	•	
Havarti	Loaf	4.08 kg	9 lb	shrink-wrapped	•	•
		R/W* cuts		shrink-wrapped		•
Limburger	Loaf	227 g	8 oz	aluminium foil, shrink-wrapped	•	•
Mascarpone		2.27 kg	5 lb	tub	•	
		1.36 kg	3 lb	tub	•	
		454 g	1 lb	cup		•
		227 g	8 oz	cup		•
		113 g	4 oz	cup		•
Monterey Jack	Block	18.1 kg	40 lb	shrink-wrapped	•	
		4.54 kg	10 lb	shrink-wrapped	•	
	Wheel	4.54 kg	10 lb	shrink-wrapped	•	
	Wedge	227 g	8 oz	shrink-wrapped		•
	Stick	227 g	8 oz	shrink-wrapped		•
	Shreds, cubes	454 g	1 lb	bag		•
		227 g	8 oz	bag		•
Mozzarella	Block	18.1 kg	40 lb	shrink-wrapped	•	
		9.08 kg	20 lb	shrink-wrapped	•	
	Loaf	3.63 kg	8 lb	shrink-wrapped	•	
	Shreds, cubes	2.27 kg	5 lb	bag	•	
		454 g	1 lb	bag		•
		908 g	2 lb	bag		•
	Balls	454 g	1 lb	fresh mozzarella only, shrink-wrapped		•
	Stick	454 g	1 lb	shrink-wrapped		•
		227 g	8 oz	shrink-wrapped		•

*R/W: random weight cuts

Typical U.S. Cheese Packaging Types (continued)

Cheese	Style	Weight		Packaging Type	Market Segment: Foodservice/ Industrial	Market Segment: Retail
Mozzarella – Individually Quick Frozen (IQF)	Shreds, dices	6.80 kg	15 lb	box	•	
Note: IQF mozzarella is a product designed only for bulk use						
Muenster	Block	18.1 kg	40 lb	shrink-wrapped	•	
	Print	4.54 kg	10 lb	shrink-wrapped	•	
	Wheel	2.72 kg	6 lb	shrink-wrapped	•	
	Loaf	2.27 kg	5 lb	shrink-wrapped	•	
	Stick	227 g	8 oz	shrink-wrapped		•
	Wedge	227 g	8 oz	shrink-wrapped		•
	Shreds, cubes	454 g	1 lb	bag		•
Neufchâtel	Block	13.6 kg	30 lb	shrink-wrapped	•	
	Loaf	1.36 kg	3 lb	shrink-wrapped	•	
		454 g	1 lb	shrink-wrapped or tub		•
	Bar	227 g	8 oz	aluminium foil/box or tub		•
		113 g	4 oz	aluminium foil/box or tub		•
		85 g	3 oz	aluminium foil/box		•
	Portion control	28 g	1 oz	cup		•
Parmesan	Wheel	34 kg	75 lb	in rind	•	•
		10 kg	22 lb	in rind	•	•
		R/W* cuts		shrink-wrapped		•
	Wedge	227 g	8 oz	shrink-wrapped		•
	Grated, Shreds	4.54 kg	10 lb	tub, bag, carton	•	
		2.27 kg	5 lb	tub, bag, carton	•	
		22 g	8 oz	tub (shreds), canister (grated)		•
		113 g	4 oz	tub (shreds), canister (grated)		•
		85 g	3 oz	canister (grated)		•
Process Cheese	Block	272 kg	600 lb	plastic wrap	•	
		18.1 kg	40 lb	plastic wrap	•	
	Loaf	4.54 kg	10 lb	plastic wrap	•	
		2.27 kg	5 lb	plastic wrap	•	
	Stak Pak	18.1 kg	40 lb	plastic wrap	•	
	Stagger Pak	18.1 kg	40 lb	plastic wrap	•	
	Ribbons	18.1 kg	40 lb	plastic wrap	•	
	Side-by-side	18.1 kg	40 lb	plastic wrap	•	
	Individually wrapped slices (IWS)	18.1 kg	40 lb	plastic wrap	•	
		907 g	2 lb	plastic wrap		•
		454 g	1 lb	plastic wrap		•
		227 g	8 oz	plastic wrap		•
Process Cheese Spread	Spread	4.5 kg	10 lb	tub, pail, can	•	
		2.27 kg	5 lb	tub, pail, can	•	
		454 g	1 lb	tub, squeeze dispenser, can, aerosol can		•
		227 g	8 oz	tub, squeeze dispenser, can, aerosol can		•
Provolone	Cylinder	45.4 kg	100 lb		•	
		9.08 kg	20 lb		•	
		3.63 kg	8 lb		•	
	Wedge	227 g	8 oz	shrink-wrapped		•
	Shreds, cubes	4.54 kg	10 lb	bag (shreds only)	•	
		2.27 kg	5 lb	bag (shreds only)	•	
		454 g	1 lb	bag		•

*R/W: random weight cuts

Typical U.S. Cheese Packaging Types (continued)

Cheese	Style	Weight		Packaging Type	Market Segment: Foodservice/ Industrial	Market Segment: Retail
Queso Blanco	Block	18.1 kg	40 lb	shrink-wrapped	•	
	Print	4.54 kg	10 lb	shrink-wrapped	•	
	Loaf	2.27 kg	5 lb	shrink-wrapped	•	•
		454 g	1 lb	shrink-wrapped		•
	Cubed, crumbled	454 g	1 lb	bag		•
		227 g	8 oz	bag		•
Ricotta		13.6 kg	30 lb	plastic-lined box	•	
		9.07 kg	20 lb	bag	•	
		4.54 kg	10 lb	pail	•	
		2.27 kg	5 lb	tub	•	
		454 g	1 lb	tub		•
		227 g	8 oz	cup		•
Romano	Wheel	11.3 kg	25 lb	wax	•	•
	Half wheel	5.65 kg	12.5 lb	wax, shrink-wrapped	•	•
	Wedge	227 g	8 oz	shrink-wrapped		•
	Grated, shreds	4.54 kg	10 lb	tub, bag, carton	•	
		2.27 kg	5 lb	tub, bag, carton	•	
		227 g	8 oz	tub (shreds), canister (grated)		•
		113 g	4 oz	tub (shreds), canister (grated)		•
Swiss	Wheel	90.8 kg	200 lb	in rind	•	
		18.1 kg	40 lb	in rind	•	•
		9.08 kg	20 lb	in rind	•	•
	Block	18.1 kg	40 lb	rindless, shrink-wrapped	•	
	Loaf	4.54 kg	10 lb	rindless, shrink-wrapped	•	
		3.63 kg	8 lb	shrink-wrapped	•	
		2.27 kg	5 lb	rindless, shrink-wrapped	•	•

*R/W: random weight cuts

4.5 STORAGE

When storing cheese, a general rule is that low-moisture cheeses (less than 50% moisture) can withstand higher temperatures, while high-moisture cheeses (more than 50% moisture) should be kept cold. However, to maintain the high quality of cheese and maximize its shelf life, it is important to adhere to more specific storing, out-of-refrigeration and freezing guidelines.

Storing cheeses at proper temperatures and humidity levels reduces the risk of undesirable flavor development, oiling-off of the milkfat and growth of mold. (See Table 2. Storage Recommendations for Specific Cheese Varieties at the end of this section.) All cheeses are best stored at 65% humidity.

In the event that mold does grow on the surface of cheese, simply trim off the moldy sections of the cheese 1 cm (0.39 in) below the deepest mold penetration. This way, the quality of the remaining cheese is not affected. Varieties of mold-ripened cheeses such as blue, brie and camembert do not need to be trimmed.

Shelf Life

Moisture content and composition are the primary factors affecting the keeping quality of cheese. As a general rule, soft, high-moisture cheeses such as cream cheese have a shorter shelf life. Hard cheeses such as cheddar have a longer shelf life if handling and storage are carefully controlled. The shelf life of cheese powders (dry cheeses) and dry blends ranges from 6 to 9 months.

Freshness Date

To help buyers estimate the projected shelf life of a particular cheese, manufacturers may mark retail packages of cheese with a freshness date. The freshness date, which is not required on packages by U.S. law, is a manufacturers estimate of when the flavor and texture of the cheese is best. However, the cheese typically is safe to eat beyond this time.

This date also is important to cheese buyers when managing inventories of soft cheeses with storage periods of less than 1 month.

Out-Of-Refrigeration Display

Bulk point of purchase product displays are proven to increase sales. Firm and hard cheeses like parmesan, romano, cheddar and colby may be displayed out of refrigeration to promote cheese sales in a retail display, or as part of product demonstrations and samplings. Cheese placed on bulk displays or near sampling stations should always be tightly wrapped in plastic film, or in their original factory sealed packages. Products should not be placed in hot spaces near sunny windows, and only placed on display for short periods of time.

Freezing Cheese

Freezing cheese is not generally recommended because the freezing process can result in cheese with a grainy or mealy texture, making it more suitable for cooking applications than cheese stand alone service. Most cheeses should not be frozen, but if it becomes necessary, some guidelines include:

- Cheese should be frozen as quickly as possible to -23°C (9°F).
- Frozen cheese should be thawed under refrigeration between 0 to 1°C (32 to 34°F) for several days.
- After cheese is thawed, it should be stored between 0 to 1°C (32 to 34°F) for 10 days. This process is known as "tempering," and assures that the texture and melting performance of the cheese are not affected significantly by frozen storage.
- For the best flavor, cheese should not be frozen for more than several months.

Some cheeses freeze better than others, and handling instructions vary by cheese variety. When mold-ripened cheeses including bloomy rind, blue, and washed-rind cheeses are frozen, the beneficial molds are killed and do not continue to grow after they are frozen and thawed. Before freezing any cheese, check with your distributor or cheese manufacturer regarding specific freezing guidelines.

U.S. cheese makers produce many cheese varieties that are intended to be stored frozen for long periods. They include Individually Quick Frozen (IQF) cheeses like shredded and diced mozzarella. Most cheeses that are frozen are used as ingredients in prepared foods and other foods intended to be cooked.

Recommended Storage for Specific Varieties of Cheese

Proper refrigeration greatly extends the usable shelf life of cheese. Storage guidelines vary with different types of cheese, but, as a general rule, cheese should be stored as cool as possible without freezing. Soft-fresh cheeses and more perishable cheeses can be stored at 0 to 1°C (32 to 34°F). Firm or harder cheeses can safely be stored at 1 to 3°C (34 to 37°F).

Soft Cheeses

Soft cheeses are classified into two groups: soft-fresh cheeses and soft mold-ripened cheeses. The moisture content for both exceeds 50%.

Soft-fresh cheeses, such as cottage, cream and ricotta, will keep for approximately 2 to 4 weeks when refrigerated between 0 to 1°C (32 to 34°F). Warming these cheeses can cause flavor-related or microbiological spoilage, while freezing can cause textural damage.

Soft mold-ripened cheeses such as camembert, which is produced in the United States from cow's milk, should be refrigerated between -1 to 1°C (30 to 34°F). Under these conditions, soft mold-ripened cheeses will keep for approximately 2 months. Freezing is not recommended for soft cheeses because of their high moisture content.

Mozzarella Blocks

Blocks of mozzarella can be frozen and stored between -18 to -29°C (0 to -20°F) for 1 year without adverse effects because its curd is stretched during its manufacturing process. To assure that the texture and melting performance of the cheese are not affected by frozen storage, it should be tempered between 0 to 1°C (32 to 34°F) for 10 days after the cheese is thawed. It takes up to 10 days to thaw.

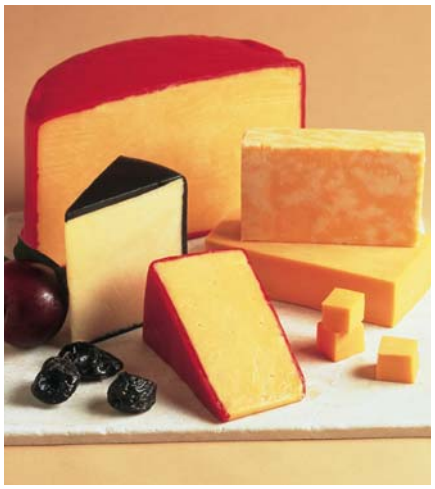
IQF Mozzarella

Individually Quick Frozen (IQF) mozzarella cheese cubes or shreds may be stored for 1 year between -18 to -29°C (0 to -20°F). Thaw cheese between 0 to 1°C (32 to 34°F) for 2 days. Once the cheese has thawed, use within 10 days.

Semi-Soft Cheeses

Semi-soft cheeses are classified into two groups: mold-ripened cheeses often referred to as washed-rind, and those without added mold referred to as dry-rind. Moisture content ranges from 44 to 52% for semi-soft cheeses without added mold, such as monterey jack, fontina, dry-rind brick and muenster. These cheeses should be refrigerated between 0 to 1°C (32 to 34°F). At this temperature, these cheeses will keep for approximately 2 to 3 months. Flavor deterioration results from prolonged exposure to warmer temperatures. Freezing these cheeses is not recommended.

Semi-soft, washed-rind, and other mold-ripened cheeses, such as blue, brie and limburger, have a maximum moisture content of 50% and should be refrigerated between 0 to 1°C (32 to 34°F). Under these conditions, these cheeses will keep for approximately 2 to 3 months. When stored at warmer temperatures, they tend to soften, release moisture and may develop unwanted surface mold. The rate at which these quality defects appear varies with storage temperature. For example, defects are likely to occur after only a few days if cheese is stored at 7°C (45°F) or more. Semi-soft washed-rind and other mold-ripened cheeses should not be frozen. The beneficial molds used in their production will be killed by the freezing process and no longer active after they thaw.



Hard Cheeses

The moisture content for hard cheeses, such as cheddar, colby and swiss, range from 36 to 43%. Generally, hard cheeses intended to be aged for more than 3 months contain less moisture than mild flavor hard cheeses, which may be sold sooner.

Hard cheeses should be refrigerated between 0 to 1°C (32 to 34°F). Under this condition hard cheeses will keep for approximately 12 months. However, these cheeses readily withstand short-term, out-of-refrigeration displays at a maximum temperature of 25°C (77°F) for less than 1 week. They are susceptible to body and textural changes, such as unsightly oiling-off of the milkfat, when exposed to warmer temperatures.

Hard cheeses may be frozen at temperatures lower than -23°C (-9°F). Thawing hard cheese between -2 to 1°C (28 to 34°F) over a period of 10 days will limit textural changes.

Hard Grated Cheeses (also known as Very Hard Cheeses)
The moisture content of hard grating cheeses, such as parmesan and romano, is 34% or less before grating. Hard grating cheese may be stored at temperatures lower than 25°C (77°F) and will maintain flavor and texture quality. These cheeses exhibit oiling-off at temperatures above 25°C (77°F).

Grated parmesan and romano have a maximum moisture content of 18% and do not require refrigeration as long as the container remains unopened. Under these conditions, these cheeses keep for approximately 12 months. After packages are opened, refrigerate grated cheeses at lower than 4°C (39°F).

Grated parmesan, romano, or other hard cheeses can be frozen in foodservice or bulk packages. When thawed properly under refrigeration, it performs well in all applications.

Grated cheeses in retail or consumer size cans should not be frozen because when thawed, condensation often forms inside the container, causing the cheese to lump together.

Pasteurized Process Cheese, Cheese Food and Cheese Spread
Pasteurized process cheese is a modified form of cheese that is made by grinding, blending and heating one or more natural cheeses. Pasteurized process cheese may have a maximum moisture content of 43%. The pasteurization or heating step of this process stops the action of enzymes responsible for the curing of cheese. Therefore, the shelf life of this cheese is extended.

If the cheese maker adds additional milk or cream to the blended cheese mixture, the product is classified as pasteurized process cheese food and may have a maximum moisture content of 44%.

Pasteurized process cheese spread has more added moisture than pasteurized process cheese food, which makes it spreadable at room temperature. The maximum moisture content of pasteurized process cheese spread is 60%.

The higher moisture content of pasteurized process cheese, cheese food and cheese spread make them more susceptible to the effects of higher temperatures when opened. Once a package is opened, refrigerate remaining product between 0 to 4°C (32 to 39°F). If unopened, these cheese varieties will keep for approximately 6 to 10 months.

Unopened packages of pasteurized process cheese, cheese food and cheese spread are relatively stable in storage lower than 25°C (77°F) and withstand out-of-refrigeration display without risk of spoilage. Therefore, frozen storage is unnecessary.

Cold-Pack Cheese
Cheese manufacturers make cold-pack cheese by grinding and blending one or more natural cheeses without the use of heat. This way the cheese continues to age. Although cold-pack cheese is more perishable than pasteurized process cheeses, the dairy processor can extend cold-pack's shelf life with an added mold inhibitor (sorbic acid, nisin, sodium propionate or calcium propionate). Cold-pack cheese products should be refrigerated between -1 to 1°C (30 to 34°F) and should not be frozen.

Storage Recommendations

Storage recommendations listed are for cheeses in original, factory sealed packaging. Storage temperatures and storage periods listed are general guidelines. Always consult your supplier for storage recommendations on specific cheese varieties and brands.

Table 2. Storage Recommendations for Specific Cheese Varieties

Cheese	Temperature °C	Relative Humidity (RH)	Storage Period	Maximum Display Time[1]	Frozen Storage Possible?
Blue	0 to 1	65	2 to 3 months	Refrigerate at all times	Yes
Brie	0 to 1	65	2 months	Refrigerate at all times	Yes
Brick	-1 to 1	65	2 to 3 months	Refrigerate at all times	Yes
Camembert	-1 to 1	65	2 months	Refrigerate at all times	Do not freeze
Cheddar	0 to 1	65	12 months	1 week	Yes
Cottage	-1 to 1	65	2 to 3 weeks	Refrigerate at all times	Do not freeze
Colby	0 to 3	65	6 months	1 week	Yes
Cold-Pack	-1 to 1	65	3 months	Refrigerate at all times	Do not freeze
Cream cheese	0 to 1	65	4 weeks	Refrigerate at all times	Do not freeze
Edam	0 to 1	65	6 months	Refrigerate at all times	Yes
Gouda	0 to 1	65	3 to 6 months	Refrigerate at all times	Yes
Grated cheese, dried[2]	0 to 4	65	12 months	Unlimited[3]	Do not freeze
Monterey Jack	-1 to 1	65	2 to 3 months	Refrigerate at all times	Yes
Mozzarella	0 to 1	65	1.5 to 2 months	Refrigerate at all times	Yes
Limburger	0 to 1	65	2 to 3 months	Refrigerate at all times	Yes
Neufchâtel	0 to 1	65	4 weeks	Refrigerate at all times	Yes
Parmesan	0 to 24	65	10 to 24 months	Unlimited	Do not freeze
Process cheese	0 to 4	65	6 to 10 months	Unlimited[3]	Do not freeze
Process cheese slices	0 to 4	65	6 months	Unlimited[3]	Do not freeze
Process cheese food	0 to 4	65	6 to 10 months	Unlimited[3]	Do not freeze
Process cheese spread	0 to 4	65	6 months	Unlimited[3]	Do not freeze
Provolone	0 to 1	65	3 to 12 months	Refrigerate at all times	Yes
Romano	0 to 24	65	5 to 12 months	Unlimited	Do not freeze
Swiss	0 to 4	65	8 to 12 months	1 week	Yes

[1]Maximum out-of-refrigeration display time at temperatures lower than 25°C.
[2]Cheese dried to 18% moisture or less.
[3]Unlimited out-of-refrigeration display time at temperatures lower than 25°C for unopened package. Refrigerate between 0 to 4°C after opening.

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History of Cheese in America

America is a nation of immigrants, and many of our traditions reflect our immigrant ancestry. One of those traditions is a love for cheese. In fact, when the first pilgrims arrived in America, they brought cheese with them on the boat. As more people arrived in America and began to settle the land, they found rich soil and lush grasses that reminded them of their European homelands. Soon, they began farming the land, and as they grew grain for their breads, any surplus was stored for use over the long cold winters. Cattle grazed on lush pasture grasses in the summer, hay and grain in the winter. This steady source of milk, cream, and butter started our dairy traditions, and cheese making was soon to follow.

In addition to having a taste for cheese, many of our ancestors brought with them the expertise to make cheese. Using centuries old recipes and traditional methods, they quickly began making cheese with any surplus milk available, first for themselves, and then for others. An industry was born, and it started a long tradition of cheese making in the U.S. that continues today. Our industry has pioneered research in dairy science and cheese making, yielding tremendous production efficiencies and an unparalleled safety record. Today, the U.S. is the largest cheese producing country in the world, crafting over 400 different varieties of cheese and over 4 million mt annually. Our cheese is also top quality, and consistently wins top honors at international competitions. We are justifiably proud of the heritage, craftsmanship, and quality of the cheese that our cheese makers produce.

There are many ways to organize cheese varieties, including country of origin, milk type and so on. The most widely accepted method is by degree of hardness. The following sub-sections are arranged in this manner, from soft and fresh cheeses through hard grating cheeses.

5.1 SOFT-FRESH CHEESES

Varieties include:

- Cottage Cheese (various fat contents)
- Cream Cheese (plain & flavored)
- Feta
- Mascarpone
- Neufchâtel (plain & flavored)
- Queso Blanco
- Ricotta (whole milk, low-fat, fat-free)

Manufacturing Process

Soft-fresh cheeses are referred to as acid-set or direct-set, since the milk is usually coagulated with lactic acid, lemon juice, vinegar or similar acid directly added to the milk, instead of rennet and enzymes. Whey is drained from soft cheeses using gravity rather than mechanical pressure to help retain the velvety texture and higher moisture content. Many soft cheeses are packaged, often in tubs, without being cut, pressed into a form or aged.

Performance

Soft-fresh cheeses contain the highest moisture content of any cheeses. This makes them excellent ingredients for spreads and fillings. In most cases, these cheeses have a mild, delicate, creamy flavor much like the top U.S. quality milk from which they are made.

Key Applications

Most soft cheeses, except feta and queso blanco, are spoonable/spreadable cheeses. In foodservice, prepared foods, and end-user applications, they are widely used as a base for bread and snack spreads and dips. They are also popular in fillings for pasta and casseroles, appetizers, and baked goods. Feta and queso blanco are the low-moisture exceptions to the rule in this family of cheeses. Their crumbly texture and resistance to melting further separate them from the rest of this group. Traditionally used only in ethnic dishes, these cheeses are now used in salads, soups and a variety of hot entrées, even pizza.

Marketing Advantages

Superb consumer appeal; add value to baked goods, snacks, and prepared foods. High consumer acceptance due to their mild taste and smooth, creamy texture.

Key Benefits in Foodservice and Prepared Foods

Excellent cold spreadability for dips, spreads and frostings. Creamy texture for use in pasta fillings, casseroles, and a range of other fillings. Perfect flavor carrier. Versatile: works well in sweet or savory dishes. Can be used to bind other ingredients together and as texture agents. Low-fat, no-fat and reduced-calorie versions provide high quality options for restricted diets.

CREAM CHEESE

Color
Bright white to slightly off-white.

Texture
Smooth, creamy, spreadable.

Flavor
Rich and creamy, a bit nutty and with a sweet/tart finish. Available plain and in many sweet and savory flavors, including strawberry, pineapple, garden vegetables, and garlic and herb, among others.

Typical Composition
55% moisture; at least 33% milkfat solids.

Performance Characteristics and Applications
Melts quickly. Great flavor carrier, sweet or savory. Most often used in spreads, dips, sauces, frostings, bakery fillings, appetizer fillings, pastries, and cheesecakes.

Storage/Shelf Life
Store at refrigerated temperatures between 0 to 1°C (32 to 34°F). Cut pieces should be wrapped tightly in barrier film and stored away from other pungent foods, as these cheeses will pick up flavors and aromas quickly. Also, proper FIFO (first in, first out) product rotation is extremely important. Depending on packaging and style, cream cheese may be held refrigerated from 90 to 180 days. Do not freeze.

Curing/Aging
Not cured or aged.

An American Original
Developed in the late 1800's in the Philadelphia area.

Summary of Key Benefits
Smooth, spreadable texture; mild, sweet/tart flavor. Excellent filling agent and bakery ingredient.

NEUFCHÂTEL

Color
Bright white to slightly off-white.

Texture
Similar to cream cheese, with a somewhat firmer body.

Flavor
Mild, similar to cream cheese, but a bit more tart.

Typical Composition
65% moisture; 20-30% milkfat solids.

Performance Characteristics and Applications
Melts quickly. Great flavor carrier, sweet or savory. Most often used in spreads, dips, sauces, frostings, bakery fillings, appetizer fillings, pastries, and cheesecakes.

Storage/Shelf Life
High-moisture cheeses are more perishable than hard cheeses, so handling, storage and product rotation are critical. Store at refrigerated temperatures between 0 to 1°C (32 to 34°F). Cut pieces should be wrapped tightly in barrier film and stored away from other pungent foods, as these cheeses will pick up flavors and aromas quickly. Also, proper FIFO (first in, first out) product rotation is extremely important. Proper sanitation when handling these cheeses will greatly increase their shelf life and quality. Depending on packaging and style, neufchâtel may be held refrigerated from 90 to 180 days. Freezing is not recommended.

Curing/Aging
Not cured or aged.

Summary of Key Benefits
Lower fat than cream cheese, but still with a smooth, spreadable texture; mild, sweet-tart flavor; excellent filling agent and bakery ingredient.

COTTAGE CHEESE

Color
Bright white.

Texture
Consists of soft, moist, individual curds. Available in large and small curd.

Flavor
Delicate, fresh milk flavor with a slightly acidic tang.

Typical Composition
80% maximum moisture. Available in whole milk, 2%, 1% and fat-free.

Performance Characteristics and Applications
Curds resist melting. Bake in cakes and breads for added taste and texture. Use in pasta stuffings. Serve with fresh fruit and in composed salads.

Storage/Shelf Life
High-moisture cheeses are more perishable than hard cheeses, so handling, storage and product rotation are critical. Store at refrigerated temperatures between 0 to 1°C (32 to 34°F). They should be as cold as possible without freezing. Proper sanitation when handling these cheeses will greatly increase their shelf life and quality. Do not freeze.

Curing/Aging
Not cured or aged.

Summary of Key Benefits
Creamy, mild, milky flavor. Excellent in pasta fillings, bakery goods and salads.

FETA

Color
White to off-white.

Texture
Soft curd cheese that flakes apart and crumbles easily.

Flavor
Tangy, sharp, salty taste. The flavor intensifies as the cheese ages. Available plain or in a variety of savory flavors.

Typical Composition
No Federal Standard of Identity exists for feta, but its moisture content places it in the family of soft-fresh cheese.

Performance Characteristics and Applications
Resists melting. Crumbles easily by hand. Used on salads, in pastries and breads, and Mediterranean cuisine.

Storage/Shelf Life
Store at refrigerated temperatures between 0 to 1°C (32 to 34°F) for 90 to 180 days. Brine can be replaced as needed at a ratio of 1 tablespoon of salt per cup of water. Proper sanitation when handling these cheeses will greatly increase their shelf life and quality. Do not freeze.

Curing/Aging
5 days to 1 month.

Summary of Key Benefits
Distinctive flavor and crumbly texture.

MASCARPONE

Color
Off-white to beige.

Texture
Silky smooth, creamy, spreadable. Should not be grainy.

Flavor
Rich, mildly sweet, buttery.

Typical Composition
While no Federal Standard of Identity exists for mascarpone, its minimum 70% milkfat makes this a triple cream cheese.

Performance Characteristics and Applications
Melts easily, best with indirect heat. Best known as the creamy ingredient in Tiramisu, the popular Italian dessert. Mascarpone is used in sauces, soups, tortes, spreads, frostings, desserts, and baked goods.

Storage/Shelf Life
High-moisture cheeses are more perishable than hard cheeses, so handling, storage and product rotation are critical. Store at refrigerated temperatures between 1 to 3°C (34 to 37°F). These cheeses will pick up flavors and aromas quickly, so keep tightly covered. Also, proper FIFO (first in, first out) product rotation is extremely important. Proper sanitation when handling these cheeses will greatly increase their shelf life and quality. Properly handled product may be held refrigerated up to 120 days. Do not freeze.

Curing/Aging
Not cured or aged.

Summary of Key Benefits
Excellent flavor carrier, and creamy texture.

QUESO BLANCO

Color
Bright white.

Texture
Firm and crumbly. Stays firm when heated.

Flavor
Mild with a tart finish. Somewhat salty.

Typical Composition
No Federal Standard of Identity exists for queso blanco, but its moisture content places it in the family of soft-fresh cheese.

Performance Characteristics and Applications
Resists melting to the point of browning. Can be cubed and browned for use as croutons in salads. Used extensively in Hispanic cuisine, primarily as an ingredient in savory hot dishes.

Storage/Shelf Life
Store at refrigerated temperatures between 0 to 1°C (32 to 34°F) for up to 10 weeks. Proper sanitation when handling these cheeses will greatly increase their shelf life and quality. Do not freeze.

Curing/Aging
Not cured or aged.

Summary of Key Benefits
Mild flavor and retains texture after cooking.

RICOTTA

Color
Bright white.

Texture
Soft and moist, sometimes slightly grainy. The texture varies with the milkfat content.

Flavor
Mild and milky, slightly sweet.

Typical Composition
68-73% maximum moisture. Available in whole milk, part-skim and fat-free.

Performance Characteristics and Applications
The lower fat versions are more resistant to melting. Used extensively in stuffings for pasta, in casseroles and in baked goods. Popular in Italian and vegetarian cuisines.

Storage/Shelf Life
High-moisture cheeses are more perishable than hard cheeses, so handling, storage and product rotation are critical. Store at refrigerated temperatures between 0 to 1°C (32 to 34°F) for up to 4 weeks. Proper sanitation when handling these cheeses will greatly increase their shelf life and quality. Do not freeze.

Curing/Aging
Not cured or aged.

Summary of Key Benefits
Perfect in Italian and vegetarian dishes from pasta and casseroles to baked goods and desserts.

5.2 SOFT-RIPENED CHEESES

Varieties include:

- Brie (single, double and triple cream and flavored)
- Camembert

Manufacturing Process

Soft-ripened cheeses are distinguished by the beneficial white Penicilium Candidum mold that forms the outer "bloomy rind." This mold allows the cheese to ripen from the outside in, as evidenced when cutting soft-ripened cheeses. The area nearest the rind softens first, becoming almost liquid, while the center remains firmer, even chalky. As these cheeses ripen, they continue to soften and develop more distinct flavors and aromas.

Performance

The body of these cheeses melts well, while the rind remains intact, so for most hot applications, the rind should be trimmed. For cold applications, it is recommended to consume the rind, as this is a major flavor component and the primary source of calcium in soft-ripened cheeses.

Key Applications

Soft-ripened cheeses are used in cold and melted applications, including sandwiches, cheese plates, appetizers, dips and spreads, gourmet-style pizza, quiches, soups, sauces, warm salad dressings and fondue.

Marketing Advantages

Well recognized cheeses by consumers, add distinction and help differentiate a dish.

European-style gourmet appeal, premium quality image.

Key Benefits in Foodservice and Prepared Foods

Distinctive appearance and flavor make this cheese perfect for cheese plates and cold appetizers. The fact that they come from the U.S. ensures quality and attention to detail. All U.S. soft-ripened cheeses are produced with pasteurized milk, ensuring safety, as well as quality.

BRIE AND CAMEMBERT

Color
White, bloomy rind with cream-colored interior.

Texture
Firm when young, becoming softer as the cheese matures. Older cheeses will begin to harden as they dry, but the cheese is far beyond its prime by then.

Flavor
Quite mild and buttery when young, becoming more flavorful as it ripens. Brie is also available with herbs. These cheeses are described as mildly earthy, with the aroma of the forest floor, mushrooms, or fallen leaves. It is normal for a slight aroma of ammonia to be present. If the ammonia dominates, the cheese is past its prime.

Typical Composition
No Federal Standard of Identity exist for soft-ripened cheeses, but the fat content varies with the type of brie produced, single, double or triple cream. Camembert is typically produced in the single cream version.

Performance Characteristics and Application
The body of these cheeses melts beautifully in soups, sauces and warm dressings with the rind trimmed. A whole wheel of cheese can be wrapped in filo dough or puff pastry and baked for a hot appetizer. Other hot applications include gourmet-style pizzas, quiches, and fondues. Cold applications include cheese plates, sandwiches, appetizers, spreads and dips.

Storage/Shelf Life
All cheeses should be inspected carefully when receiving them, and this is particularly true of soft-ripened cheeses. Brie and camembert are overripe or mishandled if they have a strong smell of ammonia, a dry, cracked rind, or numerous off-color mold spots on the rind. Also, it is important to remember that the mold on the surface requires air to continue to ripen. If possible, rewrap brie and camembert in its original wrapper. Otherwise, wrap in wax paper and store away from strongly flavored items in the cooler, as these cheeses pick up flavors quickly. The shelf life depends on the age and handling of the cheese before it arrives at your door. Refrigerate at 0 to 1°C (32 to 34°F). The total time from production to past prime is approximately 12 to 16 weeks. Do not freeze.

Curing/Aging
Approximately 3 weeks prior to shipment, the cheese continues to ripen in transit to the end-user.

Summary of Key Benefits
Gourmet appeal, with highest safety standards. Adds distinction and helps differentiate dishes.

5.3 SEMI-SOFT CHEESES

Varieties include:

- Brick, dry- and washed-rind
- Fontina
- Havarti
- Limburger
- Monterey Jack
- Muenster
- Pepper Jack

Manufacturing Process

These cheeses share one important similarity in make procedure; they are all made with whole milk, sometimes with added cream, but never part-skim milk. This gives them their characteristic soft, creamy texture and great melting ability. There are two distinct styles of semi-soft cheeses, dry-rind and washed-rind. Washed-rind cheeses, also referred to as surface-ripened, are surface-treated with a bacterial smear and then washed with a solution to encourage the smear to grow. Washed-rind cheeses ripen from the outside in. Dry-rind cheeses are cured without a surface treatment.

Performance

Semi-soft cheeses can be shredded, sliced and cubed. Semi-soft cheeses melt well and lend themselves to hot applications, even microwave applications. They have some stretch, and they can be broiled and browned.

Key Applications

Their melting ability makes them ideal for sauces, soups, casseroles and roulades. They can be blended easily with other cheeses to build signature gourmet pizzas. Many are available flavored with a variety of items, from hot peppers to herbs and spices and more. They are also sliceable, making them perfect for sandwiches and consumer-ready snacks.

Marketing Advantages

Add value to products in a cost-effective manner. Excellent acceptability by children. Provides visual appeal when melted or browned. Dry-rind versions are mild and buttery and have universal appeal. Washed-rind versions have premium European-style image and gourmet appeal.

Key Benefits in Foodservice and Prepared Foods

Their mild flavor profiles make them excellent flavor carriers. Blend well with other semi-soft cheeses or with stronger flavored cheeses. Good slicing and shredding properties. Highly versatile cheeses, with applications from the cheese course to the oven and from fast-food to fine dining. Ready to use cubes, shreds and slices provide labor and cost savings.

BRICK

Color
Dry-rind: Ivory to creamy yellow.
Washed-rind: Pale yellow when young, developing a beige to tan rind with ripening.

Texture
Dry-rind: Smooth, open texture.
Washed-rind: Firmer when young, becoming softer and creamier with ripening.

Flavor
Dry-rind: Mildly sweet and nutty.
Washed-rind: Mild when young, more aromatic and full flavored with age. The rind may be trimmed on well-aged cheeses when it becomes too strong for most tastes but the body remains buttery and nutty with an earthy undertone.

Typical Composition
44% maximum moisture, 50% minimum milkfat solids.

Performance Characteristics and Applications
Melts easily for topper or use in casseroles. Sliceable for sandwiches. Shreddable for pizza applications. Washed-rind version perfect for cheese course, pairs well with beers.

Storage/Shelf Life
Dry-rind: Store at refrigerated temperatures between 0 to 1°C (32 to 34°F). Cut pieces should be wrapped tightly in barrier film and stored away from other pungent foods, as these cheeses will pick up flavors and aromas quickly. Proper sanitation when handling these cheeses will greatly increase their shelf life and quality. Properly handled product may be held refrigerated up to 3 months. If frozen, thaw from 0 to 1°C (32 to 34°F). Freezing is not recommended.
Washed-rind: Store at refrigerated temperatures between 1 to 4°C (34 to 39°F). This cheese matures for approximately 12 to 16 weeks maximum. It is mild up to about 5 to 6 weeks, medium from 7 to 10 weeks and fully aged after 10 weeks. It is important to store this cheese in breathable wrap, like its original foil/paper wrap, to ensure proper ripening. Proper sanitation when handling these cheeses will greatly increase their shelf life and quality. Do not freeze.

Curing/Aging
Dry-rind: 2 to 3 months.
Washed-rind: Released about 4 to 5 weeks, or aged to specification.

An American Original
Developed around 1875 in Wisconsin and patterned roughly after German beer käse, or beer cheese. Named for its shape and the method used to press the cheese, brick cheese is now made in many parts of the United States.

Summary of Key Benefits
Melts well and slices well for sandwiches. Washed-rind version brings full flavor to a dish, and adds distinctive American flair to a cheese course.

HAVARTI

Color
Pale, buttery yellow.

Texture
Supple and creamy, with small mechanical holes throughout. Softer with age.

Flavor
Buttery with a hint of nuts. Slightly tart, particularly when young. Available plain and in a variety of savory flavors including garlic and herb, dill, caraway, horseradish, among others.

Typical Composition
36-39% maximum moisture, 37-38% milkfat solids.

Performance Characteristics and Applications
Easily cut or sliced when well-chilled. Popular for sandwiches. Melts very easily. Ideal for casseroles, fondue, premium pizza blends.

Storage/Shelf Life
Store at refrigerated temperatures between 1 to 3°C (34 to 38°F) for up to 3 months. Cut pieces should be wrapped tightly in barrier film and stored away from other pungent foods, as these cheeses will pick up flavors and aromas quickly. Proper sanitation when handling these cheeses will greatly increase their shelf life and quality. Freezing is not recommended.

Curing/Aging
4 to 8 weeks.

Summary of Key Benefits
Rich buttery flavor, popular with everyone. Ideal for melts and sandwiches.

LIMBURGER

Color
Creamy white body with distinctive ocher colored rind.

Texture
Creamy, smooth, becoming softer with maturity.

Flavor
Aromatic and spicy when younger to pungently earthy when fully ripe. The aroma is always stronger than the flavor in washed-rind cheeses, and trimming the rind reduces much of the aroma.

Typical Composition
No Federal Standard of Identity exists for limburger, but its make procedure and moisture content places it in the family of semi-soft cheese.

Performance Characteristics and Applications
Melts quickly when sliced. Good topper for grilled meats. Flavorful addition to salads. Slice for sandwiches. Pair with sweet fruits, like figs and dates or with shaved onions, mustard, dark rye bread and bock beer.

Storage/Shelf Life
Store at temperatures between 1 to 3°C (34 to 38°F). This cheese matures for approximately 12 to 16 weeks. It is mild up to about 5 to 6 weeks, medium from 7 to 10 weeks and fully aged after 10 weeks. It is important to store this cheese in breathable wrap, like its original foil/paper wrap, to ensure proper ripening. Proper sanitation when handling this cheese will greatly increase its shelf life and quality. Do not freeze.

Curing/Aging
1 to 2 months.

Summary of Key Benefits
Flavorful addition to sandwiches, salads and casseroles. Limited but loyal audience.

MONTEREY JACK

Color
Creamy white.

Texture
Semi-soft, pliable, creamy and smooth.

Flavor
Delicate and buttery with a slight tartness. Available plain and in many flavored versions, including hot peppers (pepper jack), herbs and spices.

Typical Composition
44% maximum moisture, 50% milkfat solids.

Performance Characteristics and Applications
Excellent melting cheese. Good for soups, sauces, toppings, casseroles, nachos, and gourmet pizzas. Also good slicing and shredding cheese for sandwiches and salads.

Storage/Shelf Life
Store at refrigerated temperatures between 1 to 3°C (34 to 38°F). Cut pieces should be wrapped tightly in barrier film and stored away from other pungent foods, as these cheeses will pick up flavors and aromas quickly. Proper sanitation when handling these cheeses will greatly increase their shelf life and quality. Properly handled product may be held refrigerated for up to 3 months. Freezing is not recommended.

Curing/Aging
1 to 3 months.

An American Original
Monterey jack is named after the first man to commercially produce and distribute the semi-soft cheese made in the California missions for many years. In 1882, David Jacks, a dairy owner and businessman from Monterey, California began producing this cheese commercially and branded his shipping boxes with his last name and the city of origin, hence Monterey – Jacks became monterey jack. Now produced in many states including California, ironically, monterey jack is no longer made in Monterey. Monterey dry jack is an aged version of monterey jack which is considered a specialty cheese (refer to Section 5.15 for additional information).

Summary of Key Benefits
Mild flavor. Easy melting. Good slicing and shredding. Convenient forms and flavors.

MUENSTER

Color
Creamy white interior, with a white or orange rind. Orange color is annatto, or achiote, a flavorless food coloring from the fruit and seeds of the Bixa Orlleana tree from Mexico and Central America. It is used extensively in Hispanic cuisine.

Texture
Semi-soft, smooth and elastic. Firmer when young, creamier with age.

Flavor
Mellow flavor with a mild aroma. Becomes more savory with age.

Typical Composition
46% maximum moisture, 50% milkfat solids.

Performance Characteristics and Applications
Melts quickly when shredded. Excellent choice for toppings. Orange rind version adds color to sandwiches and salads. Also great to blend into premium pizza.

Storage/Shelf Life
Store at refrigerated temperatures between 1 to 3°C (34 to 38°F). Cut pieces should be wrapped tightly in barrier film and stored away from other pungent foods, as these cheeses will pick up flavors and aromas quickly. Proper sanitation when handling these cheeses will greatly increase their shelf life and quality. Properly handled product may be held refrigerated for up to 3 months. Freezing is not recommended.

Curing/Aging
2 to 8 weeks.

Summary of Key Benefits
Excellent melt properties when shredded. Colorful and flavorful addition to appetizers, salads and sandwiches. The orange version is particularly popular with children.

5.4 BLUE-VEINED CHEESES

Varieties include:

- Blue Cheese
- Gorgonzola, creamy style
- Gorgonzola, crumbly style

Manufacturing Process

When making blue and gorgonzola, the various blue molds are added directly to the milk. Stainless steel needles are used to pierce the body of the cheese to allow oxygen in and carbon dioxide out of the interior, allowing the mold to thrive.
If the cheese has been in vacuum packaging for some time, it will appear almost completely white. As soon as the bag is removed, the cheese will begin to "blue-up" in a matter of hours.

Performance

Good melting cheeses, these are used most commonly for their crumbling properties. Thoroughly chilling these cheeses makes crumbling easier.

Key Applications

Their melting ability makes them ideal for sauces, soups, and casseroles. They can be blended easily with other cheeses to build signature gourmet pizzas. They are crumbled into salads and used in dressings. Also traditional for the cheese course.

Marketing Advantages

These cheeses add big flavor to a dish with small cost and minimum fat for the calorie-conscious. Premium European image, gourmet appeal.

Key Benefits in Foodservice and Prepared Foods

Distinctive flavor adds unique intensity to sauces, dressings and a myriad of other dishes. Crumbly texture ideal for salads, or for crumbling over hot or cold dishes.

BLUE

Color
Creamy ivory with green-blue veining.

Texture
Creamy to crumbly with open texture.

Flavor
Sharp and piquant flavors that intensify with age. Somewhat salty.

Typical Composition
46% maximum moisture, 50% minimum milkfat solids.

Performance Characteristics and Applications
Used like a spice in cooking. Melts well, crumbles beautifully for use over salads, in sauces, dressings and as a topping for grilled meats. Also popular on gourmet pizzas.

Storage/Shelf Life
Special care should be taken when handling blue-veined cheeses. After handling product, carefully clean anything that could have come in contact with it, as the molds can easily be transferred to almost any other perishable foods. Due to the fragile texture of these cheeses, use care to avoid crushing during storage. It is also a good idea to keep these cheeses away from high-moisture items in the cooler (milk, fresh cheeses, vegetables, etc.) as cross-contamination can occur. Store at refrigerated temperatures between 0 to 1°C (32 to 34°F) for up to 1 year. Proper sanitation when handling these cheeses will greatly increase their shelf life and quality. Do not freeze.

Curing/Aging
2 months minimum, sometimes up to 6 months or more.

Summary of Key Benefits
Distinctive tanginess delivers maximum flavor for minimum cost.

GORGONZOLA

Color
Creamy ivory with gray-green to green-blue veining.

Texture
Young/creamy style: Soft and creamy with natural brownish rind.
Aged/crumbly style: Drier than most blue cheeses, crumbly and a bit granular.

Flavor
Young/creamy style: Earthy and richly buttery.
Aged/crumbly style: Sharper than young version, but still more earthy than traditional blue cheeses.

Typical Composition
42% maximum moisture, 50% minimum milkfat solids.

Performance Characteristics and Applications
Young/creamy style: Melts well for soups and sauces, also excellent for spreads and dips. Ideal choice for cheese course.
Aged/crumbly style: Crumbly texture ideal for salads, pizzas, and casseroles. Also great for baking.

Storage/Shelf Life
Special care should be taken when handling veined cheeses. After handling product, carefully clean anything that could have come in contact with it, as the molds can easily be transferred to almost any other foodstuff, referred to as cross-contamination. Due to the soft texture of the young/creamy style and the crumbly texture of the aged version, it is best not to store anything on top of them in the cooler. It is also a good idea to keep these cheeses away from high-moisture items in the cooler (milk, fresh cheeses, vegetables, etc.) as cross-contamination can occur. Store at refrigerated temperatures between 0 to 1°C (32 to 34°F) for up to 1 year. Proper sanitation when handling these cheeses will greatly increase their shelf life and quality. Do not freeze.

Curing/Aging
3 months minimum, often 6 months to 1 year.

Summary of Key Benefits
Distinctive earthiness delivers maximum flavor for minimum cost.

5.5 GOUDA AND EDAM

Varieties include:

- Gouda
- Smoked Gouda
- Edam

Manufacturing Process

These cheeses are made in a similar process to semi-soft cheeses, but they use specific starter cultures and only the highest quality milk to produce these "sweet-curd" cheeses. The primary difference between the two is that gouda is made with whole milk, while edam is produced with part-skim. Flavored goudas have spices or herbs added to their curd, prior to pressing, smoked versions can be natural cheese wheels smoked in a smokehouse, or pasteurized process cheese log with a brown coating with liquidized natural smoke essence on the rind.

Performance

These cheeses can be shredded, sliced and cubed. Gouda and edam melt well, but gouda, with its higher milkfat content, will flow when melted and resist browning, Edam will flow less and brown better. Edam, with its denser texture, is the better choice for slicing, but either one can easily be shredded.

Key Applications

Their melting ability makes them ideal for sauces, soups, casseroles and roulades. They can be blended easily with other cheeses to build signature gourmet pizzas. Gouda is available flavored with a variety of herbs, spices and more. Edam is sliceable, making it perfect for sandwiches and consumer-ready snacks. Smoked gouda is a popular snack cheese, and aged gouda is perfect for the cheese course. Aged gouda, with its robust nutty, caramel and butterscotch flavors and easy melting properties, is an excellent addition to sauces and cream soups.

Marketing Advantages

Add value to products in a cost-effective manner. Young versions are mild and buttery and have universal appeal. Aged versions have premium European-style image and gourmet appeal.

Key Benefits in Foodservice and Prepared Foods

Range of flavors and textures from part-skim edam to whole milk mild gouda, to aged gouda, as well as smoked and flavored. Ease of shredding and melting makes these cheeses a good topping choice for hot or cold applications. Good choice for casseroles or roulades. Popular in gourmet pizza blends.

GOUDA

Color
Pale, buttery yellow body typically with a red wax coating on mild gouda, yellow or clear denotes aged or flavored, black or brown indicates smoked.

Texture
Creamy and smooth but dense, becoming somewhat waxy with age.

Flavor
Buttery, nutty, becoming somewhat caramel and butterscotch-like, not sharp with age. Available mild, aged, smoked and flavored with spices and herbs.

Typical Composition
45% maximum moisture, 46% minimum milkfat solids.

Performance Characteristics and Applications
Melts well, particularly well-suited for casseroles and fillings. Slices and shreds well for use on sandwiches or as a topper for hot or cold appetizers, entrées and vegetables. Flavored versions give signature taste to gourmet pizza blends. Any version is applicable for cheese course.

Storage/Shelf Life
Store at refrigerated temperatures between 1 to 3°C (34 to 38°F) for up to 3 months. Proper sanitation when handling these cheeses will greatly increase their shelf life and quality. Freezing is not recommended.

Curing/Aging
2 months or longer.

Summary of Key Benefits
Mild flavor, excellent sandwich cheese.

EDAM

Color
Pale, buttery yellow body typically with a red wax coating on mild edam.

Texture
Firm, smooth, becoming somewhat waxy with age.

Flavor
Light buttery, nutty, becoming more nutty and rich with age.

Typical Composition
45% maximum moisture, 40% minimum milkfat solids.

Performance Characteristics and Applications
Melts well, particularly well-suited for top-melting. Slices and shreds well for use on sandwiches or as a topper for hot or cold appetizers, entrées and vegetables. Used in gourmet pizza blends.

Storage/Shelf Life
Store at refrigerated temperatures between 1 to 3°C (34 to 38°F) for up to 3 months. Proper sanitation when handling these cheeses will greatly increase their shelf life and quality. Freezing is not recommended.

Curing/Aging
2 months or longer.

Summary of Key Benefits
Mild flavor, excellent sandwich cheese.

5.6 PASTA FILATA CHEESES

Varieties include:

- Fresh Mozzarella
- Low-Moisture, Part-Skim Mozzarella
- Low-Moisture, Whole Milk Mozzarella
- Part-Skim Mozzarella
- Whole Milk Mozzarella
- Provolone, mild, aged and smoked
- String Cheese
- Pizza Cheese
- Individually Quick Frozen Mozzarella (IQF)

Manufacturing Process

Pasta filata cheeses are named for the unique process of pulling the curds while they are dipped in hot water. Made from cow's milk in the U.S., preparation of the curd is similar to semi-soft and firm cheeses, involving warming of the milk and the addition of starter cultures and enzymes. Once the curd has been heated and stretched, it is molded. In the case of mozzarella-style cheese, the molded cheese is immersed in cold water, cooled in brine, and packaged. Provolone is often made with added lipase enzymes for a piquant flavor, ripened and in some cases, smoked.

Performance

Pasta filata and related cheeses have an elastic consistency, and excellent melting, stretching and browning properties. Used as filling for breaded appetizers and pastas, as well as in toppings for pizzas, pastas and other hot entrées.

Key Applications

Pasta filata cheeses work well in gratins, salads, sandwiches and stuffings. Their meltability makes them ideal for U.S.-style pizza, the number one use for mozzarella worldwide. Also popular as the hot appetizer "cheese sticks," breaded and fried. String cheese is extremely popular among children.

Marketing Advantages

Mild in flavor, these cheeses have near universal acceptance. Uniform and consistent melting properties ensure product quality and dependability. Browning qualities add visual appeal as a topper in many Italian-style dishes. Low-fat, low-calorie types of pasta filata cheese are ideally suited for diet products.

Key Benefits in Foodservice and Prepared Foods

Used in a wide range of hot applications, especially when excellent melting, browning properties are needed. Adds body and mouthfeel to many dishes. Wide range of mozzarella types and formulations to meet specific applications. Provolone is popular in hot and cold sandwiches. Pasta filata cheeses can be sliced, shredded and cubed. They perform well in the freeze-thaw-cook cycle. They work beautifully in frozen prepared dishes. IQF cheeses offer excellent storage and labor saving advantages.

WHOLE MILK MOZZARELLA

Color
Creamy white.

Texture
Semi-soft and elastic. Creamier than part-skim version.

Flavor
Fresh, mild and delicate. More buttery than part-skim version.

Typical Composition
52-60% moisture, 45% minimum milkfat solids.

Performance Characteristics and Applications
Melts and stretches more easily than low-moisture or part-skim versions. Shred for pizza topping. Melt on grilled meats, poultry and fish.

Storage/Shelf Life
Store at refrigerated temperatures between 0 to 1°C (32 to 34°F) for up to 6 weeks. Proper sanitation when handling these cheeses will greatly increase their shelf life and quality. If frozen, thaw between -2 to 1°C (28 to 34°F). For best texture and performance, thaw for at least 48 hours.

Curing/Aging
5 to 10 days.

Summary of Key Benefits
Excellent melt, flow and stretch for optimum coverage on hot entrées or pizzas. Available in a variety of labor and cost saving styles.

LOW-MOISTURE MOZZARELLA

Color
Creamy white.

Texture
Semi-soft and elastic. Creamier than part-skim version, firmer than whole milk style.

Flavor
Fresh, mild and delicate. More buttery than part-skim version.

Typical Composition
46-52% moisture, 45% minimum milkfat solids.

Performance Characteristics and Applications
Easier cold manipulation (shredding, slicing, etc.) than whole milk mozzarella. Melts slower and browns quicker than the whole milk version. Well-suited as pizza topping. Use in hot appetizers and entrées.

Storage/Shelf Life
Store at refrigerated temperatures between 0 to 1°C (32 to 34°F) for up to 6 weeks. Proper sanitation when handling these cheeses will greatly increase their shelf life and quality. If frozen, thaw between -2 to 1°C (28 to 34°F). For best texture and performance, thaw for at least 48 hours.

Curing/Aging
5 to 10 days.

Summary of Key Benefits
Excellent melt, browning and stretch for pizza applications or on hot entrées. Available in a variety of labor and cost saving styles.

PART-SKIM MOZZARELLA

Color
Creamy white.

Texture
Semi-soft and plastic bodied. Firmer than whole milk style.

Flavor
Fresh, mild and delicate.

Typical Composition
52-60% moisture, 45% minimum milkfat solids.

Performance Characteristics and Applications
Easier cold manipulation (shredding, slicing, etc.) than whole milk mozzarella. Melts slower and browns much quicker than whole milk version. Well-suited in blends for pizza topping. Use in entrées and pasta stuffings.

Storage/Shelf Life
Store at refrigerated temperatures between 0 to 1°C (32 to 34°F) for up to 6 weeks. Proper sanitation when handling these cheeses will greatly increase their shelf life and quality. If frozen, thaw between -2 to 1°C (28 to 34°F). For best texture and performance, thaw for at least 48 hours.

Curing/Aging
5 to 10 days.

Summary of Key Benefits
Excellent browning and stretch for pizza blend applications or in pasta stuffings. Available in a variety of labor and cost saving styles.

LOW-MOISTURE/ PART-SKIM MOZZARELLA

Color
Creamy white.

Texture
Semi-soft and plastic bodied. Firmer than whole milk style.

Flavor
Fresh, mild and delicate.

Typical Composition
45-52% moisture, 30-45% milkfat solids.

Performance Characteristics and Application:
Easier cold manipulation (shredding, slicing, etc.) than whole milk mozzarella. Melts slower and browns much quicker than whole milk version. Well-suited in blends for pizza topping. Use in entrées and pasta stuffings.

Storage/Shelf Life
Store at refrigerated temperatures between 0 to 1°C (32 to 34°F) for up to 6 weeks. Proper sanitation when handling these cheeses will greatly increase their shelf life and quality. If frozen, thaw between -2 to 1°C (28 to 34°F). For best texture and performance, thaw for at least 48 hours.

Curing/Aging
5 to 10 days.

Summary of Key Benefits
Excellent browning and stretch for pizza blend applications or in pasta stuffings. Available in a variety of labor and cost saving styles.

PROVOLONE

Color
Ivory to pale beige.

Texture
Firm and smooth with distinctive striated texture when young, becoming more granular with age.

Flavor
Always made with whole milk. Fuller flavor than mozzarella, even when young. Becoming increasingly sharper and piquant with age. Also available smoked.

Typical Composition
45% maximum moisture, 45% minimum milkfat solids.

Performance Characteristics and Applications
Melts and stretches more easily than low-moisture or part-skim mozzarella. Shred for pizza topping. Melt on grilled meats, poultry and fish.

Storage/Shelf Life
Store at refrigerated temperatures between 0 to 1°C (32 to 34°F) for up to 12 months. Proper sanitation when handling these cheeses will greatly increase their shelf life and quality. If frozen, thaw between -2 to 1°C (28 to 34°F). For best texture and performance, thaw for at least 48 hours.

Curing/Aging
4 to 14 months.

Summary of Key Benefits
Excellent melt when shredded. Good for melting on grilled meats and sandwiches. Blend shredded provolone with mozzarella for more flavorful pizza blends. As provolone ages and becomes more intensely flavored, a smaller amount will give your pizza blend cost-effective distinction.

INDIVIDUALLY QUICK FROZEN MOZZARELLA (IQF)

IQF mozzarella and IQF cheese blends are products specifically designed to offer a high level of performance consistency. Virtually any variety of cheese can be quick frozen. IQF cheese is 100% natural. It has simply been shredded or diced and quick frozen to stop the aging process. Custom blends, featuring other types of cheese, are also available from the U.S.

Color and Texture
Typical of the cheese(s) used for its manufacture.

Flavor
Typical of the cheese(s) used for its manufacture.

Typical Composition
Typical of the cheese(s) used for its manufacture.

Product Forms
Shredded, dried and free-flowing.

Cooking/Performance Characteristics
Highly consistent characteristics and cooking performance. Consistent appearance, browning, texture and melt.

Typical Applications/Uses
U.S.-style pizza, hot sandwiches, Italian and Mexican-style dishes, baked goods, salads, stuffings and deli items. Frozen manufactured foods.

Storage/Shelf Life
This frozen product has a long shelf life. Cheese should be stored frozen. Follow manufacturers' instructions for thawing. Ensure proper sanitation when handling cheese.

Summary of Key Benefits
Cost-effective way to control portions. Reduced labor costs. Reduced preparation, clean-up costs and waste.

5.7 CHEESES FOR PIZZA AND BLENDS

Varieties include:

- Cheese for Pizza
- Specialized Blends

In addition to choosing from pasta filata cheese varieties and IQF cheeses to manufacture pizza, operators may also choose from pizza cheese blends that are generally made by a stirred curd process rather than a pasta filata process. Designed for pizza, they are selected for their flavor, functionality and cost advantages.

U.S. mozzarella is among the world's most popular topping for U.S.-style pizza, because it provides the right mix of flavor, melting, stretch and elasticity characteristics. Low-moisture/part-skim mozzarella is one of the most popular choices of cheese in food processing applications because of its firmer body, longer shelf life and excellent shreddability. Whole milk mozzarella, another popular ingredient, provides a smooth, creamy flavor and texture, and even melt. Reduced- and no-fat mozzarellas are used primarily in foods designed to have lower fat or calorie content.

Pasteurized process mozzarella is manufactured by heating and mixing mozzarella and other cheeses, among with other ingredients, as allowed by U.S. Federal Standards of Identity for pasteurized process cheeses. It is used in applications requiring strict functional performance and a high degree of uniformity. Pasteurized process cheeses generally provide uniform color, flavor and melting properties.

Provolone is a pasta filata cheese closely related to mozzarella and is used in pizza blends to increase flavor while maintaining attractive melt and stretch properties.

Application Benefits

The pizza segment is one of the largest cheese applications served by U.S. cheese manufacturers. U.S. cheeses are used in frozen pizza, refrigerated pizza, pizza kits and fresh pizza that is made and served at foodservice establishments all over the world. As pizza chains continue to expand their restaurant sites around the world, the demand for cheese and the need for high-performance cheese continue to grow. There is a growing variety of cheeses and blends designed and manufactured specifically for these applications.

Custom Pizza Blends

Many U.S. cheese suppliers offer specialized and customized pre-shredded cheese blends for pizza applications. These include blends of two, three, and even more cheeses with specific flavors, colors, price points, and functional characteristics.

5.8 CHEDDAR AND COLBY

Varieties include:

- Cheddar
- Smoked Cheddar
- Colby

Manufacturing Process

Cheddar is the name of the cheese, the name of the gorge in England where this cheese originated and the name of a step in the make procedure that differentiates this family of cheeses. Traditionally, the curds are pulled to the sides of the vat and the whey is drained. As the curds drain, they knit into a solid mass that is cut into slabs, turned, stacked and allowed to re-knit. This is called "cheddaring" the cheese. After a few turns, the slabs are milled and formed. These cheeses are then wrapped in cheese cloth and waxed. Today, only specialty cheddars are made in this fashion. Modern technology takes the guesswork out of cheddar making. The cheddars produced today in the U.S. are of consistently excellent quality with the ability to customize the flavor, texture and aging potential to meet the specific need.

Colby, named after its town of origin in Wisconsin, is made similarly to cheddar, except that the curds are cut smaller and rinsed after the whey is drained. This rinsing hinders the knitting of the curds, leaving small irregular openings in the body of the cheese. This process is rumored to have been an accident, as are many of the new cheese making techniques through the ages.

Performance

Colby and younger cheddars perform similarly under heat. Good melting when shredded or sliced as a topper for a dish going under the broiler. Excellent slicing and shredding properties.

Medium and aged cheddars perform better for most hot applications. They melt more completely, with less separation. Beyond a certain age, they become more problematic to slice, as the body of the cheese becomes more crumbly.

Key Applications

Colby and younger cheddars are ideal for shredding to top any hot or cold application from salads to Hispanic foods and much more. Their slicing properties make them perfect for sandwich applications, hot or cold.

Aged cheddars, with their superior melting ability, are ideal for sauces, soups, and casseroles. They can be blended easily with other cheeses to build signature gourmet pizzas. They are shredded or crumbled into salads. Specialty cheddars are welcomed with any cheese course.

Marketing Advantages

Highest customer acceptance of these cheeses. The U.S. is the world's largest producer in quality and volume. These cheeses are high in calcium, a much needed mineral in most diets.

Key Benefits in Foodservice and Prepared Foods

Available in a range of flavor, texture and performance options depending on the age of the cheese. Their versatility and consumer acceptance allows them to be used in a wide array of prepared foods. Melts well and can be used in frozen/microwaveable applications. Available cubed, shredded and sliced for cost-efficiency through labor savings and reduced waste.

CHEDDAR

Color
Ivory or orange with the addition of annatto or achiote, a flavorless food coloring from the fruit and seeds of the Bixa Orlleana tree from Mexico and Central America; used extensively in Hispanic cuisine.

Texture
Dense and smooth, more elastic when young, becoming more crumbly with extended aging.

Flavor
Mild when young, becoming sharper with age. Mature cheddar has been described as "beefy" or "brothy;" however, many people have a difficult time describing the flavor of cheddar. Also available smoked.

Typical Composition
39% maximum moisture, 50% minimum milkfat solids.

Performance Characteristics and Applications
Melts well, aged cheese ideal for cream soups and sauces, such as Rarebits. Slices and shreds well for use on sandwiches or as a topper for hot or cold appetizers and entrées. Popular in pizza blends. Also available as "cheddarella," a blend of cheddar and mozzarella curds pressed together into one cheese. Well-matured specialty cheddars are popular on the cheese course.

Storage/Shelf Life
Store at refrigerated temperatures between 1 to 3°C (34 to 38°F) for up to 12 months. Proper sanitation when handling these cheeses will greatly increase their shelf life and quality. Freezing is not recommended.

Curing/Aging
Traditionally:
Mild – 30 to 90 days
Medium – 90 days to 6 months
Sharp – 6 months or more

Beyond this point the years of age should be listed on the cheese. Currently available in the U.S. aged up to 5 years or more.

Summary of Key Benefits
Most popular cheese in the world and U.S. cheddar quality is world renowned.

COLBY

Color
Orange with the addition of annatto, or achiote, a flavorless food coloring from the fruit and seeds of the Bixa Orlleana tree from Mexico and Central America, used extensively in Hispanic cuisine.

Texture
Firm, but softer and more elastic than cheddar. Open texture with tiny, mechanical holes.

Flavor
Similar to mild cheddar. Brothy, and milky.

Typical Composition
40% maximum moisture, 50% minimum milkfat solids.

Performance Characteristics and Applications
Melts well, particularly well-suited for top-melting. Slices and shreds well for use on sandwiches or as a topper for hot or cold appetizers and entrées.

Storage/Shelf Life
Store at refrigerated temperatures between 1 to 3°C (34 to 38°F) for up to 6 months. Proper sanitation when handling these cheeses will greatly increase their shelf life and quality. Freezing is not recommended.

Curing/Aging
1 to 3 months.

An American Original
Developed in the central Wisconsin town of Colby in 1874. The first batch was said to be a happy accident, as many new cheeses through the years have been.

Summary of Key Benefits
An American Original with a mild flavor, popular with children.

5.9 SWISS CHEESES

Varieties include:

- Baby Swiss
- Swiss
- Gruyère

Manufacturing Process

Swiss and baby swiss cheeses are made with a specific proprionic culture that gives off carbon dioxide. This is what forms the holes or "eyes" so familiar in these cheeses. Traditionally swiss was made in 90.8 kg (200 lb) wheels because that was the biggest size one man could work and turn in the aging room. This large size was also a way for cheese makers in the Middle Ages to reduce their tax burden, as taxes on cheese were by the piece. Swiss is typically made with part-skim milk, which results in a firmer, more resilient body than baby swiss, typically produced with whole milk. Baby swiss is made in smaller sizes, with smaller and fewer eyes. Gruyère is the washed-rind member of the family, with a dense body and infrequent pea-sized holes. Gruyère is washed with a smear regularly, at decreasing intervals, throughout its many months of ripening. The washes are discontinued in time for the rind to dry out prior to shipping.

Performance

Swiss, available in a rindless version, has excellent slicing and shredding properties. It melts when shredded or sliced thin, but firms up after cooling. Baby swiss has good slicing and shredding properties, and melts readily in any application. Gruyère shreds well, melts readily and resists separation.

Key Applications

These cheeses are traditional in fondues, as well as soup toppers, ingredients in baked goods, soups, sauces, quiches, gratins, roulades, gourmet pizza applications and more. Wherever good melting and full flavor are required, this family has a cheese to fit the need. Aged gruyère is a favorite on the cheese board, too.

Marketing Advantages

World class quality. Convenient rindless versions reduce waste and increase ease of slicing. European-style, gourmet appeal, particularly in the aged gruyère.

Key Benefits in Foodservice and Prepared Foods

Range of appealing flavors, from mild baby swiss to nutty swiss and earthy gruyère. These cheeses melt well and can be used in frozen/microwaveable applications. Add both flavor and texture to any hot entrée or side dish.

BABY SWISS

Color
Pale, buttery yellow.

Texture
Soft, smooth and silky with small eyes. Creamier than traditional swiss.

Flavor
Buttery, mild, creamy and somewhat sweet.

Typical Composition
37.5-40.5% maximum moisture, 23-27% minimum milkfat solids.

Performance Characteristics and Applications
Melts readily, particularly well-suited for soups, sauces, fondues, casseroles and fillings. Slices and shreds well for use on sandwiches or as a topper for hot or cold appetizers, entrées and vegetables. Because it is made with whole milk, it will remain softer after melting and cooling, referred to as "post melt chew," in hot sandwich applications such as a Reuben.

Storage/Shelf Life
Store at refrigerated temperatures between 1 to 3°C (34 to 38°F) for up to 6 months. Proper sanitation when handling these cheeses will greatly increase their shelf life and quality. Freezing is not recommended.

Curing/Aging
2 months.

An American Original
Amish dairy farmers in Pennsylvania and Ohio are credited with producing the first baby swiss sometime between 1890 and 1900. The name "baby swiss" was chosen because this cheese is made in smaller sizes than traditional swiss, it is aged for less time, and has smaller holes or eyes than traditional swiss.

Summary of Key Benefits
Mild flavor, excellent melting cheese. Natural in fondues, and on hot or cold sandwiches.

SWISS

Color
Ivory.

Texture
Firm and elastic with large, dime-sized eyes. Traditionally made wheels of swiss have a very dense rind.

Flavor
Mellow, buttery and nutty.

Typical Composition
41% maximum moisture, 43% minimum milkfat solids.

Performance Characteristics and Applications
Melts well, suited for sauces, fondues, casseroles and fillings. Slices and shreds well for use on sandwiches or as a topper for hot or cold appetizers, entrées and vegetables. Because it is made with part-skim milk, it has a slower melt and less flow than baby swiss, making it ideal for hot appetizers. It also gives fondue a chewier, more resilient body.

Storage/Shelf Life
The culture that produces the eyes continues to remain active in the cheese, producing carbon dioxide. This can result in a puffy package of swiss. This is not a defect or problem, but a natural occurrence. Store at refrigerated temperatures between 1 to 3°C (34 to 38°F) for up to 1 year. Proper sanitation when handling these cheeses will greatly increase their shelf life and quality. Freezing is not recommended.

Curing/Aging
2 months or more, commonly about 7 to 9 months.

Summary of Key Benefits
Traditional in fondues and on hot or cold sandwiches. Distinctive nutty flavor and chewy texture play an important role in a wide number of popular dishes. Rindless varieties reduce trimming and waste.

GRUYÈRE

Color
Ivory to pale yellow with a distinctive pebbly brown rind.

Texture
Dense, smooth and a bit waxy with occasional pea-sized holes.

Flavor
As a washed-rind cheese, gruyère has a richer, earthier flavor than swiss. This earthiness becomes more pronounced as the cheese ages.

Typical Composition
39% maximum moisture, 45% minimum milkfat solids.

Performance Characteristics and Applications
Melts readily and resists separation, perfectly suited for sauces, fondues, casseroles and fillings. Slices and shreds well for use on sandwiches or as a topper for soups, hot or cold appetizers, gratins, entrées and vegetables. It also gives fondue its distinctive flavor. Perfect for gourmet pizzas. Aged version ideal for cheese course.

Storage/Shelf Life
Store at refrigerated temperatures between 1 to 3°C (34 to 38°F) for up to 1 year. Proper sanitation when handling these cheeses will greatly increase their shelf life and quality. Freezing is not recommended.

Curing/Aging
3 months minimum, commonly about 6 months or more. Rind washed regularly at decreasing intervals throughout the aging process. Produced in copper vats and traditionally aged on red spruce boards.

Summary of Key Benefits
Traditional in fondues, quiches, on gratins and soups, and more. Gourmet appeal.

5.10 HARD CHEESES

Varieties include:

- Asiago
- Parmesan
- Romano
- Pepato

Manufacturing Process

The manufacture of hard cheeses is unique in a number of ways. The curd is cut much smaller, the size of a kernel of wheat, versus the size of an unshelled peanut for cheddar. It is also cooked at a higher temperature than other cheeses. This results in a drier curd. The curd is pressed and either brined or dry salted. It is turned regularly and rubbed with vegetable oil.

Performance

Hard cheeses generally have longer shelf lives due to their low-moisture content. Ideal for grating. Freshly grated hard cheeses incorporate well into soups, sauces, stuffings, fillings and bread crumbs. Their low-moisture content makes them excellent in baked goods. These cheeses brown quickly on direct heat applications.

Key Applications

Hard cheeses are used as ingredients in a wide variety of food applications, including appetizers, breads, dressings, soups, pasta dishes, salads, rice, potato or vegetable dishes. They are also used for their more intense cheese flavor in applications such as chips, popcorn, crackers, dips and sauces.

Marketing Advantages

Longer shelf life. Rich in calcium, which facilitates positioning in the "nutrition marketing segment." Strong consumer recognition. Italian-style appeal and quality image.

Key Benefits in Foodservice and Prepared Foods

Intense cheese flavors. Easily grated and used in soups, sauces, pasta and pizza toppers, salads and more.

ASIAGO

Color
Ivory to light yellow.

Texture
Fresh: Firm and elastic.
Medium: Dense and smooth.
Aged: Hard and granular, but softer than parmesan, due to higher milkfat.

Flavor
Mild when fresh. Buttery, nutty, and sharper with age. Between parmesan and white cheddar.

Typical Composition
Fresh: 45% maximum moisture, 50% minimum milkfat solids
Medium: 35% maximum moisture, 45% minimum milkfat solids
Aged: 32% maximum moisture, 43% minimum milkfat solids.

Performance Characteristics and Applications
Freshly grated or shredded, asiago melts readily and incorporates evenly into soups, sauces, stuffings, baked goods, bread crumbs and garnishes. Perfect for gourmet pizzas and as a pasta topper.

Storage/Shelf Life
Store at refrigerated temperatures between 1 to 3°C (34 to 38°F) for up to 1 year. Proper sanitation when handling these cheeses will increase their shelf life and quality by reducing mold development. Shredded and grated hard cheese can be successfully frozen for extended periods. Thaw under refrigeration.

Curing/Aging
60 days to over 12 months.

Summary of Key Benefits
Versatile as a topping/garnish, as well as an ingredient in many dishes. Labor saving shredded and grated versions store for long periods.

PARMESAN

Color
Ivory to light yellow.

Texture
Hard and granular. Drier with age.

Flavor
Buttery, nutty, somewhat sweet and slightly salty.

Typical Composition
32% maximum moisture, 32% minimum milkfat solids.

Performance Characteristics and Applications
Freshly grated parmesan melts readily and incorporates evenly into soups, sauces, stuffings, baked goods, bread crumbs and garnishes. Grated parmesan browns quickly under direct heat. Perfect for gourmet pizzas and as a pasta topper. Aged version ideal for cheese course.

Storage/Shelf Life
Store at refrigerated temperatures between 1 to 3°C (34 to 38°F) for up to 2 years. Proper sanitation when handling these cheeses will increase their shelf life and quality by reducing mold development. Shredded and grated hard cheese can be successfully frozen for extended periods. Thaw under refrigeration.

Curing/Aging
10 months minimum, available aged up to 20 months or more. The rind is brined or salt rubbed to make it harder. This retains more moisture inside the cheese as it ages.

Summary of Key Benefits
Extremely versatile as a topping/garnish, as well as an ingredient in many dishes. Labor saving shredded and grated versions store for long periods. Distinct flavor integral to Italian cuisine.

ROMANO

Color
Creamy white to ivory.

Texture
Hard, granular.

Flavor
Sharp, piquant with an acidic tang. Much more assertive than parmesan. Romano is available studded with black peppercorns in a variety called pepato.

Typical Composition
34% maximum moisture, 38% minimum milkfat solids.

Performance Characteristics and Applications
Freshly grated or shredded romano melts readily and incorporates evenly into soups, sauces, stuffings, baked goods, bread crumbs and garnishes. Flavorful gourmet pizza topper. Traditional pasta topper in Italian cuisine.

Storage/Shelf Life
Store at refrigerated temperatures between 1 to 4°C (34 to 39°F) for up to 1 year. Proper sanitation when handling these cheeses will increase their shelf life and quality by reducing mold development. Shredded and grated hard cheese can be successfully frozen for extended periods. Thaw under refrigeration.

Curing/Aging
5 months minimum for table cheese.
12 months minimum for grating.

Summary of Key Benefits
Traditional pasta topper in Italian cuisine. Versatile and flavorful as a topping/garnish, as well as an ingredient in many dishes. Labor saving shredded and grated version store for long periods.

5.11 PROCESS CHEESES

Dairy Management Inc.

Varieties include:

- Pasteurized Process Cheese
- Pasteurized Process Cheese Food
- Pasteurized Process Cheese Spread
- Pasteurized Process Cheese Product
- Cold-Pack

Manufacturing Process

Pasteurized process cheese is made by mixing and heating natural cheese. The cooking temperature depends on whether the end-product is process cheese, process cheese food or process cheese spread. Cold-pack cheese, which is similar in many ways to process cheese, is not heated during processing. Another type of process cheese, pasteurized process cheese product, meets different moisture and fat levels from that of pasteurized process cheese spread, and unlike the others mentioned above, it has no Federal Standard of Identity.

Key Benefits in Foodservice and Prepared Foods

Process cheese products can be custom designed to deliver specific melting properties: from no-melt types to products designed for sauces and dips. The wide variety of formulations delivers cost-efficient solutions in fast-food applications. Premium process cheese products offer uniqueness and lend themselves well to high quality, consistent food preparations. Extended shelf life provides cost advantages.

Marketing Benefits

Superb product consistency ensures consumer satisfaction; repeat sales.
Ingredient customization offered by suppliers facilitates end-product differentiation.
Good nutritional properties and enrichment possibilities add extra appeal and value.
Smooth texture and mild taste have strong appeal to children. Deliver "cheese appeal" in shelf-stable products.

Performance

Process cheeses typically have a longer keeping quality compared with natural cheeses. Shelf-stable process cheese products are also available, which may not require refrigeration.

Process cheeses are usually selected for their uniform flavor and performance. They are available with a wide range of melting and slicing characteristics and in a variety of color and flavor intensities, forms and package sizes.

Key Applications

Process cheeses are used in nearly every application where natural cheeses are used, including cheese snacks, soups and sauces, baked goods, cheese stuffed entrées, sandwiches, vegetables in cheese sauce, meats, microwaveable foods, and casseroles. Reduced- or fat-free types of process cheeses are ideal in processed food applications such as fat-free soups, sauces, appetizers, baked and microwaveable entrées.

PASTEURIZED PROCESS CHEESE

Color
The color of pasteurized process cheese often reflects the types of natural cheese used in the cheese making process, and colors range from white to ivory, buttery, or the golden color of cheddar. The color agent used is typically annatto, a natural vegetable color obtained from the mature seeds of the Bixa Orlleana tree.

Texture
Smooth, dense, and homogeneous. Slight plastic or gelatinous texture when cold. Smooth, creamy texture when heated. The addition of permitted vegetables, fruits, nuts, or meats also affects texture.

Flavor
Pasteurized process cheese flavors are buttery, rich, and correspond to the different cheese varieties used in its production. As a benchmark, "American" has a pronounced buttery and cheddary flavor. Other permitted ingredients and flavors will also determine the final flavors.

Typical Composition
The base ingredient for pasteurized process cheeses is natural cheese, and the moisture and milkfat composition of these cheeses will correspond to the individual varieties used in their production. They may be made using one cheese or a combination of different cheeses. The cheeses permitted include cheddar, brick, muenster, swiss, and a variety of washed curd cheeses. In some styles, gouda and edam are also used. When used in the context of pasteurized process cheese, the term "American" refers to a specific blend of cheddar, colby, and a variety of washed curd cheeses. Vegetables, fruits, nuts, meats, and other flavors are also permitted ingredients in certain types of pasteurized process cheese.

Performance Characteristics and Applications
When cold, pasteurized process cheese has a firm texture that can be easily sliced. When warmed or heated it has a smooth creamy texture, and melts quickly. As most natural cheeses are melted and then cooled they quickly become firm, a process known as post-melt chewiness. Pasteurized process cheese melts quickly and stays soft much longer with very little post-melt chewiness. Slices melt well and are most popular for grilled cheese and cheeseburgers.

Storage/Shelf Life
The pasteurization process yields cheeses with exceptionally long shelf lives. Recommended storage temperatures are from 1 to 4°C (34 to 39°F). Freezing is not recommended. When retained in the original factory sealed packaging, their shelf life is indeterminate and often measured in years. Some products are shelf-stable and require no refrigeration.

Curing/Aging
These cheeses are not typically aged or cured. They are ready for consumption immediately after processing and packaging.

PASTEURIZED PROCESS CHEESE FOOD

Color
The color of pasteurized process cheese food often reflects the types of natural cheese used in the cheese making process, and colors range from white to ivory, buttery, or the golden color of cheddar. The color agent used is typically annatto, a natural vegetable color obtained from the mature seeds of the Bixa Orlleana tree.

Texture
Smooth, dense, homogeneous. Slight plastic or gelatinous texture when cold. Smooth creamy texture when heated. The addition of permitted vegetables, fruits, nuts, or meats may also affect texture.

Flavor
Pasteurized process cheese food flavors are buttery, rich, and correspond to the different cheese varieties used in its production. As a benchmark, "American" has a pronounced buttery and cheddary flavor. Other permitted ingredients and flavors will also determine the final flavors.

Typical Composition
Pasteurized process cheese foods have a maximum moisture content of 44% and a minimum milkfat content of 23%. The base ingredient for these cheeses is natural cheese. They may be made using one cheese or a combination of different cheeses. The cheeses permitted include cheddar, brick, muenster, swiss, and a variety of washed curd cheeses. In some styles, gouda and edam are also used. When used in the context of pasteurized process cheese food, the term "American" refers to a specific blend of cheddar, colby, and a variety of washed curd cheeses. Vegetables, fruits, nuts, meats, and other flavors are also permitted ingredients in some types of pasteurized process cheese foods.

Performance Characteristics and Applications
Pasteurized process cheese foods have exceptional shelf life and good hot performance in cooking applications. They are the basis for many cheese sauces and dips, from nachos to macaroni and cheese. Their easy melting ability makes them ideal for stovetop, microwave or baking applications.

Storage/Shelf Life
The pasteurization process yields cheese foods with exceptionally long shelf lives. Recommended storage temperatures are from 1 to 4°C (34 to 39°F). Freezing is not recommended. When retained in the original factory sealed packaging, their shelf life is indeterminate and often measured in years. Some products are shelf-stable and require no refrigeration.

Curing/Aging
These cheeses are not typically aged or cured. They are ready for consumption immediately after processing and packaging.

PASTEURIZED PROCESS CHEESE SPREAD

Color
The color of pasteurized process cheese spread is meant to reflect the types of natural cheese used in the cheese making process, and colors range from white to ivory, buttery, or the golden color of cheddar. The color agent used is typically annatto, a natural vegetable color obtained from the mature seeds of the Bixa Orlleana tree. Other permitted ingredients may also affect the color. One popular cheese spread is port wine with cheddar. The resulting cheese yields a ruby color similar to the port wine.

Texture
Vegetable gums are often used in the cheese making process for pasteurized process cheese spread. They help retain moisture in the spreads, and yield a soft, smooth, creamy texture. The addition of permitted vegetables, fruits, nuts, or meats may also affect texture.

Flavor
Pasteurized process cheese spreads are buttery and rich, and the flavors will correspond to the different cheese varieties used in their production. As a benchmark, "American" has a pronounced buttery and cheddary flavor. Other permitted ingredients and flavors will also determine the final flavors.

Typical Composition
In pasteurized process cheese spreads, the moisture content may range from 44 to 60%, and they have a minimum milkfat content of 20%. The base ingredient for these cheeses is natural cheese. They may be made from one cheese or a combination of different cheeses. The cheeses permitted include cheddar, brick, muenster, swiss, and a variety of washed curd cheeses. In some styles, gouda and edam are also used. When used in the context of pasteurized process cheese spread, the term "American" refers to a specific blend of cheddar, colby, and a variety of washed curd cheeses.

Performance Characteristics and Applications
Pasteurized process cheese spreads are designed to spread smoothly and are the basis for many snacking or appetizer applications with crackers, breads, or vegetables.

Storage/Shelf Life
The pasteurization process yields cheeses with exceptionally long shelf lives. Recommended storage temperatures are from 1 to 4°C (34 to 39°F). Freezing is not recommended. When retained in the original factory sealed packaging their shelf life is indeterminate and often measured in years. Some products are shelf stable and require no refrigeration.

Curing/Aging
These cheeses are not typically aged or cured. They are ready for consumption immediately after processing and packaging.

COLD-PACK

Color
White, ivory, light yellow to orange, depending on cheese varieties used. Port wine or other ingredients also add unique colors.

Texture
Smooth and spreadable.

Flavor
Mild to sharp. Flavors reflect the natural cheese varieties used to produce the cheese. Often flavored with spices, meats, fruits, or vegetables. Port wine is also a popular flavor.

Typical Composition
Cold-pack must contain the same amount of moisture as the cheese varieties used to produce it. No water can be added. If fruits, vegetables, meats, or spices are used, the moisture is allowed to be 1% higher and the milkfat can be 1% lower than the cheese varieties used.

Performance Characteristics and Applications
Cold-pack was first used as a bar or pub snack that was spreadable. It is still most often used as a spread with crackers, breads, or chips. Because the cheese is so finely chopped it also melts well into sauce applications.

Storage/Shelf Life
Store at refrigerated temperatures between 0 to 1°C (32 to 34°F) for 90 to 180 days. Check specific code dates on packaging. Available in a vast array of sizes for retail and foodservice applications.

Curing/Aging
Not cured.

Summary of Key Benefits
A wide range of cheeses and seasonings used offer many flavors from which to choose. Can be served cold for spreading on crackers or bread, or used in hot sauce applications.

5.12 CHEESE POWDERS AND ENZYME MODIFIED CHEESES

Varieties include:
- Cheese Powders
- Enzyme Modified Cheeses (EMCs)

Manufacturing Process

Cheese powders may contain one or more varieties of natural cheeses. Cheeses commonly used to create powders and dry blends include cheddar, blue, parmesan, romano and swiss-style cheeses. The base cheese, which may be blended with other ingredients and colors, is spray-dried to create a free-flowing powder with a low-moisture content (typically in the 3 to 5% range).

Some products are dehydrated in vegetable oils for easier application on chips, crackers and other dry snacks. Hard Italian-style cheeses (e.g. parmesan) can be dried after grating in tray or belt dryers to reduce moisture to less than 18%. After cooling, the cheeses are ground and packaged.

EMCs, which provide intense cheese flavor, are made from special blends of natural cheese with added lipases and other food-grade enzymes. Flavor concentrations 10 to 20-fold as high as that of the ripened cheeses develop in 1 to 3 days. The cheese paste is then heat-treated to stop the biochemical reaction and cooled.

EMCs are available in paste form as well as dried form. EMCs offer significant savings and functional benefits in products such as cheese-flavored crackers and other bakery items.

Performance

Cheese powders are used as a primary flavor ingredient in prepared foods. When concentrated flavor is needed, enzyme-modified cheeses are a good option for standardizing natural cheese flavor.

Product Specifications

Most cheese powders have a moisture level of 4 to 5% max. Fat content varies as a function of the raw cheese material used and the amount of other ingredients that may be added as carriers. Similarly, salt content varies but is often in the 5 to 10% range.

Key Applications

Cheese powders, also called dried cheese or dehydrated cheese, are well-suited for use in low-moisture applications such as snacks, cereal-based products and prepared dry mixes. They are also used as a flavor component in a wide range of other processed foods, such as soups, cheese sauces, dips, salad dressings, frozen foods and bakery products. Reduced-fat dried cheese blends are available for low-fat formulations.

Marketing Advantages

Cheese powders are ready-to-use, and adaptable to many food processing systems. They can be customized for use with other dry ingredients and can be blended with dry ingredients and additives. They offer labor savings and cost effectiveness. Well-suited for value-added, extended shelf life products, cheese powders can be packed in modified atmosphere packs to obtain a storage life of a year or more.

Key Benefits in Foodservice and Prepared Foods

Cheese powders and enzyme-modified cheeses are used in snack coatings, dry mixes, salad dressings, sauces, soups, crackers and to enhance natural cheeses in seasonings and baked goods. U.S. cheese suppliers can create hundreds of dry cheeses and blends with different flavors, colors, functional properties and price points.

5.13 CUSTOM AND CONVENIENCE CHEESE PRODUCTS

Dairy Management Inc.

Varieties include:

- Pre-blends
- Pre-cut Cheese
- Shredded Cheese
- Grated Cheese
- Cheese Sauce
- Portion Packaged Cheese

Cheese Appetizers

U.S. cheese appetizers are gaining popularity around the world. They offer foodservice operators cost savings in terms of labor and waste reduction, as well as convenience and consistency. U.S. manufacturers offer a variety of batters and breadings, as well as many different shapes (sticks, balls, triangles, and custom shapes). Cheese appetizers also include a range of vegetable, pasta and dough shells filled with U.S. cheese. Jalapeño peppers filled with U.S. cream cheese, for example, are a popular appetizer. Cheese appetizers are generally marketed as frozen products. They can be prepared in a variety of ways: frying, cooked in convection or microwave ovens.

Manufacturing Process

Cutting, slicing, shredding, packaging or other processing of cheese is performed after the manufacturing process and any aging is completed. Convenience-forms of both natural and process cheeses are available.

Cheese sauces are aseptically processed, viscous liquids that are canned. Typically, ingredients used are natural cheeses, skim milk, whey, salt, stabilizers, emulsifiers and seasonings. Viscosity of the sauces can vary but is often in the 30-60,000 cps range at 21 to 27°C (70 to 81°F).

Key Benefits in Foodservice and Food Processing

Reduce on-site labor costs. Ensure greater consistency of finished products. Increase food processors' manufacturing efficiencies. Sauces are pumpable and provide good portion control. Extended shelf life, no need for refrigeration for cheese sauces.

Key Applications

These cheeses are selected primarily to reduce on-site labor and to ensure a greater consistency of finished product. Convenience cheeses are available for use with nearly every cheese application, from sandwiches and appetizers to meals, entrées and snacks. Cheese sauces are convenient as ready-to-use dips as well as for omelets, pasta, dressings, sauces and soups.

Cheese Concentrates

U.S. cheese suppliers have recently developed technologies that enable them to offer cheese concentrates. These can be used in liquid as well as dry applicatons. Added at low levels, cheese concentrates reinforce the flavor of sauces and can be used as an ingredient in pasteurized process cheese products.

Cheese Sauces and Dressings

The popularity of cheese sauces derived from cheddar and other types of cheeses results from their convenience. Their main use are omelets, nachos, pasta, side dishes, salad dressings, dips and toppings. They are increasingly used as fillings in pocket sandwiches, entrées, battered and breaded foods.

Cheese sauces are formulated to have specific and desirable characteristics in terms of flavor, consistency, flow and behavior during cooking. U.S. manufacturers can design cheese sauces to meet very specific melting point requirements. Cheese sauces are often thermally processed so they are shelf-stable until opened. Many varieties are also available in powder form. Most cheese sauces are formulated to be freeze-thaw stable and to be reheated in a microwave as well as convection ovens.

U.S. cheeses are also a key flavoring agent in spoonable, pourable dressings and in powdered dressing mixes. Cheddar, parmesan, blue, romano, cream and ricotta cheeses are often used in the manufacture of ready-to-use dressings.

Dips are used with salty snacks, vegetables, meats and fruits. In the manufacture of premium dips, the major ingredients are sour cream, skim milk and stabilizers. U.S. cheeses are added to achieve desirable flavor profile as well as for texture.

Shreds and Cubes

Using pre-cut cheeses helps reduce waste and labor costs during preparation and clean-up. U.S. manufacturers can supply customers with a very wide variety of sizes and shapes. The following are examples of pre-cut items available. For more options, please contact your U.S. cheese supplier.

Cubes, square pieces and rectangular sticks. These pieces are generally 1.5 to 2 cm thick and are cut to specified, consistent lengths. Mini cubes (dice-shaped shreds) are also available.

Standard shreds. These shreds are approximately 0.2 to 0.3 cm around, with a length between 1.5 and 3 cm. These are also often referred to as bevel shreds.

Fine shreds. These shreds are generally less than 0.15 cm around and 1.25 to 4.5 cm long. These are often referred to as fancy shreds.

Flat shreds. They are 0.15 to 0.35 cm around, with a flat, "hand-shred" appearance.

Sandwich slices. Slices are available in a variety of shapes (rectangular, moon, round, custom) and of varying dimensions to meet end-users' needs.

Cheese Seasonings

U.S. manufacturers offer a variety of seasonings in which cheeses play a key role as flavoring agents. Cheese seasonings are often applied on snacks. To achieve desirable adherence, appearance and other characteristics, other functional ingredients are typically added to seasonings. They include butter, whey solids, milk solids and buttermilk. Frequently, salt and spices are added to provide flavor.

Using Seasonings for Cheese-flavored Snacks

The mesh size of seasoning powders needs to be compatible with the oil content of the snack. A coarse particle size of 40 to 100 is recommended for potato chips (36 to 38% oil). Corn-based chips require a much finer particle size, as their oil content is typically lower (18 to 22%). To maximize adhesion on fat-free snacks, a surface film needs to be created.

In many snacks, a superior flavor profile can be achieved by incorporating cheese seasonings or cheese powders in the product formulation itself, rather than as a coating. Cheese crackers are a good illustration of this type of application.

5.14 CHEESE FOR SPECIAL NEEDS

Dairy Management Inc.

Varieties include:

- Low-fat Cheeses
- No-fat Cheeses
- Low-sodium Cheeses
- Kosher Cheeses
- Halal Cheeses
- Organic Cheeses

Manufacturing Process

Specialized cheese products are available in a wide variety of natural and processed cheese forms. In producing Kosher, Halal, organic and nutrient-modified products, U.S. cheese makers follow established guidelines for production and inspection to meet the specific requirements of those claims.

Performance

Except for Kosher, Halal and organic products, which do not differ from traditional cheeses in terms of nutrient content or composition, other specialized cheeses, such as low-fat cheeses, may not function in exactly the same way as the traditional cheese varieties on which they are based. Please contact your U.S. cheese supplier for information on the functionalities of specific cheeses.

No-fat and Low-fat Cheeses

A variety of low-fat and no-fat cheeses developed for foodservice operators are available from the United States. Among the most popular and versatile varieties are cheddar, mozzarella, swiss and provolone. These products may offer the same functionality, such as stretchability and meltability, as full-fat cheeses. They help foodservice operators design low-fat dishes with an excellent nutritional profile and high consumer appeal.

Key Applications

There is a wide variety of specialized cheese products available for use in products targeting consumers with special needs or interests, including low-fat and low-calorie cheeses, Kosher, Halal and organic cheeses. These products, depending on their specific functionalities, may be incorporated into a wide range of foods, from crackers and other snacks to entrées, appetizers and desserts.

Marketing Advantages

Cater to the needs of specialized markets and consumers. Offer nutritional benefits of cheese while meeting requirements of special diets. Receive variety without compromising on convenience and quality.

Key Benefits in Foodservice and Food Processing

Allow chefs and food processors to benefit from the flavor, texture and funtionality of cheese while creating foods that meet the special needs of specific consumers.

5.15 SPECIALTY CHEESES

U.S. specialty cheese production goes back centuries with farmstead cheese making when European immigrants settled in America. Today, even though the United States alone produces a quarter of the world's cheese output in mostly large, state-of-the-art factories, specialty cheese making is still widely practiced and is currently the fastest growing segment of the American cheese market.

The size of U.S. specialty cheese factories is usually small and production often times occur in an open-vat environment. However, these factories are subjected to the same stringent level of inspection and quality assurance programs like larger facilities to ensure consumers' safety.

The range of specialty cheese varieties produced and available from the United States is quite broad. Every family of cheese includes specialty cheeses whether it is a more high-end version of an everyday-type table cheese such as monterey dry jack, which is an aged version of monterey jack, or a new cheese uniquely crafted and/or named by American specialty cheese makers.

The following list, divided by degree of hardness, contains just a small sample of the specialty cheeses made in the U.S. Some of them might be produced by more than one cheese maker while some are specific brands.

Soft-Fresh Cheese	• Crème Fraîche • Crescenza • Quark (Plain & Flavored) • Feta (Plain & Flavored)	• Fromage Blanc • Mascarpone • Schloss*
Soft-Ripened Cheese	• Brie • Camembert • ColoRouge* • Green Hill* • Hudson Valley Camembert* • La Petite Crème*	• Les Frères* • Mt. Tam* • Pierce Point* • Poudre Puffs* • Tomme • Velvet Rose*
Blue	• Amish Blue* • Berkshire Blue* • Buttermilk Blue* • Point Reyes Blue*	• Creamy Gorgonzola* • Maytag Blue* • Mountain Top Blue*
Semi-Soft	• Brick (Surface Ripened) • Fontina • Gruyère Surchoix* • Havarti (Plain & Flavored) • Knights Vail*	• Limburger • Muenster • Red Hawk* • Teleme Jack
Gouda & Edam	• Aged Gouda • Geliefde*	• Smoked Gouda
Pasta Filata	• Aged Provolone • Burrini/Manteche • Fresh Mozzarella	• Oaxaca • Scamorze
Cheddar	• Naturally Bandaged Cheddars • Raw Milk Cheddar	• Aged Cheddar (2-8 Years Old)
Swiss Cheese	• Gruyère Surchoix* • Pleasant Ridge Reserve*	• Petite Swiss • Raclette
Hard Cheese	• American Grana • Monterey Dry Jack • Pepato	• Romanello* • Sareanah* • Stravecchio Parmesan*

*Indicates Brand Name

Testifying of the resurgence of specialty cheese making in America, the American Cheese Society (ACS), an organization headquartered in Louisville, Kentucky, was formed in 1982 by a group of American artisan and farmstead cheese makers. ACS is dedicated to promoting the growth of artisan, farmstead and specialty cheeses and their makers. By their definitions, the term *Artisan* refers to unique, hand-made cheeses, produced with minimal mechanization. *Farmstead* refers to cheeses made on the same farm that produces the milk while the term *Specialty* indicates limited production and special attention to quality through the cheese making and curing process.

U.S. specialty cheeses have won many awards at international competitions such as the World Cheese Awards and the World Championship Cheese Contest. Over the years, while competing side-by-side with European cheese makers, the U.S. cheese industry has proven that it is a true contender to supply the world with safe, wholesome and high quality cheeses.

Contact the U.S. Dairy Export Council for more information.

6.1 CUTTING AND HANDLING

By MARK TODD
Research Resources, Monte Rio, CA
and
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Tools for Cutting and Slicing Cheese

The tools for cutting and slicing cheese vary depending on the density of the cheese to be cut. The following is an overview of all tools.

Cheese Knives:

1. Double-Handled Cheese Knife
Also known as a double-handled cheese knife, this tool is used for cutting large blocks, wheels, or cylinders of semi-soft to hard cheeses. This knife reduces the incidence of injury associated with using a knife too small for the job.

2. Case Cutter/Package Opening Knife
Whether it is a case cutter or a small paring knife, be sure to use a separate tool to open boxes, plastic wrap, or foil that covers the cheese to avoid cross-contamination.

3. Paring Knife
Essential for any kitchen. The pairing knife is used on all smaller pieces of cheese, for serving or trimming. Available in a variety of sizes and shapes, this knife is the most used piece of equipment in your arsenal, so choose one that fits your hand and style.

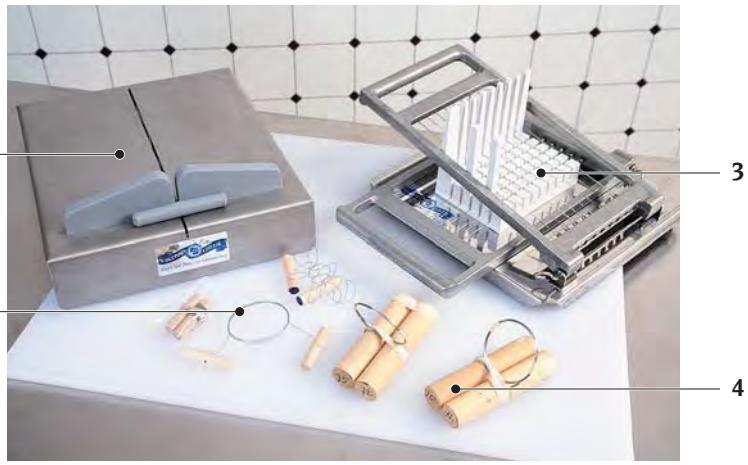
4. Parmesan Knife
Used as part of a set for splitting a wheel of hard grating cheese, like parmesan. Also used to break off chunks of hard cheese for serving. Limited uses, but great visual appeal on a serving tray.

5. Chef's Knife
Most versatile knife in the kitchen. Used for almost any cutting job. Be careful when cutting large pieces of cheese, as the tip of the knife is a dangerous place for the palm of your hand. In cases like these, use the two handled knife.

6. Soft Cheese (Brie) Knife
Serrated, flexible knife with cut-away style blade for cutting soft and soft-ripened cheeses. The serrations cut the bloomy rind while the cut-away metal face reduces the area to which the soft cheese may stick. The typical two-pronged knife tip is for serving the cheese after cutting.

7. Cheese Plane
An ideal serving tool for any semi-soft to firm cheese, delivering a paper thin slice. While tricky to master, this is the best tool for sampling. It delivers a small sample with a big surface area for flavor, while sealing the body of the cheese each time it is used. Also good for parties or small get-togethers.

8. Spreader
Used for soft cheeses and spreads.



Cheese Wires:

1. Platform/Pull Wire Cutter
Ideal tool for large volume production. Works well with all cheeses through semi-firm, not recommended for the harder grana-type cheeses.

2. Fish Line Cutters
Great for breaking down 20 kg (44 lb) blocks. Also for cutting soft cheeses, like cream cheese, brie or blue, as it leaves a clean edge. Fish lines do not kink or break as frequently as wires, and if they do break, new knots can be tied easily. They are also easy to clean and can replace cheese wires for many tasks.

3. Cheese Cuber
Excellent for portioning cheese, either for recipes, or large samplings. Can be used to produce many shapes and sizes.

4. Hand Wires
Available in varying lengths and strengths, these are ideal for breaking down larger pieces of firm to hard cheese. Care must be used not to kink the lines, as this renders them prone to breakage.

Techniques for Handling and Cutting Cheese

The Three "C's"
It is important to remember the 3 "C's" when dealing with cheese: clean, cold and covered.

- **Clean** means everything that will come in contact with the cheese, from the cutting board, the cutting tools, your work station, your hands (preferable freshly gloved) and your wrap station.

- **Cold** means most cheeses need to be kept between 1° to 4°C (34° to 39°F). The longer the cheese is allowed to remain outside this temperature zone, the more the quality deteriorates.

- **Covered** refers to the abundance of mold in the air. If you keep cheeses covered, even loosely, when working with them, you will reduce the chances of surface mold. Plus, keeping cheese covered helps to maintain its cool temperature and slows moisture loss, which will adversely affect the cheese.

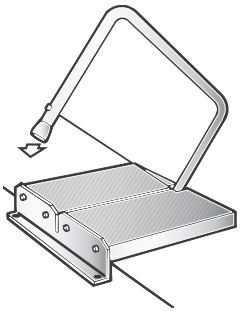
BLOCK

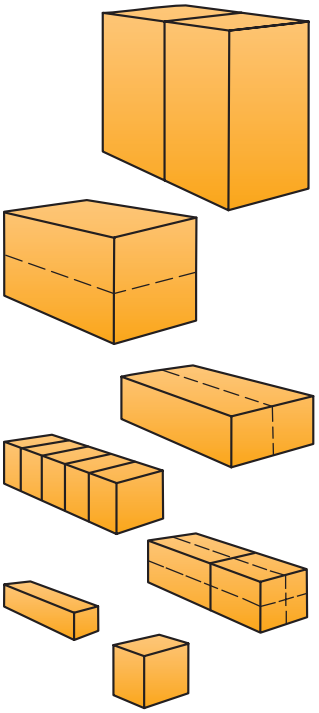
Cheddar, Monterey Jack, Mozzarella, Muenster, Swiss

Paring knife

Fish line cutter

Stationary wire platform cutter





Break 20 kg (40 lb) blocks down to the size best suited to the application.

LOAF

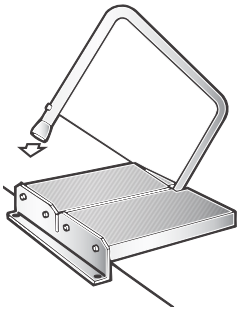
Brick, Cream Cheese, Edam, Havarti, Monterey Jack, Muenster, Swiss

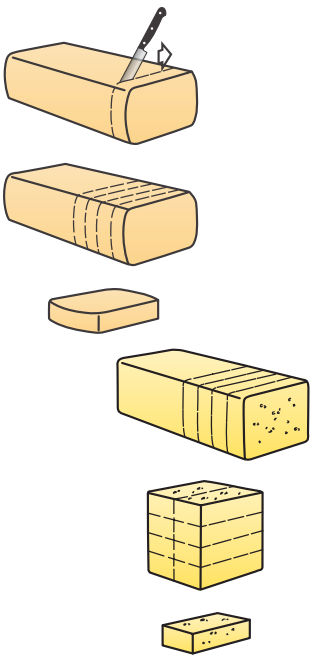
Chef's knife

Paring knife

Fish line cutter

Stationary wire platform cutter





Note: Square loaves yield different shaped pieces than rectangular loaves.

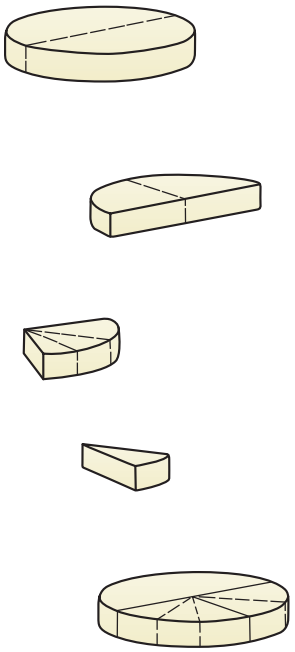
SOFT-RIPENED

Brie, Camembert

Paring knife

Chef's knife

Brie knife



Once you cut soft-ripened cheeses, they will not ripen as well. It is best to cut the whole wheel once you start.

Until you cut into these cheeses, leave them in the special wrap in which they were shipped, this wrap allows the cheese to breath and continue to ripen.

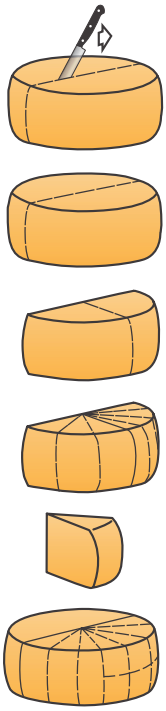
WAXED WHEELS

Cheddar Daisies, Cheddar, Fontina, Gouda

Double-handled cheese knife

Paring knife

Chef's knife



For waxed wheels, score through the wax with a paring knife first. Leave the wax on for cheese displays.

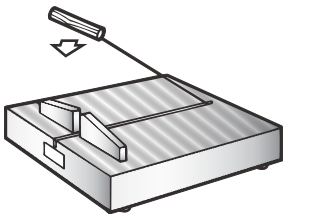
BLUE WHEELS

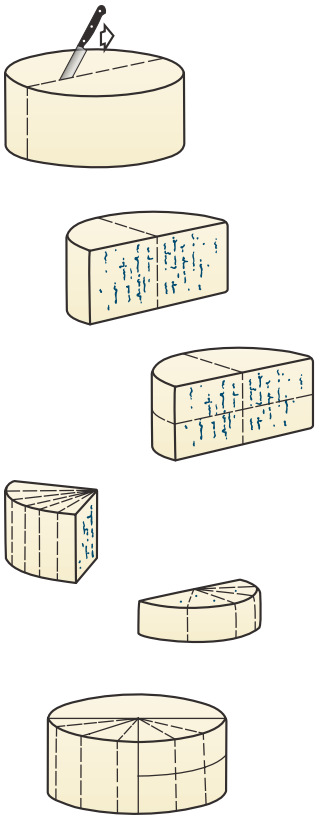
Blue, Gorgonzola

Paring knife

Fish line cutter

Pull wire cutter





Sanitize cutting boards and tools before and after cutting blue-veined cheeses.

HARD WHEELS

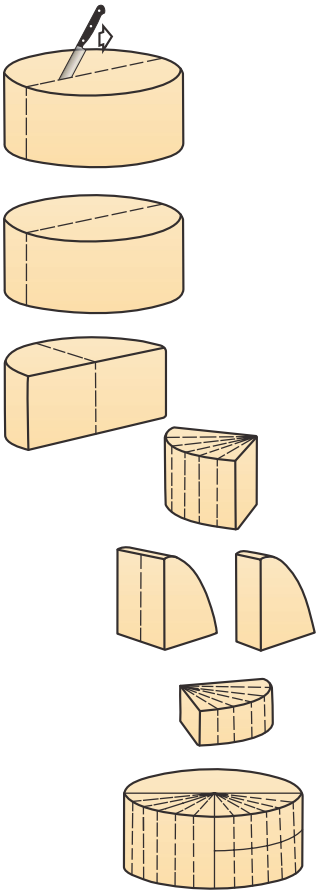
Asiago, Parmesan, Pepato, Romano

Paring knife

Double-handled cheese knife

Hand wire

Parmesan knife



Before cutting, score through the wax or rind first with a paring knife.

CYLINDER

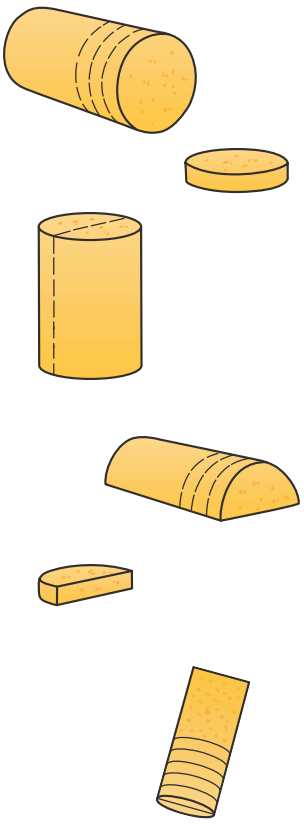
Colby, Provolone, Smoked Gouda

Paring knife

Chef's knife

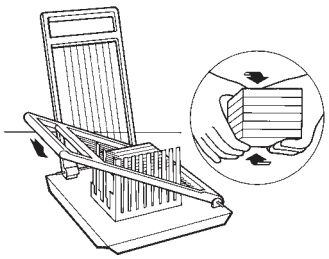
Double-handled cheese knife

Fish line cutter

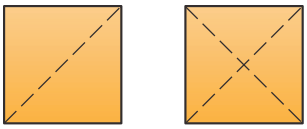


PORTIONS

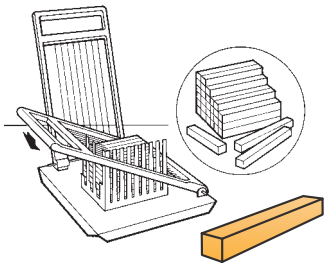
Cheese cuber



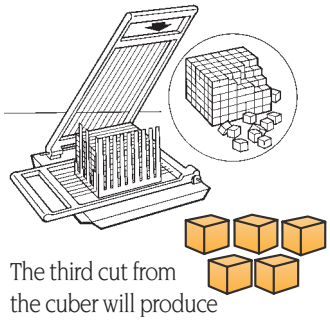
The first cut from the cuber forms slabs that can be cut in half to form small triangles.



Rotate the slabs away from you (as shown above) to prepare for the next step, cutting sticks.



The second cut on a cuber produces sticks.



The third cut from the cuber will produce potion-controlled cubes.

Cutting Guidelines

The following are important guidelines to keep in mind when cutting or slicing cheese.

- Wear foodservice gloves to discourage mold growth. This prevents leaving fingerprints (particularly important with soft-ripened cheeses like brie and camembert), and prevent skin acids from affecting the cheese.
- Never cut more cheese than you can wrap in 15-30 minutes maximum. This will help prevent the cheese from molding and drying out.
- Wrap cheese to be displayed for sale in plastic film immediately to keep air out and moisture in. Check all seams to ensure tight fit and sealed coverage. If cutting cheese for immediate sale, it is best to wrap cheeses in wax paper or butcher paper, as plastic wrap has distinct odors and particularly softer cheeses can pick up flavors and aromas from the wrap.
- Do not reuse plastic film! A fine layer of oil from the cheese will prevent the wrap from clinging properly a second time, allowing air access to the cheese.
- It is important to physically turn the cheeses over regularly, at least twice a month, to keep natural oils evenly distributed throughout the cheese. This is true of whole wheels and cut pieces.

- After cutting dense cheeses like cheddar and gouda, draw the flat of the knife over the cut surface of the cheese to close up exposed pores and prevent further moisture loss.
- Blue cheeses and gorgonzolas may arrive to your location in vapor barrier bags (commonly called Cryovac) that keep virtually all air out. The molds will go to sleep under those conditions; so these cheeses are almost white when first opened. This will change rapidly as the cheeses are cut and wrapped. Keep the exposed time for these cheeses down to a minimum, as excessive mold development will adversely affect the appearance.
- It is important to follow cutting diagrams until you are familiar with the proper ways to cut each shape to minimize waste or odd shapes which are more difficult to sell.
- Always use the proper tools for the type of cheese with which you are working. This will help ensure proper procedures as well as better safety.

When Cheese Molds

Molds are naturally occurring organisms in the atmosphere, and despite your best intentions and sanitation, molds can show up on your cheeses. If the mold is the normal greenish-bluish mold often found on cheeses, you can safely trim the mold off by removing about 1 cm (10 mm) of cheese behind the mold. Change the wrap as well. This remaining piece of cheese can be safely eaten, but once it has molded, it is prone to mold again, so use it quickly, by reducing the price or sampling it. If the molds you encounter are unusual looking, either their color (pink, or black) or their appearance, discard the cheese.

Receiving and Storing Cheese

When receiving cheeses, as with any perishable product, check the packaging for damage. Have any seals been damaged? Are there signs of seepage or leakage? What is the temperature of the product and delivery truck? If your cheeses are not vacuum sealed or otherwise protected, is there any evidence that other products in the truck leaked on to your product? Most of this is common sense, but needs reinforcement.

Once in your hands, you have the responsibility for quality control. Cheeses need to be rotated on a FIFO (first in, first out) basis, and this is extremely critical for soft-fresh and soft-ripened cheeses. If you do not follow this rule, you will shrink a lot of product. Temperature is the most critical factor in preserving the quality of cheese. Keep most cheeses stored under 4°C (39°F).

Humidity is another important aspect of storing cheese. For most cheeses in vacuum packaging, location in the cooler is not critical. But for cheeses that are either soft-ripened, or naturally rinded, it is important to remember that refrigerators are dehydrators as well. Keep these cheeses out of the direct cooler fan, preferably in a covered area, to mitigate these effects. Loosing water affects the quantity, as well as the quality, of cheeses. If you are storing cheeses longer than 1 month, it is important to turn them over, at least twice a month, to redistribute the oils, which migrate with gravity.

Another concern is cross-contamination. When storing cheeses, it is impossible for most people to segregate their blue and soft-ripened cheeses to separate coolers. The molds on these cheeses will spread, if not contained carefully. Keep these cheeses tightly wrapped and as far from each other and the other cheeses as convenient. If possible, keep these cheeses in secondary containment, like a sealable plastic bin, to avoid any possible problems. It is also critical to follow the sanitation procedures to the letter when dealing with mold-ripened cheeses.

6.2 MERCHANDISING U.S. CHEESE AT RETAIL

Contributed by the
WISCONSIN MILK MARKETING BOARD, INC.,
Madison, WI

Adapted from the "Retail Merchandising Guide"

Merchandising is defined as "sales promotion as a comprehensive function, including market research, development of new products, coordinating production, marketing and effective advertising and selling."

This section provides information on merchandising cheese from start to finish. It covers detailed steps on everything from setting and maintaining a cheese case to selling and sampling tips. You'll find fresh ideas for adding value to cheese, themes and promotions and cross-merchandising.

Market Research

To know what your customers want, you must conduct market research. To design a program for optimal sales, first gather information to determine your customer profile then study your competition, and finally, assess trends in consumer eating and lifestyles. The following activities will help you gather data that will make your marketing efforts successful:

- Conduct a customer survey annually. Review store demographics for ethnic influences and income levels.
- Ask sales representatives to review top selling items in your area.
- Examine competition – product lines and services offered; include warehouse and specialty stores. Determine which niche the competition fills and which it doesn't.
- Check out items available from restaurants that provide take-out and delivery services.
- Track food and beverage trends – national, regional and local.

Increasingly, consumers will buy more prepared meals and convenience foods. When your customers shop in your department, you'll already know what they want. You've done your homework – market research.

Different Cases, Different Looks

Different cases offer unique features to merchandise cheese.

Self-Service Coffin Cases

Self-service coffin cases adapt easily to different styles of merchandising. They have adjustable bottoms to hold varying inventory and enough space for full wheels and mammoths, and for baskets and props. Utilize the back counters and add knee knockers in the front for cross-merchandising.

Service Islands

Service islands provide a work station in the center for an associate to answer questions and to service, sell and sample product. Use back counters that do not interfere with customer service for cross-merchandising.

Self-Service Upright Cases

The upright case clearly displays all the varieties of cheese you carry, and its adjustable shelving allows for merchandising wheels and larger pieces in the case. Take advantage of these cases, including the platform space on top, for themes and special occasion merchandising.

Self-Service, Tiered Deck Cases

Tiered deck cases bring product to eye level. They require less labor to service and merchandise and work well for pre-cut programs. Merchandise tie-in items on the top of the case.

Upright Case as a Back Wall

Upright cases keep product visible for customers and provide easy access for slicing cheese. Flexible shelving allows space to display back stock, including whole pieces of cheese. Use large, bold print on signage for easy reading.

European-Style Service Cases

The curved glass front looks contemporary and shows off the product in this case. Best suited for stores with high traffic in the service deli, this case puts products on stage at all times but requires continual upkeep and service.

Setting the Case

Organizing U.S. Cheese in Categories

Organizing cheese by category guides customers and staff through the case. The most common ways to categorize cheese include:

- Degree of hardness (soft-fresh, soft-ripened, semi-soft, firm, hard)
- Flavor (mild, medium, sharp)
- Milk type (cow, goat, sheep)
- Origin (country, region, state)

Categorizing cheeses by the degree of hardness is the most universal method, because they are grouped by common characteristics of handling, taste and use.

Styles for Displaying U.S. Cheese

The three most prevalent styles for displaying cheese include regimented, random or a combination of the two. Each has distinct advantages.

Regimented

The regimented case features cheese and other products displayed in neat rows and stacks. Customers find a regimented case easy to shop. Associates find it easy to fill, rotate stock, inventory and reorder product. The case requires continual maintenance to keep it well-stacked and orderly.

Random

The random case casually displays cheese in stacks, fanned out and in piles. This style brings customers to the case and works well in high-traffic stores and for promotions and large displays. When inventory runs low, spread the product out so cases appear full. Random case sets require careful management and constant inventory inspection.

Combination

A combination of regimented and random styles provides optimum flexibility. Most stores use this combination to merchandise high volume cheeses in large random displays and specialty cheeses in regimented rows and stacks.

Case Setting

1. Clean the case with hot, soapy water and rinse with a sanitizing solution.

2. Case liners prevent product from falling into fans and drains. They come in a variety of colors.

3. Ramps, pedestals and risers help landscape the case. If your case bottom is not adjustable, invest in a variety of risers.

4. Add your highest volume cheeses to the case first. Bulk pieces form a base, add atmosphere, serve as landmarks for the cut pieces and keep the case attractive even after it has been shopped.

5. Be consistent with the style you have chosen when adding cut pieces and containers of cheese.

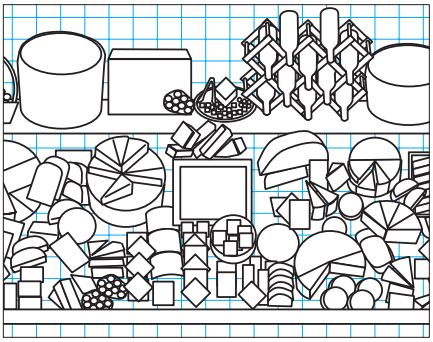
6. Alternate cheese faces to create contrast and color. Alternate heights to create peaks and valleys (put peaks towards the back of the case).

7. Cross-merchandise related items on the back counter to prompt impulse sales.

8. The final touch of greens and creative signage brings the case to life.

Case Planners

Once you have made adjustments, such as giving fast movers more room, and your case is set, you are ready to create a case planner, or plan-o-gram. Case planners help maintain the department or set up new stores.



Cross-Merchandising

Carrying non-food and other groceries in the cheese department increases sales of cheese and related items. Merchandise items that complement the cheeses you sell and the themes you implement – everything from serving plates to condiments.

It is not necessary to have a large quantity of any one item on display to enhance sales. But if you place cookies, berries and jam near the mascarpone and cream cheese, you will sell more of everything. Even if some items get credited to another department, sales are increasing.

The more cross-merchandising you do in proximity to the cheese case, the more product you will sell. Do not waste any space, including floor space.

Merchandise breads and crackers on knee knockers in front of self-service or coffin cases. Use the tops of cases and free-standing shelving units to extend themes and promotions.

This soft-ripened display combines cross-merchandising and added-value items for maximum profits.

Bring fresh fruit such as pears, and impulse items such as books and videos, into the cheese case to prompt sales.

Encourage cheese sales with displays in other departments. This display gives shoppers an idea for dinner tonight.

Signage

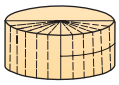
When you use signage, you employ one of the best workers you will ever hire. This silent salesperson stands ready at all times, personally greets every customer, never takes a break, works for free, and most importantly, motivates customers to buy. Be sure to include the following information when making signs.

- Cheese name
- Place of origin
- Description
- Pairings and serving suggestions
- Price
- Nutrition information

U.S. ASIAGO
Texture and flavor reminiscent of sharp cheddar and parmesan. Excellent table cheese; adds zest to salads, soups and pasta dishes.
$0.00/kilo

U.S. Asiago
Pronunciation:
Ah-see-ah-go
PLU#4413

- Hard, granular texture
- Clean, sharp flavor
- Clear wax = mild
- Brown wax = medium
- Black wax = aged



Front and back side of signs: Don't neglect the back of the sign that faces the employee. It is an effective place to put cutting diagrams, serving suggestions or the Price Look Up (PLU) number. Other information, such as pronunciation, helps employees talk intelligently to customers.

Chalkboards like this one can be changed easily to advertise your U.S. cheese specials.

A good sign attracts customers, so set the stage for your promotion and reinforce messages through powerful signage.

Hand-written signs enhance merchandising. This attractive sign provides useful information.

To design neat, orderly signs, use colorful markers on grid stock paper.

Whether you tell your customers why cheddar is orange, how to taste cheese properly or explain the differences among mild, medium and sharp cheddar, informational signs sell more cheese.

Maintaining the Case

Daily

- Face the case each morning – straighten all cheese displays, cheese and signs, turning all manufacturer labels face up and pulling out-of-date products and cheese with surface mold.
- Make a list of cheeses that need to be cut or restocked and fill in the empty spaces by spreading out the remaining cheese.
- Stock advertised cheeses in a variety of shapes and sizes.
- Clean windows and dust tops of the cases and counters as you work.
- Straighten all cross-merchandising displays and make a restocking list.
- Record shrink and out-of-date items.
- Organize your cutting list by degree of hardness, starting with the most perishable. Cut mold-ripened cheeses, such as brie and blue last, so you don't contaminate other cheeses.
- Be sure all close-dated items are out of the cooler and in your case.
- Make sure the sanitizing and cleaning solutions are fresh and the towels are clean.
- Clean and sanitize the slicing and wrapping stations.

Weekly

- Rotate stock as you receive it.
- Keep walk-in cooler product to a minimum. Keep as much cheese as possible in the display case.
- Clean coolers; sweep and mop floors.
- Evaluate ordering pars to keep inventory under control.
- Change display themes and promotions every 1 to 2 weeks.

Monthly

- Plan out next month's promotions or themed displays.
- Meet with other departments in your store to plan cross-merchandising.
- During inventory each month, make a list of projects that need to be completed by the next inventory. (In setting up store operations, always keep in mind your local health codes.)

Props

Don't forget these easy-to-find props when you're setting the case:

- Rustic containers are perfect for cut pieces.
- Wooden boxes and baskets add texture and character.
- Wooden cheese box lids serve as merchandising platforms or to mount signage.
- Fresh greens such as lemon leaves add a fresh look.
- Large pieces of cheese draw attention to the case.
- Bakery, produce and other grocery items are natural tie-in products.

Themes and Promotions

Contests and Demos

Effective merchandising means constantly creating activity and a sense of drama in the store. Influencing the customer's purchase decision comes next. Promotion remains an integral part of good merchandising. Promotion includes customer contests and in-store events. Use a theme, such as a holiday, graduation, a celebration of one variety of cheese ("Have a Blues Night!") or "U.S. Cheese of the Month." Seasonal themes such as fall, Lent or football season provide additional opportunities.

Set up contests to guess the weight of a large cheese or to guess how many kilograms of milk go into making 1 kg of cheese to attract shoppers to the cheese display. Prizes might include a wedge of cheese, a cheese grater or a gift certificate for a cheese tray.

Other events could include sampling a featured cheese, cooking demonstrations, cheese cutting and cheese carving. Emphasize good sanitation and good personal hygiene on the part of employees, especially during these events. Customers notice.

Creative Promotions

There are many opportunities to promote premium, versatile U.S. cheese, whether it is emphasizing the state-of-the-art quality, or the diversity inherent in producing over 400 varieties. Decorative themes can really encourage increased sales.

The best promotions get customers involved. Try in-store activities such as contests, sampling and cooking demonstrations or have customers register for prizes.

Summer's heat and activities increase shoppers' desire for cool, quick and easy meals. Be sure to have some ready to go.

Themed promotions add excitement to the cheese department. Set up a fondue party promotion, complete with cheese, bread and fondue pots.

"Salads with a Twist" will move cheese into the produce department.

Italian Theme

Italian is consistently the hottest food trend and cheese is a prominent ingredient in many Italian menu favorites – plus, it is a natural cuisine to feature and promote. Suggested cheeses to include: mozzarella, fresh mozzarella, asiago, ricotta, mascarpone, parmesan, pepato, romano – and don't forget the special shapes, sizes and varieties of provolone (salami and salamini, hand-formed pears, balls and bells, smoked, etc.). Have plenty of shredded and grated cheeses on hand for easy meal solutions. For maximum impact, design an integrated promotion that ties in other products such as pastas, tomatoes, olive oil, fresh garlic, eggplant, component packages and supply items such as cheese graters and strainers. Offer samples of the cheeses, product information, point-of-purchase materials and recipes or application ideas.

Given the opportunity, your staff will be able to deliver many themed promotions like this and will enjoy creating themes that will make your customers take notice.

An Italian display and promotion attracts attention any time. Italian is one of the top-selling cuisines around the world, and hand-formed cheeses hanging from the rack and a provolone leaning Tower of Pisa carving will charm customers.

Adding Value to Cheese

Adding value to cheese challenges sales associates, attracts customers and increases profits in any cheese department. It easily makes your store stand out from the competition as a destination location.

Busy summer schedules leave little time for cooking, and this case offers something to satisfy almost every appetite – pita sandwiches, burger fixings, salads, fruit and vegetable trays, sliced cheese and more.

Offer your customers a meal solution that is popular and one they can assemble at home – taco toppings. A variety of shredded and crumbled cheese encourages trial and repeat sales.

Home Meal Replacements

Today's retailers compete not only with each other but also with restaurants. Consumers want their food flavorful, fresh and fast. U.S. cheese meets those criteria and offers a way to add value to custom meals and take-out options in your home meal replacement (HMR) program. Research shows that over 95% of the cheese sold today is consumed as an ingredient or with another item. Therefore, meal replacements provide an outstanding opportunity to increase cheese sales and margins. Whether it is a complete meal or components for a recipe, your customers will remember your store as a valuable resource for meal solutions.

To encourage repeat sales, HMR items should identify the cheese along with the other ingredients. Labels that read "made with" and list the origin and brand or logo of the cheese add even more perceived value to your HMR program.

Offer ready-to-heat cheese bread, component pizza and salad kits, salads, and sandwiches.

Carving Cheese

Cheese carvings draw attention, especially carved in front of the customer. Carvings can be simple or elaborate. Anyone can create a two-dimensional (2-D) carving using a stencil and simple tools. These carvings make effective signs for prices and themes. Personalize party trays for your customers with carved logos and messages.

Three-dimensional (3-D) carvings especially grab customers' attention. If handled carefully, both the trimmings and the carving may be shredded for prepared dishes or cubed for sampling.

Use a stencil to make a relief wax carving.

Cheese carvings make your sampling program highly visible. This vertical cheddar tasting with informational signage creates an education station.

Gifts and Trays

Make your cheese department the year-round gift and entertaining center. A wide variety of cheeses add interest to party trays, individual gifts and gift baskets. Traditional holidays offer many opportunities, but don't forget that every day is a special day for someone – birthdays, graduations and anniversaries.

People entertain throughout the year, from small get-togethers to formal parties. Their busy schedules provide you the opportunity to sell added-value items and party trays. Brie tortes, brie en croute, a carved parmesan wedge filled with chunks, or mascarpone and fruit trays are just a few examples. Offer an assortment every week, especially towards the weekend.

Make a photo album of the added-value items you offer so customers can place advance orders for items you don't carry on a regular basis.

Your customers can use this "Blues Night" hostess gift anytime. It contains reusable items and the makings for a quick entrée or side dish.

This holiday case includes trays, small novelty gifts and ready-to-bake brie en croute (with baking instructions on the back label).

Floral bries are whimsical on a picnic and add an elegant touch to weddings or Mother's Day celebrations.

Service Selling

Staff Training

Training your staff to handle and sell cheese correctly remains one of the most important investments you can make toward a successful department. You can't run a profitable department without a staff that understands the basics of merchandising cheese, including sanitation and handling.

Training is key in educating your staff about the products you sell. Have them sample every cheese at least once, so they can describe the taste and other characteristics to your customers.

Steps for tasting cheese

Use these steps to educate staff and customers on how to taste cheese.

1. **Examine the appearance.** Look for even color and consistent texture characteristic.
2. **Smell the aroma.** To enhance the aroma, allow the cheese to reach room temperature. Rub a small piece between your fingertips until it is warm and soft, then smell the cheese.
3. **Taste the cheese.** Pay attention to the first flavor and, as you chew and swallow, savor the final flavor. Take a breathe in through the mouth and exhale through the nose so the scent can rise in the nasal passages.
4. **Evaluate the flavor.** Once the bite is finished, the flavor should "clean out" quickly, leaving no aftertaste – just a memory of the flavor.
5. **Put it into words.** You should be able to describe the taste and texture of the cheese. Or ask your customers to describe the flavors to help build their appreciation of cheese.

Customer Service

Offering quality customer service remains key, even in self-service departments. Customer service ranges from correct product handling to effective signage to added-value items. Other easy-to-implement services include resource centers where customers can locate additional information, a knowledgeable staff, and cheese sampling. Institute clear policies on special orders to assure customers their needs will be met.

Sampling improves sales. There are three types of sampling:

- Static (self-sampling)
- Interactive
- Demonstration

Sampling a new cheese takes some of the perceived risk out of the purchase decision. Don't forget to sample familiar cheeses, too. For example, offer a vertical tasting of cheddar (mild, medium and sharp) to remind customers of the differences and to suggest new uses or recipes.

Tips for Successful Sampling

Prepare associates to sample and sell. Explain and show them how you want them to interact with customers.

- Prepare actual questions and greetings:

  "How may I help you?"

  "Are you finding what you're looking for?"

  "Good morning, would you like to taste this monterey jack from the United States? It's soft and creamy with a touch of fresh herbs. We're featuring it this week for $0.00 a kilo. U.S. monterey jack is easy to serve and tastes delicious. We have recipes and serving suggestions."

- Be sure you train employees to ask for the sale:

  "Would you like a kilo or a half kilo today?"

- Allow employees to role play and practice with you. They must be prepared to make the customer feel comfortable with the purchase.
- Always be ready to sample; keep a cheese plane and unseasoned crackers handy.
- Hang a sign in the cheese department that says, "Please ask for a sample."
- Sample during peak traffic times.
- Wear gloves when offering samples. An apron also presents a clean image.
- Keep the surrounding area neat and clean.
- Sample 3 varieties of cheese at a time for small cheese departments and 6 for large operations.
- Signs should tell your customers which cheese variety they are sampling, special information such as country of origin, price and dates of the promotional period. Complete signage is especially important for self-sampling.
- For demonstrations, print information for the person doing the demo on the back of the sign.
- Sample bite-sized, 1 cm (1/2 in) cubes or wedges.
- Use salad greens, fruits, vegetables, paper doilies and paper grape leaves to decorate trays.
- Locate the sampling station near the product that is on sale.
- Provide trash containers for toothpicks and napkins.
- Neutral bread or crackers are best for sampling to enjoy the full flavor of the cheese.
- Place recipes, serving suggestions and coupons near samples.

6.3 MERCHANDISING U.S. CHEESE AT FOODSERVICE

Contributed by the
WISCONSIN MILK MARKETING BOARD, INC.,
Madison, WI

Adapted from the "Foodservice Merchandising Guide"

Make sure customers know your menu items are special and worth a higher price than "plain" dishes because of the quality ingredients you use – such as cheeses from the United States.

U.S. Cheese – An Important Sign of a Quality Menu

Effective merchandising means giving customers a sense of excitement with their meals, and the satisfaction of value for their money. Merchandising with cheeses from the United States is a natural way to provide great taste and performance from the more than 400 varieties, types and styles of cheese produced by U.S. manufacturers. Here are some ways that U.S. cheese can be an impactful merchandising tool.

Cheese is a natural partner to the foods customers want. Experts are urging consumers to add more breads, pastas, rices, vegetables and fruits to their diets. Cheese can add taste and value to these foods, and can be the vehicle that moves vegetables and grains to more profitable entrée status.

Cheese is a classic comfort food, and customers will pay a premium for a dish that has both comfort and creativity. For example, instead of "Classic Macaroni 'n' Cheese," merchandise your dish as "Our Own Three-Cheese Macaroni 'n' Cheese" made with U.S. aged cheddar, mozzarella and provolone." This treatment justifies a higher selling price that increases the profit margin.

Use cheese as a "spice" to add flavor excitement to dishes. With the vast selection of cheeses from the U.S., the "cheese as a spice" options are practically endless. A little of any one of the many intensely flavored cheeses available from the United States goes a long way. Add exciting flavor with feta, gorgonzola, asiago, parmesan, smoked gouda, aged provolone or aged cheddar. The extra charge on the menu for a dish featuring U.S. cheese can translate into extra margin.

Cheeses can be your best menu merchandising tools. They can create profitable new dishes, add value to existing ones, move side dishes to center of the plate and transform breads and vegetables into premium-priced specialty items.

Cheese on the Plate

Merchandising with U.S. Cheese to Build More Profits on the Plate

The most impactful image customers remember is the food presentation on their plates. People love food that looks good, and beautiful presentation is the key. U.S. cheese can be a most impressive tool in serving meals that look and taste great, while maintaining low food and labor costs. Use the hundreds of varieties of cheeses from the United States as effective, edible garnishes, or as enhancements or ingredients for entrées.

A sure way to increase menu sales is to combine cheese with the foods that consumers want more of these days—foods that taste good and offer healthful attributes: breads, rices, pastas and other grains, as well as fruits and vegetables. In fact, when paired with cheese, many foods often relegated to side dishes can be transformed into entrées. Pastas, rices, beans, dried peas, lentils, salad greens – all of these low-cost foods can become profitable center-of-the-plate items with the addition of cheese as a source of protein, flavor and appearance.

Patrons expect that beautifully presented foods will taste better, and therefore have a higher perceived value. Some operators charge a 20% or more price premium for dishes enhanced with cheese.

Build Profit with U.S. Cheese

Key Ingredient Costs of a U.S. Two-Cheese Burger*

Ingredient	Quantity	Total
Ground beef	1/2 lb	$0.36
Onion	1/2 tbsp	$0.02
Salt	1/8 tsp	$0.02
Pepper	1/16 tsp	$0.04
Alfalfa sprouts	1/2 cup	$0.26
Lettuce	1 leaf	$0.24
Hamburger buns	1 bun	$0.25
U.S. swiss cheese	2 slices (1 oz each)	$0.44
U.S. cheddar cheese	2 slices (1 oz each)	$0.32
Ingredient cost per serving:		**$1.95**

*Costs shown here are an average from a number of sources.

This burger can be menued for prices ranging from $4.95 to $6.95 or more, depending on the market. If menued at $6.95, the margin before accounting for labor costs would be $5.00 per serving.

Center of the Plate

Cheese is the perfect menu enhancement. It has an affinity to virtually all of the foods found at the center of the plate. Cheese adds flavor, texture, color and aroma. Here are some creative ways to incorporate U.S. cheeses into your menu to take it to a new dimension in flavor and perceived value.

Meats

- Make a bold flavor impression by cutting a pocket in beef tenderloin fillets and stuffing with gorgonzola or blue cheese before broiling. Another option is to top broiled fillets with crumbled cheese prior to serving.
- Italian chicken saltimbocca transforms ordinary poultry into an extraordinary menu star. Top breast halves with capicolla ham, provolone cheese, chopped tomato and Italian seasoning. Roll up; secure with toothpick. Dip in melted butter, then seasoned bread crumbs. Brown and bake.
- Lend authentic flavor to wildly popular chicken quesadillas or burritos with queso quesadilla cheese.
- Top sliced corned beef with a thick slab of gruyère cheese, then lightly broil.
- Knead shredded aged asiago cheese into pâte brisée dough. Use to top rustic chicken potpie.

Seafood

- Salmon will sell even better with a crunchy, tangy crust. Coat fillets with a mixture of Italian-seasoned dry bread crumbs, grated parmesan cheese, horseradish and a little olive oil.
- Elevate lobster or shrimp newburg to signature status by stirring shredded aged cheddar into the sauce.
- Add Mediterranean flair to your menu with Greek seafood bake. Combine primavera sauce with cooked shrimp, mussels and calamari, and crumbled feta cheese.

Pasta

- The ultimate comfort food, macaroni and cheese, goes upscale by topping unusual pasta shapes with aged cheddar sauce and buttered bread crumbs.
- Seafood lasagna is a delicious change of pace. Layer noodles with cooked, chopped crabmeat, shrimp, lobster, fresh fish fillets and a rich alfredo sauce laced with grated parmesan, romano and provolone.
- Delicate angel hair pasta pairs beautifully with cooked fresh spinach, prosciutto and shredded pepato cheese sauce.
- Greek pastitsio is a robust dish served in squares like lasagna. Layer cooked penne pasta with ground beef, egg custard sauce laced with nutmeg and cinnamon, and lots of freshly grated romano cheese. Bake until bubbly.

Hearty Soups and Main Dish Salads

- Contrast the kick of a chili with the smooth creaminess of monterey jack and colby cheeses.
- Offer patrons the grandfather of all chef salads. Top mixed baby greens with sections of grilled tuna, smoked meats freshly chopped vegetables, cubed fontina and crumbled Italian-style gorgonzola cheeses.
- For a change-of-pace luncheon salad, offer an array of tropical fruits with a special cheese flight. Include a mild cheese (brie), a medium (havarti), a sharp (aged provolone) and a piquant (blue).

Sides – Rice and Polenta

Rice paired with cheese offers countless creative opportunities, and combining polenta and U.S. cheese creates an appealing ethnic specialty item. Both are low-cost side items that can build sales and significant profit.

With Rice: Combine brown or white rice, short-, medium- or long-grained with many different varieties of cheese. Rice with cheddar and broccoli is a familiar dish. Add value to Mexican rice with authentic Mexican-type cheeses from the United States – queso blanco, queso fresco or asadero.

With Polenta: Combine polenta with many full-flavored cheeses. Sprinkle crumbled blue cheese and walnuts on a creamy polenta and serve as a profitable side dish.

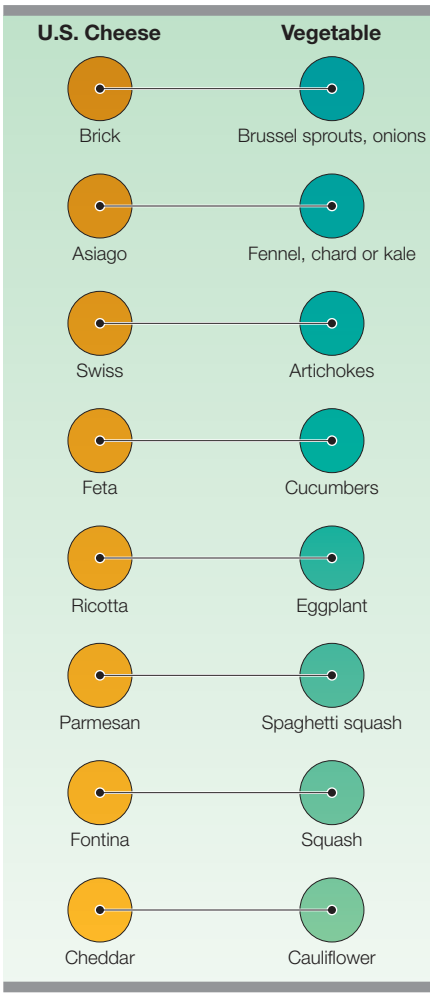
Sides – Vegetables and Potatoes

U.S. cheese combines beautifully with vegetables or potatoes, bringing welcome flavors to both. Cheese also adds appetizing color, and the word "U.S." brings added-value.

With Vegetables: Servers can grate U.S. cheese over vegetable dishes at the table. Skewer bite-size pieces of cheese and fresh vegetables – vegetable kabobs! Offer special cheese sauces over vegetables as an add-on.

With Potatoes: Blend grated romano into mashed potatoes, shredded gruyère into potatoes au gratin or shredded monterey jack and aged cheddar into scalloped potatoes. Top hash browns with a slice of fontina. Add blue cheese to potato salad.

Partnering Ideas



Breads – Cheese Breads

Creating these classic bread and cheese combinations can be as simple as adding grated or shredded cheese to bread dough as it is made, or sprinkling on the surface of "proof & bake" breads to upscale them to signature items. Top slices of baked bread with U.S. cheese or cheese blends and broil; merchandise as your own specialty cheese bread for an appealing, profitable appetizer.

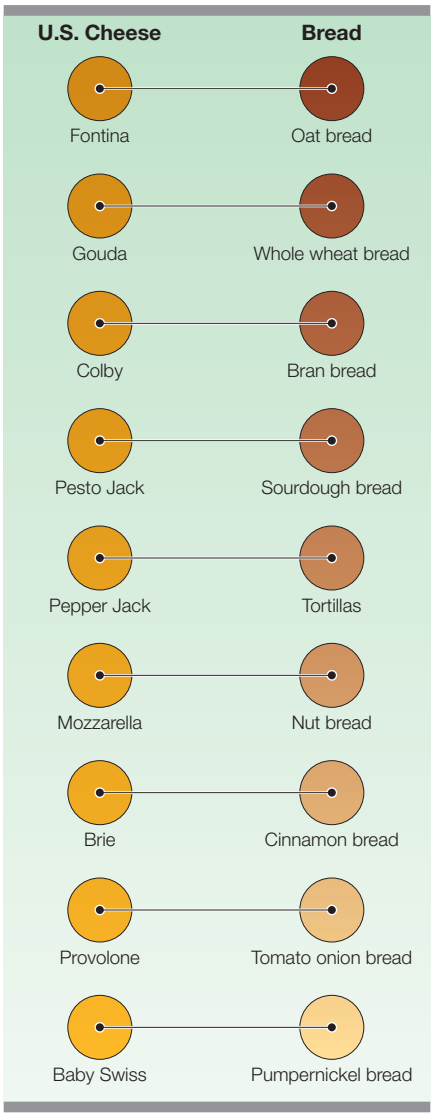
- Make pepato bread by grating pepato (romano studded with peppercorns) into white bread dough. Bake in traditional loaf shape or in a round shape.
- Make parmesan/gruyère bread by adding grated parmesan to a mixture of light rye bread dough. Sprinkle loaf with shredded gruyère.
- Make cheddar brioche by adding shredded aged or naturally smoked cheddar to brioche as it is made. Bake in a pound-cake pan.
- Make asiago lavosh by topping lavosh with grated asiago and sea salt before baking to add a piquant flavor note.

Breads – Crostini and Bruschetta

Crostini and bruschetta are traditional Italian favorites that can be highly profitable snacks, appetizers and side dishes, and are ideal for catering menus.

- Make crostini by blending gorgonzola with a little basil olive oil; spread over sliced, toasted bread; top with slivered almonds.
- Make bruschetta by mixing chopped sun-dried tomatoes and toasted pine nuts, minced onion, grated asiago and shredded provolone. Spread over slices of grilled bread.

Partnering Ideas



Carts, Food Bars & Buffets

Build Business with Added Profit Centers

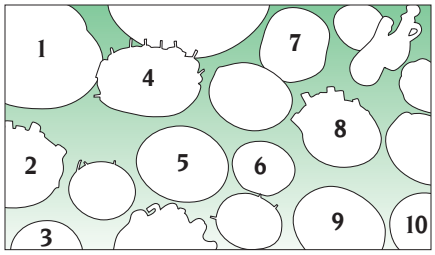
Successfully increasing sales and profits often depends on new sources of added revenue such as catering, special themed meals and carryout food. U.S. cheese can be your dependable partner for developing menus and merchandising programs that maximize the income from these added profit centers. Use the more than 400 varieties, types and styles of cheese from the United States to create value-added menus that increase customer counts and improve check averages. Food bars and carts are convenient and versatile ways to merchandise menu selections for catering, carryout sales and other profit centers. Buffets can be served from food bars and carts, or they can simply be presented on banquet tables. Add more interest to buffet presentations by displaying cheese carvings. At catered events, create a cheese carving or stencil of your customer's logo to personalize the buffet. Merchandise carryout items from a table or cart near the entrance with signs highlighting your specials and their prices. Explore new sources of revenue for your operation, and turn to cheeses from the United States for added flavor, value and memorable food displays and plate presentations. Here are some ideas for creative uses of U.S. cheese at added profit centers.

Soup and Salad Bar
Soup and salad bars are ideal for guests who like helping themselves to hearty soups and a wide selection of vegetables, breads and fruits. Natural cheese enhances the wholesome flavors of both soups and salads. Use grated and shredded cheese to accompany your soups. Offer cheese croutons as a soup topper. Cheese also makes a salad a meal, bringing it center of the plate for vegetarians and nonvegetarians alike. Let U.S. cheese bring eye appeal, flavor and nutritional value to your soup and salad bar.

Serving utensils that are too large lead to over portioning; those that are too small or hard to handle create a slowdown in the line. Provide proper utensils that are easy to use and deliver a reasonable portion of ingredients, including cheese.

Tongs: Cheese cubes, sticks, chunks
Ladle: Cheese dressings, sauces
Spoon: Cheese crumbles, dressings, shreds, grates

Train employees to keep a sharp eye on the food bar, cart or buffet table as customers help themselves. They should refill, refresh and replenish to preserve its fresh appearance.

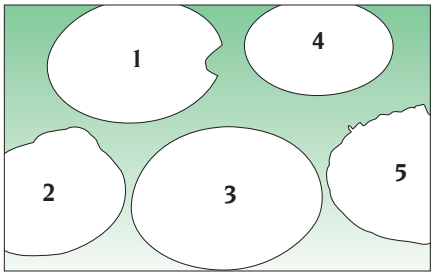


1. *Buttermilk blue cheese bowl with blue cheese crumbles*
2. *Baby swiss sticks*
3. *Quattro formaggi, shredded*
4. *Cheese and fruit kabobs*
5. *Pepper jack cubes*
6. *Feta with garlic & herbs, crumbled*
7. *Cheddar cubes*
8. *Dilled havarti sticks*
9. *Cotija, cubed and fried*
10. *Monterey jack and colby, shredded and blended*

Sandwich Bar
Sandwich bars are a great way to make a terrific selection of breads, meats and cheese available. The colors of the breads, meats and U.S. cheese, with vegetable accompaniments like lettuce, make a beautiful presentation. Slices of mozzarella and provolone or monterey jack are delicious possibilities. Crumbled blue cheese between meat slices is also a wonderful alternative. Invite your guests to be creative, to mix and match, to enjoy.

If customers don't know about your special services, such as catering, special buffets and carryout, they can not buy them. Here are some on-premise promotion ideas:

- Advertise on the menu – including the dining room menu or menuboard, catering menu and takeout menu.
- Instruct servers to promote them: "Have you heard about our Sunday brunch?" or "The parmesan bread you like so much is sold at the hostess stand."



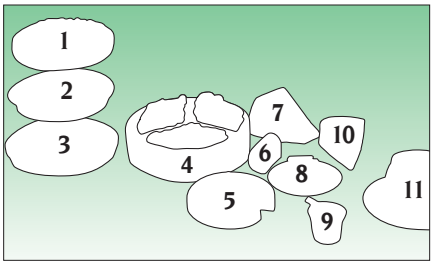
1. *Brie and roast beef*
2. *Italian-style gorgonzola and prosciutto*
3. *Feta with basil & sun-dried tomatoes on a pita pyramid*
4. *Monterey jack with pesto and gouda on focaccia*
5. *Cold-pack and veggie finger sandwiches*

Dessert Bar

A dessert buffet has high perceived value and will boost check averages while giving patrons a memorable finalé to meals. Be sure to offer a dessert bar on your catering menu; it can be a very profitable addition. Whether in your restaurant or at an off-site catering event, do not forget U.S. cheese!

Cheese adds taste and value to desserts and – as Europeans have known for centuries – cheese, by itself or with bread, fruit and wine, is an ideal finish to a meal.

Food bars and carts can enhance added profit centers such as catered events or themed meals because they provide the opportunity to create impactful, appealing displays and presentations that add value to the menu.



1. *Ricotta and cream cheese cheesecake topped with cherries*
2. *Apple pie with aged cheddar curls*
3. *Pear tart with blue cheese crumbles*
4. *Parmesan bowl with parmesan chunks, walnuts and dried apricots*
5. *Brie with strawberries*
6. *Gouda*
7. *Aged cheddar*
8. *Cheese course: gouda, aged cheddar and gorgonzola with apples*
9. *Mascarpone served in a dark and white chocolate cup with wafers*
10. *Gorgonzola*
11. *Tiramisu made with mascarpone*

Tips on Food Bars, Carts and Buffet Tables

For added profit opportunities in the restaurant and at catered events, food bars, carts and buffet tables can be impactful vehicles for delivering the menu variety customers appreciate. They are also an efficient way for your staff to handle group business, and they permit creative displays. Make your food bar ideas more impactful by merchandising with U.S. cheese.

Appetizer Bar
Serve cheeses paired with crudités, fruits and breads; serve specialty cheeses and cheese spreads on canapés and crackers. Use baby swiss, brie, edam and limburger from the United States. Merchandise cheese sticks and cubes in a cheese vessel. Offer kabobs made with cheeses paired with fruits or vegetables, and sausages or other meats. For example, use cheddar, monterey jack, swiss, provolone, muenster and gouda.

Breakfast Bar
A breakfast offering of crêpes filled with ricotta, brie salmon torte, or cheese scrambled eggs and omelets. Cheese makes breakfast bars and buffets remarkably appealing for very little more in cost. Offer a cheese bread or two, cheese muffins, breads and bagels with cheese toppings, or the ever popular fruits and cheese.

Pizza and Pasta Bar
Offer assorted U.S. cheese in vessels to top an array of hot and cold pasta dishes and specialty pizzas. Use hard-grating cheeses such as asiago, romano and pepato.

Taco Bar
Merchandise authentic Mexican-style cheeses made in the U.S., such as queso fresco, queso quesadilla and cotija, or zesty flavored varieties such as cheddar with salsa or monterey jack with jalapeño peppers.

Chili Bar
Offer a 4.5 kg (10 lb) cheddar print filled with shredded medium or aged cheese to garnish the chili. For a stretchy topping, offer shredded mozzarella.

Potato Bar
Partner with a variety of shredded and grated U.S. cheese. For example, use a medium cheddar, romano, blue and fontina.

Use Bars and Carts to Create Value-Added Sales Opportunities
Food bars and carts are great tools for increasing sales at varied profit centers.

- Special occasions, such as a Mother's Day brunch buffet or a themed dinner, call for festive displays of food and beverages. Food carts and bars provide flexibility and impact.
- Add value to off-premise catered events by using food bars and carts to serve wine or beer with cheese appetizers, or to offer signature dishes or courses.
- Use food bars and carts to prominently display profitable carryout foods, such as cheese breads, desserts, specialty cheese or other featured items.
- Merchandise wine-and-cheese pairings and beer-and-cheese pairings with displays and signage on food bars and carts.

U.S. *Cheese Vessels and Bowls: High Impact Merchandising Tools*

How to Carve Your Niche
Unique vessels and bowls carved from natural cheese will add sizzle and a signature note to your presentations, prompting extra sales opportunities. They can be created in diverse sizes, colors and shapes, and they are easy to carve.

Here are some U.S. cheese varieties that are especially good for use as vessels and bowls, and some basic carving tips.

1. Selecting the Cheese

- Consider the natural cheese flavor and appearance you want for your presentation. Cheese varieties listed here range in flavor, color and texture.
  - Asiago
  - Blue
  - Cheddar
  - Colby
  - Colby-jack
  - Edam
  - Gouda
  - Muenster
  - Parmesan
  - Pepato
  - Romano
- Wax coatings on some cheese varieties add color, protect the cheese and present an opportunity to stencil a logo or other design into the wax. Wax coatings can be clear, red, brown or black.

Leave the protective wrap on cheese, such as the foil wrap on blue cheese or the plastic film on a 4.5 kg (10 lb) cheddar print.

2. Carving Tips

- Carve in a cool area. When carving cheeses such as parmesan and romano, warm them slowly at room temperature for about an hour to help prevent chipping while carving.
- Sanitizing solutions should be used on tools and work surfaces between different cheese varieties to prevent cross-contamination. Cleaning solutions are intended for use on tools and direct contact with cheese surfaces.
- While carving you will be handling the cheese extensively, so it is important to wear disposable gloves.
- As you work, remove cheese trimmings frequently and store air-tight in a bag or bowl; use the trimmings in cooked dishes.

Many natural cheese varieties come in sizes and shapes that can be easily transformed into creative display, presentation and service vessels when carved out and filled with the cheese to serve to your guests. Cheese vessels and bowls are memorable merchandising tools that draw attention and spark impulse sales. They are ideal for tableside service, and add flair to cheese trays, buffets and food bars. When the name or logo of your restaurant or a valued customer is stenciled on the surface of the cheese bowl, this unique merchandiser can even make your restaurant a destination location. Best of all, they are easier to create than you would think. When compared to the entertainment these natural servers provide and the sales that follow, the time it takes an employee to produce a cheese vessel pays big dividends.

For more information on the tools and techniques of cheese carving, contact USDEC.

Cut a stencil of your logo or a simple seasonal decoration into the red wax.

CHEDDAR GEM

The colorful, red-waxed 1.3 kg (3 lb) U.S. cheddar wheel was easily carved into an attention-getting bowl, and simply filled with shredded cheddar. Properly rotated, covered and refrigerated, the vessel should last for up to two weeks.

Menu Applications

- Great for use at breakfast buffets, brunch and dinner.
- Have waitstaff serve tableside to transform a simple side salad into a specialty dish.
- Ideal for buffet and catering service.

MUENSTER LOAF

This eye-catching presentation is easy to create from a 2.2 kg (5 lb) U.S. muenster loaf. The cheese "sticks" are ideal appetizers or snacks. Serve with individual toothpicks or decorative cocktail spears.

Menu Applications

- Offer on your catering menu as a great hors d'oeuvre presentation at receptions and parties, and as a hearty snack for refreshment breaks at meetings.
- Promote with your soup and salad bars.

ASIAGO WEDGE

Asiago, a buttery, piquant cheese, adds a unique flavor dimension to both classic and trendy dishes. It also makes a superb cheese vessel. Instead of using an entire asiago wheel for a vessel, use a portion from the wheel. This wedge, cut from a 7.3 to 10 kg (16 to 22 lb) U.S. asiago wheel, is ideal for tableside service. The contrast of the black wax and creamy white interior of the cheese makes a dramatic impact.

Menu Applications

- Merchandise an asiago wedge as a value-added accompaniment to pasta dishes or pizza to boost the selling price and enhance your margin.
- Promote the asiago wedge with pasta dishes on your catering menu to improve the selling price and add a memorable flair to parties and banquets.

BLUE CHEESE WHEEL

This 2.7 kg (6 lb) wheel of U.S. blue cheese in its traditional foil wrap makes a memorable display and serving vessel for crumbled blue cheese. It is also ideal for blue cheese dressings or dips, although single-use service is recommended for these applications.

Menu Applications

- Merchandise for a single price with a salad of the day and serve tableside as a value-added extra.
- Offer as an added ingredient at the omelet station during brunch.
- Display near your entrance with a bottle of Port and glasses. Use signage to remind customers that this traditional dessert is available.

PARMESAN WHEEL

This uniquely carved server offers a three-way presentation of U.S. parmesan cheese – in grated, shredded and chunked forms. The natural wheel will keep heads turning in the dining room providing added attention to help promote sales of your featured and most profitable menu items.

Menu Applications

- Promote your special pastas, soups and salad dishes with the parmesan bowl to add drama and greater perceived value, which can lead to a higher selling price.
- Price your entrée salads to include the parmesan cheese vessel served tableside.

PEPATO BOWL

This vessel is carved from a 2.7 kg (6 lb) wheel of pepato – romano cheese studded with whole black peppercorns. The bowl will bring questions from guests who are not familiar with pepato, giving servers an opportunity to promote other dishes that feature this U.S. cheese variety.

Menu Applications

- Add value to pasta dishes by adding this assertive, peppery cheese; it will bring a higher selling price, ensuring a profitable dish.
- Sprinkle pepato on salads; its peppery flavor will eliminate the need for servers to bring a pepper mill to the table.
- Price your steamed vegetable plate to include the pepato vessel served tableside.

Grate any chunks of pepato left over from the vessel and add to bread dough for a peppery bread. Display the cheese bread with the pepato wheel with a sign telling customers they can buy the bread for enjoyment at home.

Be sure to have servers taste pepato, and educate them about the cheese so they can answer questions from curious guests who are not familiar with the variety.

EDAM OR GOUDA BOWL

Cheese vessels can also be used to merchandise dips and spreads. Dips and spreads are easy to prepare ahead of time and offer high customer appeal. This presentation adds drama and value to a simple edam and beer mixture festively served in a hollowed-out U.S. edam ball with cocktail rye bread. Make variations on this natural bowl by using gouda, cheddar or other semi-soft cheese varieties, and offer for self-service with any of your favorite cheese dip recipes.

Edam and Beer Spread

Yield: Filling for one bowl plus refill

2.7 kg (6 lb) U.S. edam or gouda (4.5 kg/10 lb wheel)
1 kg (2¼ lb) butter, cubed and at room temperature
1½ tbsp prepared mustard (hot)
½ cup onion, finely diced or shredded
2 bottles amber or dark beer at room temperature

To Make the Vessel

From a 4.5 kg (10 lb) wheel of cheese, leaving the wax on, cut out a circle on the top, leaving a 3.75 cm (1½ in) border around the outside. With a butter curler, remove the cheese from the center area of the wheel, creating a hollow space or vessel.

To Make the Filling

With a large-die grater, grate the cheese removed from the vessel. Place grated cheese in a large mixing bowl and add the butter, mustard and onion. Mix these together with the paddle on low speed. Add the beer and mix until it is incorporated. Place spread into the cheese vessel. Serve with cocktail rye and pumpernickel bread.

Menu Applications

- Use as a sandwich spread as you would use mayonnaise, butter or mustard.
- Promote on your catering menu for receptions and parties, and for refreshment breaks at meetings.

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7.1 OVERVIEW: CHEESE AS A SOURCE OF NUTRIENTS

Cheese is an important source of nutrients in the U.S. diet, providing significant amounts of high quality protein and minerals such as calcium. In addition, cheese confers several health benefits. Scientific evidence indicates that cheese helps to protect against dental caries and can be part of dietary patterns to reduce the risk of major chronic diseases such as osteoporosis, obesity, and coronary heart diseases. It is also well tolerated by individuals with lactose maldigestion. Cheese is made from milk, a food designed by nature for the exclusive purpose of delivering nutrition and health to mammals. Scientists have spent many years unlocking nature's secrets about milk and milk products. Some of the key findings related to the role of cheese in delivering nutrition and health are outlined in this section.

U.S. cheese is a concentrated source of milk's nutrients. A significant amount of milk's proteins, minerals (e.g., calcium, phosphorus, magnesium), fat, and fat-soluble vitamins are retained in the curd during cheese manufacturing, making cheese an excellent source of these nutrients. Because of it, cheese is considered a nutrient dense food providing a high concentration of nutrients relative to its calorie content. In 2000, cheese contributed only 3% of the calories available in the U.S. food supply. Yet, this food provided 8.5% of the protein, 25.5% of the calcium, 11% of the phosphorus, 7% of the vitamin A, 4.5% of the riboflavin, and 4.4% of the vitamin B_{12}, in addition to other essential nutrients.

Although most U.S. cheeses provide a significant amount of protein and calcium, the nutrient content of specific cheeses can vary as a result of the type of milk or milk products used and how the cheese is made (e.g., manner of coagulation, length of aging). See Table 1 (Comparative Nutritive Content Per Serving of Cheese and Cheese Products) for a listing of the typical nutrient contents of cheese varieties or refer to Figure 1 (Nutrition Facts Panel) of cheese product labels.

Figure 1. Nutrition Facts Panel

Nutrition Facts
Cheddar Cheese
Serving Size 1.5 oz (42g)

Amount Per Serving	
Calories 171	Calories from Fat 126
	% Daily Value*
Total Fat 14g	**22%**
Saturated Fat 9g	**45%**
Cholesterol 45mg	**15%**
Sodium 264mg	**11%**
Total Carbohydrate 1g	**0%**
Sugars 1g	
Protein 11g	**22%**
Vitamin A	9%
Calcium	31%
Iron	2%
Riboflavin	9%

Not a significant source of vitamin C, thiamin and niacin. Values are not available for fiber.

*Percent Daily Values are based on a 2,000 calorie diet

Specific Nutrients

Protein. Cheese is an important source of high quality protein in the U.S. diet. Protein is the major functional and structural component of all cells in the body. This nutrient functions as enzymes, membrane carriers, blood transport molecules and is a major component of muscles, blood cells, skin, hair, teeth, and bones. Because protein in cheese is a "complete" protein containing all of the essential amino acids proportional to the body's need, cheese can complement a diet based on grain products, which contain "incomplete" protein. Cheese is a good source of high quality protein, which is easily digestible.

Carbohydrate. Aged cheeses such as cheddar contain little or no lactose, the major carbohydrate in milk. In the cheese making process, lactose is removed in whey and/or converted to acids during the ripening of the cheese. The range of lactose in some cheeses such as process and cottage cheese is due to the addition of optional ingredients such as nonfat milk and cheese whey.

Fat. The fat, saturated fat, and cholesterol content of cheese vary, depending largely on the type of milk (e.g., whole, reduced-fat, nonfat) used to make cheese. A serving (42 g/1.5 oz) of cheddar cheese contains 14 g fat, 9 g saturated fat, and 45 mg cholesterol. In contrast, a serving (113 g/4 oz) of nonfat dry curd cottage cheese contains 0.5 g fat, 0.3 g saturated fat, and 8 mg cholesterol. In addition to lower fat cheeses such as cottage, ricotta, and part-skim mozzarella, manufacturers have developed a variety of cheeses reduced in fat. Cheeses labeled as low-fat must contain no more than 3 g fat per serving. A reduced-fat cheese must contain at least 25% less fat than its traditional counterpart. Fat-free or nonfat cheese must contain less than 0.5 g fat per serving.

Vitamins and Minerals. The vitamin content of cheese depends on the milk used and the manufacturing process. Because most of the fat in milk remains in the curd, cheese contains the fat-soluble vitamins (e.g., vitamin A) of the milk used in cheese making. Water-soluble vitamins – thiamin, riboflavin, niacin, vitamin B_6, vitamin B_{12}, folate – remain in the whey. Therefore, their content in cheese may be influenced by how much whey is retained in the cheese.

Most cheeses are a good, natural source of several minerals, particularly calcium. However, the calcium content of cheese varies according to how the cheese is manufactured. For example, cheeses such as cheddar, brick, and swiss are excellent sources of calcium, whereas cottage cheese contains less calcium (see Table 2. Typical Calcium Content and Calcium Density of Major U.S. Cheeses). In general, cheeses that are high in calcium contain other minerals such as phosphorus and magnesium in appreciable amounts.

Sodium. The sodium content of cheese varies. Cheeses such as swiss and cheddar generally contain less sodium than many process cheeses. For most healthy people, sodium intake is not a cause for concern. For individuals who wish to lower their sodium intake, a variety of cheeses reduced in sodium are available. Low-sodium cheeses are defined as those containing 140 mg or less sodium per serving; very low-sodium cheeses contain 35 mg or less sodium per serving; and sodium-free cheeses contain 5 mg or less sodium per serving.

Table 1. Comparative Nutritive Content Per Serving of Cheese and Cheese Products

Soft Cheeses, Fresh	Serving Size, g	Water, g	Food Energy, Kcal	Calories from Fat, Kcal	Protein, g	Total Fat, g	Total Carbohydrate, g	Calcium, mg	Iron, mg	Magnesium, mg
Cottage, Creamed, large or small curd	100	78.96	103	40.59	12.49	4.51	2.68	60	0.14	5
Cottage, lowfat, 1% milkfat	100	82.48	72	9.18	12.39	1.02	2.72	61	0.14	5
Cottage, nonfat, dry, large or small curd	100	79.77	85	3.78	17.27	0.42	1.85	32	0.23	4
Cream	100	53.75	349	313.83	7.55	34.87	2.66	80	1.20	6
Feta	100	55.22	264	191.52	14.21	21.28	4.09	493	0.65	19
Mozzarella, Part-Skim (PS)	100	53.78	254	143.28	24.26	15.92	2.77	782	0.22	23
Mozzarella, Whole Milk	100	50.01	300	201.15	22.17	22.35	2.19	505	0.44	20
Neufchâtel	100	62.21	260	210.87	9.96	23.43	2.94	75	0.28	8
Ricotta, Whole Milk	100	71.70	174	116.82	11.26	12.98	3.04	207	0.38	11
Soft Cheeses, Mold Ripened										
Camembert	100	51.80	300	218.34	19.80	24.26	0.46	388	0.33	20
Semi-Soft Cheeses										
Brick	100	41.11	371	267.12	23.24	29.68	2.79	674	0.43	24
Gouda	100	41.46	356	246.96	24.94	27.44	2.22	700	0.24	29
Monterey Jack	100	41.01	373	272.52	24.48	30.28	0.68	746	0.72	27
Muenster	100	41.77	368	270.36	23.41	30.04	1.12	717	0.41	27
Mozzarella, Whole, Low-Moisture	100	48.38	318	221.76	21.60	24.64	2.47	575	0.20	21
Mozzarella, Part-Skim, Low-Moisture	100	46.46	302	180.27	25.96	20.03	3.83	731	0.25	26
Provolone	100	40.95	351	239.58	25.58	26.62	2.14	756	0.52	28
Semi-Soft Cheeses, Mold Ripened										
Blue	100	42.41	353	258.66	21.40	28.74	2.34	528	0.31	23
Brie	100	48.42	334	249.12	20.75	27.68	0.45	184	0.50	20
Limburger	100	48.42	327	245.25	20.05	27.25	0.49	497	0.13	21
Hard Cheeses										
Cheddar	100	36.75	403	298.26	24.90	33.14	1.28	721	0.68	28
Colby	100	38.20	394	288.99	23.76	32.11	2.57	685	0.76	26
Gruyère	100	33.19	413	291.06	29.81	32.34	0.36	1011	0.17	36
Swiss	100	37.12	380	250.20	26.93	27.80	5.38	791	0.20	38
Hard Grating Cheeses (Also Known as Very Hard)										
Parmesan, Grated	100	20.84	431	257.49	38.46	28.61	4.06	1109	0.90	38
Romano, Grated	100	30.91	387	242.46	31.80	26.94	3.63	1064	0.77	41
Pasteurized Process Cheese and Related Products										
Pasteurized Process Cheese (American)	100	43.21	330	226.62	18.40	25.18	7.83	570	0.57	31
Pasteurized Process Cheese Food (Swiss)	100	43.67	323	217.26	21.92	24.14	4.50	723	0.60	28
Pasteurized Process Cheese Spread (American)	100	47.65	290	191.07	16.41	21.23	8.73	562	0.33	29
Cold-Pack Cheese										
Cold-Pack (American)	100	43.12	331	220.14	19.66	24.46	8.32	497	0.84	30

Notes: (a) The carbohydrate value is the difference between 100 and the sum of the percentage of water, protein, fat and ash.
(b) Lack of reliable data for a constituent believed to be present in a measurable amount.

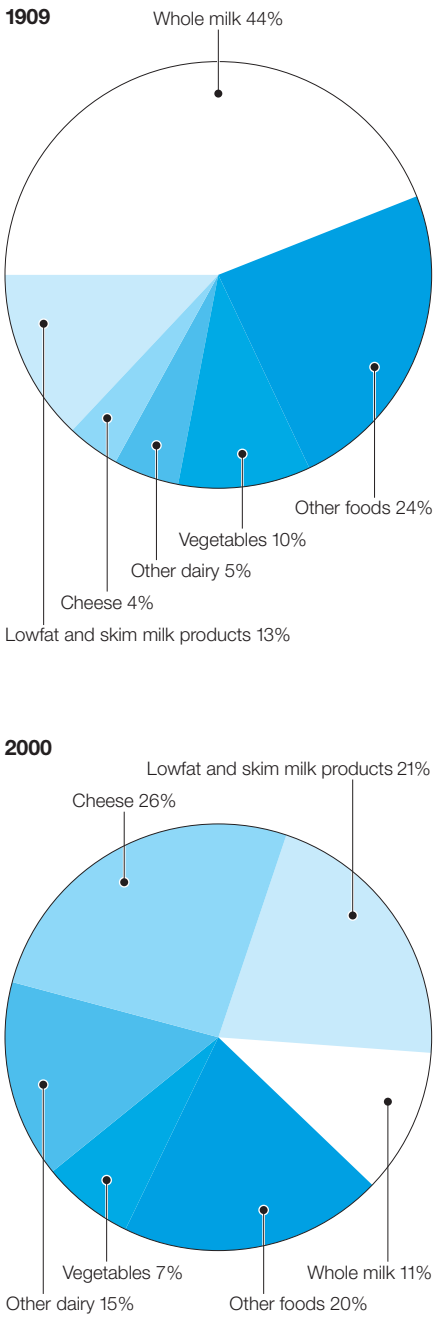
Source: USDA, ARS. 2005. USDA National Nutrient Database for Standard Reference, Rel. 18. Nutrient Data Laboratory Home Page, http://www.ars.usda.gov/ba/bhnrc/ndl

Phosphorus, mg	Sodium, mg	Zinc, mg	Thiamin, mg	Riboflavin, mg	Niacin, mg	Pantothenic Acid, mg	Vitamin B_6, mg	Folate, µg	Vitamin B_{12}, µg	Vitamin A, IU	
											Soft Cheeses, Fresh
132	405	0.37	0.021	0.163	0.126	0.213	0.067	12	0.62	163	Cottage, Creamed, large or small curd
134	406	0.38	0.021	0.165	0.128	0.215	0.068	12	0.63	41	Cottage, lowfat, 1% milkfat
104	13	0.47	0.025	0.142	0.155	0.163	0.082	15	0.83	30	Cottage, nonfat, dry, large or small curd
104	296	0.54	0.017	0.197	0.101	0.271	0.047	13	0.42	1346	Cream
337	1116	2.88	0.154	0.844	0.991	0.967	0.424	32	1.69	422	Feta
463	619	2.76	0.018	0.303	0.105	0.079	0.070	9	0.82	481	Mozzarella, Part-Skim (PS)
354	627	2.92	0.030	0.283	0.104	0.141	0.037	7	2.28	676	Mozzarella, Whole Milk
136	399	0.52	0.015	0.195	0.126	0.566	0.041	11	0.26	1134	Neufchâtel
158	84	1.16	0.013	0.195	0.104	0.213	0.043	12	0.34	445	Ricotta, Whole Milk
											Soft Cheeses, Mold Ripened
347	842	2.38	0.028	0.488	0.630	1.364	0.227	62	1.30	820	Camembert
											Semi-Soft Cheeses
451	560	2.60	0.014	0.351	0.118	0.288	0.065	20	1.26	1080	Brick
546	819	3.90	0.030	0.334	0.063	0.340	0.080	21	1.54	563	Gouda
444	536	3.00	0.015	0.390	0.093	0.210	0.079	18	0.83	769	Monterey Jack
468	628	2.81	0.013	0.320	0.103	0.190	0.056	12	1.47	1012	Muenster
412	415	2.46	0.016	0.270	0.094	0.071	0.062	8	0.73	745	Mozzarella, Whole, Low-Moisture
524	528	3.13	0.101	0.329	0.119	0.090	0.079	10	2.31	517	Mozzarella, Part-Skim, Low-Moisture
496	876	3.23	0.019	0.321	0.156	0.476	0.073	10	1.46	880	Provolone
											Semi-Soft Cheeses, Mold Ripened
387	1395	2.66	0.029	0.382	1.016	1.729	0.166	36	1.22	763	Blue
188	629	2.38	0.070	0.520	0.380	0.690	0.235	65	1.65	592	Brie
393	800	2.10	0.080	0.503	0.158	1.177	0.086	58	1.04	1155	Limburger
											Hard Cheeses
512	621	3.11	0.027	0.375	0.080	0.413	0.074	18	0.83	1002	Cheddar
457	604	3.07	0.015	0.375	0.093	0.210	0.079	18	0.83	994	Colby
605	336	3.90	0.060	0.279	0.106	0.562	0.081	10	1.60	948	Gruyère
567	192	4.36	0.063	0.296	0.092	0.429	0.083	6	3.34	830	Swiss
											Hard Grating Cheeses (Also Known as Very Hard)
729	1529	3.87	0.029	0.486	0.114	0.325	0.049	10	2.26	442	Parmesan, Grated
760	1200	2.58	0.037	0.370	0.077	0.424	0.085	7	1.12	415	Romano, Grated
											Pasteurized Process Cheese and Related Products
439	1265	3.19	0.068	0.517	0.170	0.974	0.073	7	1.26	761	Pasteurized Process Cheese (American)
526	1552	3.55	0.014	0.400	0.104	0.500	0.035	6	2.30	856	Pasteurized Process Cheese Food (Swiss)
712	1345	2.59	0.048	0.431	0.131	0.686	0.117	7	0.40	653	Pasteurized Process Cheese Spread (American)
											Cold-Pack Cheese
400	966	3.01	0.030	0.446	0.074	0.977	0.141	5	1.28	705	Cold-Pack (American)

7.2 CHEESE AS A CALCIUM SOURCE

Over the years, cheese has made an increasing contribution to Americans' calcium intake. In 2000, cheese provided 26% of the calcium available in the U.S. food supply, a six-fold increase from 4% in 1909 (Figure 2. Sources of Calcium in the U.S. Food Supply, 1909 and 2000). Most cheese varieties are good to excellent sources of calcium. Moreover, the calcium in cheese is readily available and well-absorbed. Calcium from other foods such as cereal grains and some vegetables such as spinach is not as readily absorbed.

Figure 2. Sources of Calcium in the U.S. Food Supply, 1909 and 2000



Source: Nutrient Content of the U.S. Food Supply, 1909 and 2000, Center for Nutrition Policy and Promotion, U.S. Department of Agriculture

Adequate calcium intake helps to build and maintain bones and is important for the development of teeth. Calcium also aids in the contraction and relaxation of muscles, coagulation of blood, transmission of nerve impulses, activation of enzymes, and stimulation of hormone secretions.

Americans' low calcium intake is recognized as a major public health problem. Overwhelming scientific evidence indicates that consuming adequate amounts of calcium-rich dairy foods including cheese may increase bone mass during the early years, help delay or minimize age-related bone loss, and decrease the risk of osteoporosis in later adult years. Osteoporosis is a disorder in which decreased bone mass weakens bones and leads to fractures. Adequate calcium intake, especially from dairy foods, may also help reduce the risk of hypertension, obesity, and perhaps colon cancer, among other disorders.

Dairy foods such as cheese are the best source of calcium because they contain large amounts of calcium along with other essential nutrients including protein, phosphorus, vitamin A, and magnesium, among others for optimal bone and overall health. Recognizing the unique nutrient package of dairy foods including cheese for strong bones, several government and health professional organizations recommend 3 servings of dairy foods (milk, cheese, or yogurt) a day.

The 2005 *Dietary Guidelines for Americans* and the U.S. Department of Agriculture's *MyPyramid* (**www.mypyramid.gov**) acknowledge the important role of dairy foods in the diet and recommend that Americans 9 years of age and older consume 3 servings a day of fat-free or low-fat milk or equivalent milk products as part of a healthful diet. Equivalent amounts for 1 cup (8 oz or 250 ml) of milk are 1.5 oz (42 g) of natural cheese or 2 oz (48 g) of process cheese, or 6 oz (170 g) of yogurt. In a consensus report, the National Medical Association, the nation's oldest and largest organization representing African American physicians, recommends that the American public, in general, and African Americans, in particular, consume 3 to 4 servings of low-fat milk, cheese, and/or yogurt a day to help reduce the risk of nutrient-related chronic diseases, including osteoporosis. The American Academy of Pediatrics, in a report on optimizing bone health and calcium intake of infants, children, and adolescents, recommends three 8-oz glasses of milk a day or the equivalent (i.e., cheese, yogurt) for children 4 to 8 years of age, and four 8- to 10-oz glasses of milk or the equivalent for adolescents.

The U.S. dairy industry, with leading health professional organizations, has launched a campaign called 3-A-Day™ of Dairy (**www.3aday.org**) as a call to action to establish positive eating behaviors including 3 daily servings of calcium-rich milk, cheese, or yogurt. This health and wellness campaign is supported by the following health professional organizations: the American Academy of Family Physicians, the American Academy of Pediatrics, the American Dietetic Association, and the National Medical Association.

Table 2 compares the calcium nutritional density (mg of calcium/100 Kcal) of several U.S. cheeses.

Table 2. Typical Calcium Content and Calcium Density of Major U.S. Cheeses

U.S. Cheese Name	Calcium (mg/100 g)	Calcium Density (mg/100 Kcal)
Cream Cheese	80	23
Brie	184	55
Cottage, creamed	60	58
Pasteurized process cheese	574	175
Blue cheese	528	150
Colby	685	174
Cheddar	721	179
Brick	674	182
Monterey Jack	746	200
Swiss	791	208
Provolone	456	215
Mozzarella, low-moisture, part-skim	731	242
Parmesan, grated	1,109	257

Note: This information is provided for general information only. Content varies within a range for each cheese type.
Source: USDA Nutrient Database for Standard Reference, Release 18, 2005.

7.3 DENTAL HEALTH

Several varieties of cheese – aged cheddar, swiss, brick, blue, edam, monterey jack, mozzarella, brie, gouda, and American process cheese – have been shown to reduce the risk of dental caries (cavities). Consumption of cheese may protect against root caries, a common form of dental caries in older adults. Consuming cheese immediately after meals or as a between-meal snack may be a practical way to help reduce tooth decay.

Dental caries result from the breakdown of tooth enamel (i.e., demineralization) by acid-forming dental plaque bacteria that ferment dietary sugars and starches. The acids decrease the pH at the surface of the tooth and dissolve calcium and phosphorus in the tooth enamel. If this process of demineralization (i.e., release of calcium and phosphorus in the tooth enamel) occurs at a faster rate than remineralization (i.e., replacement of calcium and phosphate), the teeth eventually form cavities. Findings from a variety of different types of studies demonstrate that cheese not only prevents acid demineralization of tooth enamel, but it also promotes remineralization of caries lesions.

Researchers have suggested several possible mechanisms to explain cheese's protective effect against tooth decay. For example, consuming cheese may stimulate the flow of saliva, which has caries reducing properties. Cheese's protein, calcium, and phosphate, by neutralizing acids and remineralizing enamel, may contribute to this food's protective effect against tooth decay.

7.4 WEIGHT MANAGEMENT

The key to weight management is to balance total calorie intake with physical activity. A wide variety of cheeses of varied calorie and fat content are available to meet different calorie targets. For individuals on a reduced-calorie diet, naturally low-fat cheeses including part-skim mozzarella, ricotta, and nonfat dry curd cottage cheese can be selected. Also, in recent years, cheese makers have produced lower fat cheeses that are reduced in calories yet have flavors and textures similar to other varieties traditionally higher in fat. Individuals can include full-fat cheeses in moderation in calorie-reduced diets by making dietary tradeoffs, for example, by balancing higher calorie foods with lower calorie foods.

Calories are not the only consideration in achieving a healthy weight. Because of cheese's nutrient density and, in particular, its high protein and calcium content, it is important to include this food in a weight control diet. Consuming calcium-rich dairy foods is emerging as an eating behavior that may play a beneficial role in controlling body weight and/or body fat. Increasing calcium, and particularly dairy products, including cheese, has been shown to help obese adults lose body weight and/or body fat when consumed as part of a reduced-calorie diet. Clinical trials have found that obese adults who consumed 3 to 4 servings of milk, cheese, or yogurt while on a reduced-calorie diet lost significantly more weight and body fat than those who consumed the same amount of calcium through supplements or who consumed one or fewer servings of milk, cheese, or yogurt a day. Epidemiological studies have shown that children who habitually consume an adequate intake of calcium or dairy products, including cheese, have lower body fat than those who consume a low intake of dairy foods.

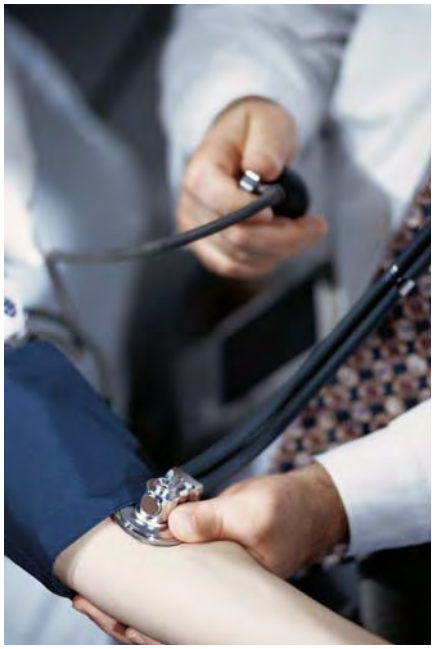
7.5 CARDIOVASCULAR HEALTH

Because current dietary advice recommends limiting fat, particularly saturated fat, and cholesterol to reduce the risk of heart disease, consumers are often advised to limit their intake of cheese or to consume lower fat cheeses. Yet, there is no scientific evidence that intake of a single food such as cheese in moderation increases the risk of heart disease.

Cheese in moderation can be included in heart healthy diets. The American Heart Association recommends that Americans 2 years of age and older aim for a diet containing no more than 30% of total calories from fat, less than 7% of calories from saturated fat, and less than 300 mg cholesterol a day. This means that for a 2,000 kcal diet, no more than 65 g of total fat and no more than 20 g of saturated fat should be consumed. Many full-fat cheeses contain, on average, about 8 g total fat and 5 g saturated fat per ounce – amounts far below recommended upper intake recommendations. Likewise, full-fat cheeses contain about 15 to 30 mg cholesterol per ounce, which is far below the upper limit of 300 mg cholesterol per day.

Many cheeses are an excellent, natural source of calcium, which may protect against heart disease by lowering the risk of hypertension and obesity, which are risk factors for heart disease, or through beneficial effects on blood lipids. Also, cheese is a major source of conjugated linoleic acid (CLA), a milkfat component which has been shown in various studies, particularly experimental animal and *in vitro* investigations, to reduce atherosclerosis, as well as cancer, inflammation, body fat gain, and hypertension, among other disorders. For individuals who wish to reduce their intake of fat or saturated fat, many reduced-fat varieties of cheese are available which provide the same amount of calcium as their full-fat counterparts. Consumers can use the Nutrition Facts Panel (Figure 1) to help choose cheeses lower in fat, saturated fat, and cholesterol.

Two major studies show that cheese in moderation can be included in dietary patterns that help reduce the risk of heart disease. Intake of the DASH (Dietary Approaches to Stop Hypertension) diet, which includes 3 servings a day of dairy foods (e.g., regular and low-fat cheeses, low-fat and fat-free milk and yogurt) and 8 to 10 servings a day of fruits and vegetables, has been shown to reduce the risk of hypertension. This diet also reduces other heart disease risk factors, specifically blood levels of total and low density lipoprotein (LDL) cholesterol and homocysteine. In the CARDIA (Coronary Artery Risk Development in Young Adults) study, which followed more than 3,000 young adults for 10 years, overweight participants who consumed the most dairy products, including cheese, were at lower risk of developing insulin resistance syndrome, a risk factor for type 2 diabetes and heart disease, than those who consumed the fewest dairy products.



7.6 GASTROINTESTINAL HEALTH

Many cheeses, particularly aged cheeses such as cheddar and swiss, contain little or no lactose, the principle carbohydrate in milk. For this reason, cheese is an important source of calcium and many other nutrients found in milk for lactose maldigesters or persons who have difficulty digesting lactose or milk's sugar. Lactose maldigesters may have difficulty digesting lactose due to a deficiency of the enzyme, lactase, which is necessary to breakdown lactose. Lactose intolerance is the occurrence of gastrointestinal symptoms such as bloating and diarrhea resulting from the incomplete digestion of lactose. Studies demonstrate that lactose maldigesters can consume cheese without developing symptoms of intolerance. In fact, because cheeses, particularly hard cheeses, are high in calcium yet naturally low in lactose, the American Academy of Pediatrics (AAP) recommends their inclusion in the diet of children with lactose intolerance.

Although some consumers believe that certain foods including cheese cause constipation, there is no scientific evidence to support this belief. To prevent and treat constipation, individuals should increase their intake of fiber from fruits,vegetables and whole grains, drink plenty of fluids, and exercise regularly.

7.7 CHILD NUTRITION

Cheese is a nutrient dense food available in many varieties and convenient on-the-go forms (e.g., slices, sticks, shreds, cubes) to meet children's nutritional needs, tastes, and lifestyles. Consuming cheese in moderation with meals or as snacks has several health benefits for children. Cheese provides energy and nutrients needed for growth and development, supports bone health, protects children's teeth from dental caries, and possibly lowers body fat.

Cheese is an important source of nutrients such as calcium, protein, phosphorus, magnesium, and vitamin A needed for bone health. Calcium is the most important nutrient to maximize peak bone mass, which may help reduce the risk of osteoporosis in later adult years. Unfortunately, a large majority of children and adolescents consume low intakes of dietary calcium. Nearly 9 out of 10 teenage girls and 7 out of 10 teenage boys in the U.S. do not meet dietary calcium intake recommendations. Adolescents' low calcium intake is of particular concern as it coincides with a period of rapid skeletal growth – the "window of opportunity" to optimize peak bone mass and protect against future risk of osteoporosis. Osteoporosis is often thought of as an older person's disease, yet its roots lie in childhood.

The AAP, recognizing the importance of adequate calcium intake to promote bone health in growing children, encourages intake of 3 servings a day of calcium-rich dairy foods including cheese for children and 4 servings a day for adolescents. The AAP identifies dairy foods such as milk, cheese, and yogurt as the preferred source of calcium because of their high content of calcium and because these foods also provide other essential nutrients.

Consuming cheese may help protect children against dental caries. Several varieties of cheese, including aged cheddar, swiss, blue, monterey jack, gouda, mozzarella, and process American cheese have been shown under experimental conditions to reduce the risk of tooth decay. The American Academy of Pediatric Dentists recommends that children be served nutritious snacks, including cheese and other foods (e.g., vegetables, yogurt, chocolate milk), that protect teeth and contribute to overall nutrition and health.

Overweight among children is a major public health concern. According to 2003-2004 data, more than 17% of American children and adolescents aged 2 to 19 years are overweight. The 2001 U.S. Surgeon General's *Call to Action to Prevent and Decrease Overweight and Obesity* reported nearly twice as many overweight children and almost three times as many overweight adolescents as in 1980. Emerging scientific research in children demonstrates that an adequate intake of dietary calcium and dairy products including cheese is linked to lower body fat. Restricting cheese intake in an effort to control children's weight may therefore be counterproductive, as well as contribute to other health problems such as poor bone health.

Recognizing that schools are an important setting to help decrease overweight among children and improve children's eating habits, the U.S. Surgeon General calls for increasing the availability of healthful snacks throughout the total school environment (e.g., vending machines, school stores). Cheese is a healthful snack for children and is available in many varieties in a range of calorie and fat levels.

Children learn by example. Parents, by consuming cheese and providing children with meals and snacks consisting of calcium-rich foods such as cheese, can help ensure that their children are getting enough calcium in their diets for bone and overall health.

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8.1 FLAVOR DESCRIPTORS AND FLAVOR GUIDE

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A *Language for Cheese Flavor*

Like fine wine, cheeses tantalize every aspect of the palate. Today's diners can find them served as a cheese course or part of the regular menu, and in a wider variety of dishes from appetizers to desserts. Whether offered as an opening to a five-course meal or the foundation for a sauce for a frozen pasta dish, U.S. cheeses can take the bland and make it extraordinary.

U.S. cheese makers turn pasteurized milk into some of the finest cheeses by culturing the milk, separating curds from whey, cutting, cooking and salting, and, finally, aging the product. Within the world of cheeses, there exist a myriad of flavors, and flavor profiles depend upon the fine differences that exist during processing and aging.

The amount of ripening and the culture used affect the cheese's flavor. Fresh cheeses, such as cream cheese, are ripened just briefly or not at all, while cheddar or manchego are ripened, pressed cheeses. Brie and blue cheese are ripened, pressed cheeses, which may be quick- or slow-ripened. Other ripened, heavily pressed cheeses, such as gouda, gruyère and parmesan-style hard, grating cheese, are cooked. Ripening the cheese for months or years at a time, usually intensifies and modifies the flavor.

Cheeses can also be macerated in wine, brandy, beer or other beverages, or rubbed with a variety of herbs, spices, chilies and juices to enhance or impart unique flavors. Process cheeses are manufactured by melting natural cheeses, adding salts and other dairy ingredients and flavorings. The selection of ingredients can result in very mild cheeses (made with young cheddar for example) to spicy nacho-style cheeses.

Cheese rinds also play a key role in cheese development. The rind slows down drying and regulates the release of gases that occurs with aging. Some rinds are more edible than others, and often times the rind has a stronger aroma than the cheese itself. In the United States, many types of cheeses can be manufactured and immediately wrapped, resulting in rindless products. This ensures a greater uniformity of flavor development and reduces waste.

Understanding and defining customers' expectations of flavor is necessary to deliver cheese flavor. For industrial users, understanding the linkage of specific flavors to volatile flavor compounds is required, and the development of a sensory language is helpful to achieving this goal. Methods to define and describe flavor are crucial for precise communication in both research and marketing. A flavor lexicon is simply a set of words, or language that can be used universally, and it is an important tool for international trade.

What is the cheese lexicon? It is a sensory language with universal intensities and references. Specific flavors are identified and then quantified using a 10-point scale. The language has been successfully applied to cheddar, American cheeses such as colby, monterey jack, cottage cheese and process cheese, Italian and Dutch cheeses. Because the language uses a universal scale (similar to using a common alphabet), multiple products can be directly compared and results from sensory panels, obtained at different times and locations, can be compared objectively. The lexicon uses both qualitative and quantitative measures. In other words, it can tell what flavors are present and at what level or intensity. The intensities are anchored with solutions for the basic tastes (sweet, sour, bitter, salty, umami).

The lexicon is an analytical tool scientists and cheese makers can use. It can be used for a variety of research applications. It has been used to document specific flavor differences between different cheddar, swiss and Italian cheeses, to understand flavor changes during aging, and to identify sources of particular flavors (and off-flavors) in products. It is an important tool for cheese makers for quality assurance purposes; however the language is also extremely useful in conjunction with consumer testing to clarify specific consumer likes and dislikes. It can be used, for example, by marketing to identify niche markets and optimize customer acceptance. For example, studies using the cheese lexicon have helped identify 6 distinct market segments for cheddar cheese consumers. Each segment or consumer group was found to have distinct preferences and expectations for cheddar cheese flavor. Using the cheese lexicon can help retailers and chefs select the products that their target consumers will prefer, and help them educate such consumers – the same way consumers can learn to recognize, anticipate and appreciate differences in wines.

Texture is an important criterion that is often associated with flavor when describing cheese. It directly relates to the cheese's moisture content. The more water the cheese contains, the softer it is, though this varies slightly depending on how the cheese is made. Very soft, spreadable cheese may contain 80% water, whereas soft cheeses are made up of 50 to 70% water. Semi-hard cheeses may have a more rubbery texture and contain 40 to 50% water. Semi-hard blue contains the same water weight as a conventional semi-hard cheese, but has a crumbly texture. Hard cheeses tend to be firm and dense, containing 30 to 50% water. Some of these cheeses are so hard, they can only be consumed grated or melted.

Four categories are used to describe cheese. Though similar to terms used for wine and other foods, some are unique to cheese. Flavor, appearance, texture and aroma define and differentiate cheese types.

Flavor descriptors (see Table 1. Excepts from "Cheese Flavor Language") include cooked/milky, whey, diacetyl, fruity, nutty, brothy, sweet, bitter, etc. Even though some of these terms may not sound appealing to the consumer, the presence of such flavors, in small amount, may be the very essence of a unique cheese – the same way, a small amount of musk creates the very unique appeal of a designer perfume.

Textures include soft, hard, runny, crumbly and creamy; the ability of a cheese to melt under different conditions, described elsewhere in this manual, is also important to the chef and foodservice operator.

Aromas, which are more noticeable when cheeses are melted or warm, often are noted as musty, nutty, smoky, pungent and sour. Again, the use of the common descriptor language is useful in international trade to help select the U.S. cheese that will optimize consumer satisfaction in each market and segment.

Appearance includes visible attributes of the cheese such as color, color intensity, color uniformity, presence and uniformity of holes (e.g., swiss cheese), and presence and uniformity of veining (e.g., mold ripened cheeses). These attributes play a large role in consumer purchase decisions and subsequent acceptance, but they can also be used to evaluate and compare the quality of cheeses. For instance, a uniform color with no mottling is an indicator of quality with cheeses that have coloring added such as cheddar.

The United States has witnessed an emergence of artisan cheeses. Many European cheese types now are made in the United States, primarily because European cheese artisans immigrated across the Atlantic. These cheeses feature a large array of quality and standards of identity, but still retain regional differences. For example, cheddar from Vermont is white, while Wisconsin cheddar is traditionally orange. And, because cheese makers may use different cultures and aging procedures, a wide variety of very fine products are available from different regions of the United States.

Because of their prominence in Italian cooking, numerous Italian cheeses are popular in the United States, including mozzarella, provolone, ricotta, parmesan-style grating cheeses, fontina and blue cheeses. Other Italian-style cheeses are bel paese and pecorino. A number of companies with European heritage are offering U.S.-made bries, goudas or manchego, which have been judged in international contests as superior or equal on the basis of their flavor.

Mexican-style cheeses are becoming more prevalent and are now manufactured in the United States. Queso fresco, which does not melt and is crumbled on salad or any ambient application; queso blanco, a semi-soft, good-melting cheese used for quesadillas; cotija (salty, hard); oaxaca (fresh like mozzarella); and enchilado (a salty, cow's milk cheese coated with chilies or paprika) are just a few examples of popular U.S. cheeses with a "south of the border" appeal and flavor.

Cream cheese, an American Original, is known for its bland flavor. For this reason it is equally compatible in sweet (cheesecake, bakery fillings) and savory (pasta fillings, spreads) dishes and applications. It also serves as a base, to which small amounts of more pungent (blue, parmesan) cheeses can be added to the intensity level that consumers in different countries will appreciate. In some countries, cream cheese is a flavoring for candy and ice cream. Other mild cheeses, such as part-skim mozzarella or monterey jack, will deliver just the right intensity flavor consumers seek in prepared dishes such as pizza, gratins or enchiladas while providing a rich, delicious mouthfeel.

U.S. cheese makers are proud to offer an ever-widening variety of cheeses that meet the needs of a wide consumer base worldwide, from the most sophisticated cheese lovers to those who are just discovering the product and developing an appreciation for it. The U.S. Dairy Export Council (USDEC) and its member companies hold a variety of seminars and tasting events designed to help buyers and consumers understand cheese flavor. They also help the trade and manufacturers around the world use the latest science to maximize consumer satisfaction in their own markets, and promote their own image or business.

Table 1. Excerpts from "Cheese Flavor Language"
(please refer to complete document referenced for further information)

Flavor	Definition	Cheeses to look for:
Cooked/milky	Aromatics associated with cooked milk.	Muenster, Cream Cheese, Cottage Cheese, Mild Cheddar, Process Cheese
Whey	Aromatics associated with cheese whey.	Colby, Monterey Jack
Diacetyl	Aromatic associated with diacetyl. Think butter flavoring.	Colby Jack, Baby Swiss, Cream Cheese
Milkfat	Aromatics associated with milkfat. Key aromatic in fresh cream and in fresh coconut.	Whole Milk Mozzarella, Whole Milk Cottage Cheese, Cream Cheese
Fruity	Aromatics associated with different fruits: most commonly pineapple, apple, pear and berry.	Parmesan, Asiago, Aged Gouda
Nutty	The nut-like aromatic associated with different nuts.	Parmesan, Aged Gouda, Aged Cheddar, Aged Swiss
Free fatty acid	Aromatics associated with short-chain fatty acids.	Feta, Aged Provolone, Brick, Smear-Ripened Cheeses
Rosy/floral	Aroma associated with roses and other floral notes.	Aged Cheddar, Brie, Camembert
Caramelized/burnt sugar	Sweet aromatics associated with burnt or caramelized sugars.	Aged Gouda
Bell pepper/earthy	Earthy aroma associated with freshly cut bell pepper.	Farmstead Cheddar
Sweet	Fundamental taste sensation elicited by sugars.	Parmesan, Aged Gouda, Blue-Veined Cheeses, Swiss
Salty	Fundamental taste sensation elicited by salts.	Aged Gouda
Umami	Chemical feeling factor elicited by certain peptides and nucleotides.	Aged Cheddar, Swiss

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8.2 SHELF LIFE GUIDE

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From the beginning, cheese has been a means to extend the shelf life of nutritious milk components from the relatively few days of fluid milk to weeks, months and even years for various cheese varieties.

Cheeses vary widely in their methods of manufacture and their composition, and subsequently the shelf life of different cheeses has a broad range. For example, the shelf life of many fresh cheeses like cottage cheese can be measured in days or at best, a week or two while the shelf life of hard cheeses like parmesan may be measured in years.

The shelf life of a cheese variety is a function of three main factors: the inherent nature of the cheese variety itself and the hygienic conditions under which it was manufactured; the conditions the cheese was exposed to during packaging, aging, storage and distribution; and the handling of the cheese at the foodservice, retail or consumer level.

Cheese Variety and Manufacturing Conditions

Cheese varieties typically have a maximum lifespan that is dictated by their composition. The most important compositional factor is the moisture content of the cheese. A good rule of thumb is the higher the moisture content of a cheese, the softer the cheese will be and the shorter shelf life the cheese will have. The reason for this is that higher moisture content allow enzymes in the cheese, which are present naturally in the milk as well as in the added rennet and starter culture, to breakdown the protein structure of the cheese; thus it softens the product and, after a certain point, results in undesirable flavors.

Cheese Shelf Life

◀◀◀ Days/Weeks			Months/Years ▶▶▶	
Soft-Fresh Cheeses	**Soft-Ripened Cheeses**	**Semi-Soft Cheeses**	**Semi-Hard Cheeses**	**Hard Cheeses**
• Cream Cheese	• Brie	• Monterey Jack	• Cheddar	• Romano
• Neufchâtel	• Camembert	• Brick	• Colby	• Parmesan
• Flavored Cream Cheese	• Blue Cheese	• Havarti	• Edam	• Asiago
• Cottage Cheese	• Gorgonzola	• Limburger	• Gouda	
• Ricotta		• Muenster	• Swiss	
• Feta		• Fontina	• Baby Swiss	
• Mascarpone		• Mozzarella	• Gruyère	
• Provolone				

Other compositional factors which affect shelf life include salt, acidity, and culture selection. Salt acts as a preservative and increases shelf life. Lactic acid from the culture also acts as a preservative; however, excessive acid production can breakdown the protein structure of the cheese and shorten shelf life. Different cultures have different abilities to produce enzymes that breakdown the cheese.

Lastly, the more hygienic the conditions under which the milk is produced and the cheese manufactured, the longer the shelf life of the cheese. Because of this, cheeses manufactured in the United States may have a longer shelf life than cheeses manufactured in less developed countries. Certain bacterial contaminants inadvertently introduced during milk production and cheese manufacturing can dramatically reduce the shelf life and quality of the cheese.

Process cheeses typically have a very long shelf life, months or years, due to the method by which they are made. Typically, process cheeses are made by mixing together blends of natural cheeses along with emulsifying salts and other ingredients and heating the mixture to high temperatures. The combination of heat, salts and acids protect these cheeses from breakdown and give these cheeses a long shelf life.

Packaging, Aging, Storage and Distribution

Even after the cheese is made, how it is handled during packaging, aging, storage, and distribution will significantly affect its shelf life. The packaging materials are designed to protect the cheese from physical contamination, especially from spoilage microbes. Additionally, the packaging materials prevent oxygen from reaching the cheese, which prevents mold growth since mold cannot grow in the absence of oxygen. That is why most cheeses are either vacuum packaged (often seen in cheese chunks) to remove all oxygen, or packaged in a modified atmosphere condition (typically seen in shredded cheese) where the oxygen has been flushed out of the container by a mixture of carbon dioxide and nitrogen.

Some cheeses, particularly mozzarella and other pizza cheeses, can be packaged in a frozen (IQF or individually quick frozen) state which dramatically increases the shelf life of the product.

The most important factor affecting cheese shelf life during aging, storage and distribution is temperature. Keeping the cheese temperature as cold as possible (0-3°C/32-38°F) will optimize shelf life. Keeping temperature fluctuations to a minimum will also increase shelf life by limiting enzymatic activity as well as minimizing moisture migration in the cheese, which occurs when cheese warms and cools repeatedly. Lastly, minimizing intense fluorescent lighting will also increase shelf life. This is because fluorescent lighting

adds heat to the cheese and also degrades the color (annatto) used in colored cheeses like many cheddars and colby cheese, resulting in an unsightly pinking defect.

Handling of Cheese at Foodservice, Retail or Consumer Level

Proper handling of cheese at this level can continue to extend product shelf life and ensure optimum quality and performance. Temperature remains the critical factor in extending product shelf life. Cheese should be stored at refrigeration temperatures (0-3˚C/32-38˚F) to slow down enzymatic activity and microbial growth.

Once a cheese package has been opened, the cheese is exposed to oxygen and mold growth may occur. Therefore, opened pieces of cheese should be utilized as quickly as possible. Cut pieces of cheese should be wrapped tightly in a barrier wrap to minimize drying, prevent contamination, and slow mold growth by reducing oxygen contact with the cheese surface.

Opened pieces of cheese should be stored away from other foods to prevent pick-up of odors.

Cheese can support the growth and survival of contaminants if mishandled. Therefore it is critically important to ensure proper sanitation when handling cheese to prevent cross-contamination, paying particular attention to knives, slicers, cutting boards, hands and gloves.

8.3 TEXTURE AND HARDNESS GUIDE

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Texture

Cheese is an extremely versatile food product that has a wide range of textures, flavors and end-uses. The texture and body of the many cheese varieties produced in the U.S. can range from soft to firm, smooth/creamy to curdy, brittle to long, mechanically open to closed, or from cheese with splits to round eyes. The physical properties of cheese are determined by the casein content, the type and strength of casein interactions, cheese composition and ripening reactions.

Some Parameters that Affect the Physical Properties of Cheese

- **Composition**
  Higher moisture cheese is softer, smoother and more meltable than a similar (e.g., age, pH, calcium content) cheese that has a lower moisture content. Low-fat cheese tends to be harder and less meltable than a similar high-fat cheese unless corrective measures are taken by the cheese maker to alter these characteristics. Decreasing the fat content in cheese results in an increase in the protein and moisture contents. Legal compositional limits often determine the moisture and fat contents of a cheese variety, although there are many ingredient cheeses that have their own specific compositions and they are classified as non-standard cheeses since they are designed to have specific industrial functionality.
- **pH (amount of acid)**
  Milk is a stable product because caseins have a net negative charge. Even if milk is gelled and made into a fresh cheese, without significant acid development the curd is not able to stretch and melt. Acidification removes calcium from within casein particles and makes them more flexible, which is important for stretch. A critical amount of acidification is employed in cheeses such as mozzarella so that it will have the desired melt, stretch and flow characteristics. If there is excessive acidification (e.g., pH < 4.9, e.g., cream cheese), the curd loses its melt and stretch characteristics. The rate of acid development during cheese making controls the calcium content of cheese and this rate can be changed by altering the pH at critical points during the process, the use of calcium chelating acids (e.g., citric) and the use of a wash step to remove lactose/salts (e.g., colby, swiss cheese).
- **Temperature**
  The marked variation in cheese texture with changing temperature is exploited to help shredded cheese when it is cold so that it is firmer and easier to cut cleanly. The softening that occurs at high temperatures is widely exploited for the use of cheese as an ingredient in a range of baked goods. Temperature affects the association of casein molecules as they expand at low temperatures resulting in increased firmness while they contract with increasing temperatures so firmness decreases.
- **Milk heat-treatment**
  High heat treatment of milk (greater than pasteurization) or other dairy ingredients (e.g. buttermilk) that contain whey proteins cause a high level of whey protein denaturation. The denatured whey proteins interact with casein and result in restricted melt and flow.

Unmelted Cheese Functionality and Performance

Unmelted cheese is subjected to a wide range of cutting and size reduction operations (e.g., shredding, slicing, grating, dicing, cubing, pureeing, crumbling, granulating, etc.) for foodservice or retail purposes. A number of functional attributes are important for these operations:

- **Firmness/hardness**
  Increased by low-moisture or low-fat contents, and decreased by low calcium or low milk casein contents. For cheddar (and other medium to low-moisture cheeses), firmness (at refrigeration temperature) does not change much during aging in contrast to higher moisture cheeses (e.g. mozzarella), which become softer and stickier with age.
- **Brittleness (short texture)**
  Can be caused by low pH, reduced calcium content, and/or excessive proteolysis (e.g. very mature cheddar cheese).
- **Machinability**
  This is a general term for the ability of the cheese to be cut/sliced/shredded by machine (e.g. wires, high speed knives). This attribute is influenced by cheese hardness (needs to be moderate to high), brittleness (should not be too "short" or it will be crumbly and will produce a lot of fines), and adhesiveness (if the curd is too adhesive it will be sticky). Machinability is influenced by cheese composition, pH, protein breakdown, and temperature of operation. In practice, machinability is controlled by the empirical selection of a suitable range for these parameters for an individual cheese variety, e.g. some cheeses may be suitable for shredding within a few days while others may only be shredded in a few months.

8.4 COOKING AND MELTING GUIDE

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Cooking Ability and Melting

Melted cheese has found a vast number of applications, e.g., as a pizza topping, cheese slices on hamburgers, toasted sandwiches, filling, layers in lasagna, and sauces. The end-users of cheese have specific requirements for what kind of melt performance they want from their cheese. U.S. cheese manufacturers can manipulate cheese performance to consistently meet these specifications. The functional properties of melted cheese are complex and we can distinguish at least seven important attributes namely flow, softening, shred identity, stretchability, tenting, blistering, browning and free oil formation.

- **Flow** (e.g., flow-off a pizza crust) increases with age (protein breakdown, and ongoing loss of calcium from casein particles) and with increased moisture or fat content. There is very little flow in low pH (< 4.9) cheeses, e.g. cottage or cream. Flow is increased by a reduction in calcium content. Cheeses with restricted flow can be achieved by high heat milk treatment, very high pH (e.g., pH > 5.9) or very low values (e.g., < 4.9). Process cheese with restricted melt/flow can be achieved by the use of specific emulsifying salts or the use of high temperatures and long hold times during cooking. Many Hispanic-style fresh cheeses are made in the U.S., like panela, which soften when heated but do not melt and flow due to the high pH (e.g. 6.6). This is widely used as a topping on tacos, chili and burritos. The use of acid to precipitate hot milk is exploited for a number of cheeses, e.g., queso del pais and ricotta, and these cheeses soften but do not flow. A wide range of cheeses can be supplied with different textures and flow properties.
- **Softening** during heating happens in all cheeses, the extent depends on composition, age and pH. Caused by the reduction in the strength of the casein interactions with increasing temperature.
- **Shred identity** after heating refers to individual shreds still obvious after baking. Caused by lack of softening and especially flow. Less common in aged cheeses as flow increases with age. Can also be caused by excessive use of anticaking agents so these ingredients have very high melting points, and if they completely coat the shreds, they can inhibit flow.

- **Stretchability** of curd occurs during cheese making; curd stretches when sufficient calcium is lost from caseins during cheese making, e.g., pH ~5.2 in cultured mozzarella but occurs at pH ~5.6 in direct acid mozzarella. The direct addition of acid to the cheese vat is more efficient in removal of calcium than the slow cultured product. The pH at which curd becomes suitable for stretching also depends on extent of demineralization (e.g., by pre-acidification with some lactic acid helps to remove more calcium), and fat and casein contents. Low-fat or high casein (concentrated) milks require a lower pH to get the curd to become suitable for stretching.

  Many cheeses are used as an ingredient on pizza. Stretchability is the ability of the melted cheese to form fibrous strands that elongate without breaking under tension during ripening. Stretch "quality" is important, as many consumers do not want long "strings." Thus, the length, tension and type of stretch (strings, feathering or fibrous) are important attributes. Many young cheeses exhibit stretch (e.g., cheddar), but during ripening the stretch quality decreases and the cheese may become stringy. During aging of mozzarella the length of stretch increases but after 3-4 weeks cheese may be "soupy," and the strands are short as well as weak. In mozzarella, the high curd temperature in the cooker stretcher reduces bacterial numbers and lowers residual enzyme activity during ripening; these process conditions help this high-moisture product have good melting functionality over a typical 1 month refrigerated storage shelf life. Longer shelf life can be provided by U.S. suppliers by tailor-making cheese.

- **Tenting** refers to bulging of the cheese that may occur during baking or during a fork test due to the entrapment of water vapor. If this bulging occurs over a small area, it is referred to as blistering. In reduced- or low-fat cheeses it in turn helps a surface "skin" to form; this skin dries out and burns/browns during baking.
- **Blistering** refers to small visual bubbles on the pizza surface. It is influenced by the textural properties of cheese, which sometimes do not allow gas bubbles to escape from the surface (unlike a "soupy" product)
- **Browning** occurs during baking when the color of some cheeses increases due to a Maillard-type reaction between reducing sugars (e.g., lactose) and proteins (especially amino acids). The color can range from light straw, to golden brown to black depending on the severity of the baking process and the type of oven used. Browning can be reduced by washing the curd as this reduces the lactose content and selecting starter cultures so that all the residual sugars are metabolized. Cheese with slight browning or completely white in color are often requested by consumers and can be supplied by U.S. companies.
- **Free oil formation** is the tendency of free oil to separate from the melted cheese and form oil pockets, particularly at the cheese surface. Excessive oiling-off leads to a greasy, shiny surface. Free oil increases with age of cheese. Some free oil may be beneficial in helping to control browning and blister formation. Process cheese has very little free oil.

The type of oven used for baking can have a major impact on cheese performance. Various heating methods, e.g. gas, electric or wood burning ovens, are used for pizza and other dishes. For pizza, various types of convection or forced air (fan assisted) ovens are common in foodservice operations as they give more rapid and even heating than conventional ovens. One popular type is the Impinger® oven where hot air under pressure surrounds the pizza and small jets of hot air are forced down on the cheese. This results in rapid heating as the cheese moves through the oven on a conveyor belt. The jets of hot air also dry out the cheese surface and are more likely to result in blistering and browning. The trapped water vapor finds it harder to be released from the surface, which can lead to a bulging up of the cheese. As blisters are formed they are more prone to drying-out, which favors the Maillard reaction, and as a result browning is greater in forced-air or Impinger ovens. In conventional ovens the baking process is slower, which is why forced-air ovens are so popular. For dishes like lasagna very long cooking times in convection ovens can also lead to greater risk of the surface drying out unless the dish is covered for some of the time. Microwave ovens are often used for quick reheating of foods including pizza but do have the tendency to make the base either brittle or very soft depending on the ingredients used. Also, the cheese itself can get tougher than in a conventional oven. Some frozen pizza suppliers also provide accessories, e.g., a crisping sleeve, to help bake the pizza in a microwave. Depending on the type of oven the heating temperature and cooking times for pizza and other cheese dishes vary. Sauces or fondues can be readily heated or reheated in a microwave.

U.S. suppliers can provide cheese that can perform under very specific oven and heating regimes (temperatures and times). Many foodservice operations use blends of cheese in a variety of dishes and fast-food products. U.S. suppliers formulate these melts to consistently deliver the desired flow, stretch, color and flavor. They can provide cheese that is shredded, blended, and grated and ready for foodservice operations. Most cheese will require refrigerated storage prior to use and some will be held frozen. U.S. manufacturers can slow down ripening changes, which facilitates shipment over long distances.

A Product Developer's Matrix of U.S. Cheese Functionality

If you are looking for… Specific Textural Properties	Cheese Varieties and Applications	Tips for Specifying
Spreadable Ingredient	U.S. cream cheese and other soft-ripened cheeses are widely used as sandwich and snack spreads and ingredients for other spreads. Process cheeses can be tailored to deliver the right texture and consistency, i.e., in cracker sandwiches.	Choose soft-ripened or process cheeses. Added ingredients can enhance the flavor of cheese spreads. Consider other components that will be used with the cheese that may influence spreadability, moisture migration and shelf life.
Filling	Cheeses are widely used in fillings for baked goods, pastas, meats and snacks. Cheese varieties such as ricotta, cottage cheese, cream cheese, neufchâtel and mascarpone, which are not aged, give the best consistency for fillings.	Choose cheeses that are not aged for better filling consistency. Use emulsifying salts to enhance the "machinability" for fillings that must flow or be pumped.
Extrudable Ingredient	Extruded cheese snacks must hold up to high heat and have good pumpability. Process cheeses are also good choices for these applications.	Select a U.S. process cheese manufacturer who can tailor a product to fit your particular flow requirements.
No Melt	In some applications, a "curdy" consistency in melted applications is desirable. Consider cheeses with relatively high pH (above 5.6) or low pH (below 4.8), such as cottage cheese, ricotta or feta. Process cheeses are also good choices for these applications.	Select a cheese with a pH outside of the range 4.8 to 5.6, such as cottage, ricotta, feta or queso blanco. The melting characteristics of other varieties can be altered during manufacturing.
Restricted Melt	In many applications, such as on burgers, American-style pizza and appetizers, it is important to limit the flow of cheese to avoid leakage.	U.S. mozzarella is one of the most popular cheeses for melting applications. For different flavor profiles consider blending two or more varieties with different melt characteristics. The melting characteristics of other varieties can be altered during manufacturing.
Free Flow, Cheese Sauce	For a cheese that flows more freely in casseroles or which melts as a sauce on an entrée or side dish, consider process cheese. Natural cheeses or cheese powders can be used as ingredients in sauces, particularly for more intense flavor.	Prepared cheese sauces are available from many U.S. cheese suppliers. Provide your cheese supplier with detailed information about your application – including cooking method, temperature and hold conditions.
Stretch	Pasta filata cheeses including U.S. mozzarella are widely known for their stretching characteristics. Some other categories of cheese stretch to varying degrees. Most applications require the proper balance between the cheese's melt and stretch characteristics.	U.S. mozzarella is widely used for its stretch functionality For different flavor profiles consider blending other cheeses with mozzarella.
Microwave Meltability	Research has shown that different factors influence thermal vs. microwave meltability. Most lower fat or lower moisture cheeses generally do not melt as well in microwave applications.	When possible, choose higher fat and/or higher moisture cheeses for microwave applications. Know the type of oven(s) that will be used for cooking the product – convection, microwave or forced air.

Specific Color Development and Flavor Properties

If you are looking for… Specific Properties	Cheese Varieties and Applications	Tips for Specifying
Limited or No Maillard Browning	Since browning is due to residual sugars in cheese, many cheese types do not brown to any significant degree.	Ask your U.S. cheese supplier for a mozzarella with reduced residual sugar.
More Maillard Browning	Controlled Maillard browning is desirable on many pizzas. Under the right circumstances U.S. mozzarella can be designed to provide the most authentic U.S.-style pizza browning effect.	U.S. mozzarella is the best choice when controlled Maillard browning is desirable. Talk to your cheese supplier about tailor-making U.S. mozzarella, or any other cheese blend that is best for your total flavor system. For baking applications keep in mind that the baking process can alter cheese flavors.
Intense Cheese Flavor	Aged cheeses, club cheeses and enzyme-modified cheeses are all used to boost flavor in prepared foods. They are frequently used in lower fat foods or other applications where the amount of cheese is limited.	Talk to your cheese supplier about your specific applications to determine which high-flavored cheese or cheese blend is best for your total flavor system. For baking applications keep in mind that the baking process can alter cheese flavors.
Mild Dairy Flavor	In applications such as filled pastas and desserts, a mild dairy flavor is the goal. Soft-ripened and unripened cheeses such as cottage, neufchâtel, mascarpone and cream cheese, colby, queso blanco and monterey jack all provide a mild creamy flavor.	Sample a variety of mild-flavored cheeses for your specific application to see which one performs best. Avoid aged cheeses, which generally have a stronger flavor.
Unique/Signature Flavors	Less familiar specialty cheeses and custom cheese blends can be used to create unique flavors in all applications.	Work with your cheese supplier to create a custom flavor profile or a blend of contrasting varieties for your application. Pre-flavored cheeses are also available.

Specific Shelf Life and Delivery Properties

If you are looking for… Specific Properties	Cheese Varieties and Applications	Tips for Specifying
Ability to Freeze or Withstand Freeze-Thaw	While all cheeses can be frozen, higher fat cheeses generally withstand freeze-thaw cycles better than lower fat varieties. Also, higher fat cheeses can reduce burning or blistering on frozen pizzas.	Higher fat cheese generally holds up better to freezing. For low-fat foods, ask your cheese supplier about lower fat cheeses that are most resistant to freeze damage.
An Extended Shelf Life	Shelf life is largely a function of the water activity of the finished foods. Lower moisture cheeses, such as aged Italian-style cheeses, can help extend shelf life. Proper packaging, heat treatments and aseptic packaging also prolong shelf life.	Choose lower moisture cheeses, such as aged cheeses, or cheeses that are made specifically for long hold. Ask your cheese supplier about packaging that can lengthen shelf life.
Good Product Hold	Products must hold up well on a steam-table or under a heat lamp. Aged cheese varieties and no-melt varieties hold up the best.	Talk to your supplier for proper cheese variety selection for foods normally subjected to these conditions.
Dispensability	Cheese ingredients that melt without clumping are critical for many successful soups and sauces. Complete dispersability for smooth applications requires an understanding of the specific performance of your cheese.	Discuss ideal processing with your U.S. cheese supplier.

Formulations for Specific Market Niches

If you are looking for… Specific Properties	Cheese Varieties and Applications	Tips for Specifying
Reduced-Fat or Low-Fat Cheeses (high protein)	Most cheese varieties are now available in many fat level options.	Talk to your cheese supplier about the fat level targets of your specific formulations.
Low Carbohydrate	Most cheeses contain little residual lactose or other carbohydrates.	Consider natural cheeses such as U.S. cheddar, colby, monterey jack and mozzarella, all of which have or can be produced with very low levels of residual carbohydrates.
Enhanced Nutrition	Most cheeses are good or excellent sources of protein and calcium.	For boosting calcium, select hard and semi-hard cheeses, such as cheddar and hard Italian-style cheeses. Nutrition profiles are readily available from your U.S. cheese supplier.
Appeal to Children	Many U.S. cheese suppliers have developed products especially for children with flavor and shapes that appeal to kids.	Consider mild-flavored cheeses, such as American pasteurized process cheese, as well as custom cheese shapes, string cheese and fruit-flavored cheese. Contact USDEC for cheese suppliers that cater to the children's market.
Support for a Gourmet Image	Speciality cheeses and cheese blends can enhance a product's image and appeal across nearly all product categories, including snacks, entrées and desserts.	Contact USDEC for suppliers of specific specialty cheese varieties and cheese blends.
Authentic International Cheeses	Authentic ethnic cheeses must be true to their point of origin in flavor, texture and performance.	The U.S. cheese industry produces cheese varieties consistent with their ethnic roots. Contact USDEC for names of cheese companies that manufacture specific, regional cheese varieties.
Reduced-Waste and/or Labor Savings	Convenience cheese such as pre-portioned packs, pre-blends, cheese slices or forms can save time and reduce waste.	Talk to your supplier about the specific forms of cheese that will work best in your application.
A Custom Formulation	Whether you want cheeses infused with certain flavors or cheese in different forms or with different specifications, U.S. cheeses are available tailor-made.	Talk to your current supplier or contact USDEC for a list of custom cheese companies.

8.5 FAT CONTENT GUIDE

By Dr. P.A. LOFGREN
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The fat or lipid components of cheese contribute a variety of unique and beneficial nutrients and other health components to the food supply. Dietary fat is necessary for transport of fat-soluble vitamins (A, D, E, and K). The fatty acids of cheese are a major source of the pleasing and unique flavors associated with various cheeses. During cheese ripening, a small amount of the fat is hydrolyzed to volatile (shorter carbon chain length) fatty acids – butyric, caproic, caprylic and capric acids, along with higher carbon chain fatty acids. Together, these fatty acids contribute to the flavor of a given cheese. Cheese is a good source of the essential fatty acids linoleic and linolenic acids and is low in trans fatty acids. See Table 2 (Comparative Total Lipid (Fat), Fatty Acid, and Cholesterol Composition of Cheeses) for a comparison of the total lipid (fat), fatty acid and cholesterol composition of cheeses.

Cheese is one of the better natural sources of conjugated linoleic acid (CLA), a group of fatty acids for which there is some evidence that they may reduce the risk of certain cancers and heart disease, enhance the immune function and regulate body weight/body fat distribution. Cheese is also a good source of sphingolipids, a class of lipid components with potent biological activities, which are receiving increased attention for their ability to reduce the risk of heart disease and some types of cancer. See Table 3 (Conjugated Linoleic Aid (CLA) and Sphingolipid Content of Various Cheeses Compared to Whole Milk) for a sampling of the CLA and sphingolipid content of various cheeses.

The fat content of cheese can vary widely, due to the type of milk product (whole, low-fat, or nonfat) that is used to make the cheese. For instance, nonfat, dry curd, cottage cheese contains 0.5 g per 4-oz serving; whereas a serving of cheddar cheese (1 oz) contains 9.4 g of fat, and a high-fat cheese such as cream cheese is enriched with cream and would contain more fat than protein.

Cheeses such as cheddar, brie, blue, limburger, muenster, gouda and swiss are generally made from whole milk and have about the same amount of fat and protein. Low-fat cheeses have a higher ratio of protein to fat.

In addition to cheeses naturally lower in fat (e.g., cottage, ricotta, part-skim mozzarella), manufacturers have developed some cheeses that are reduced in fat (in the range of 0 to 6 g fat/oz). Through the use of new technologies, processes and ingredients, these reduced-fat cheeses are showing improved quality.

The U.S. Food and Drug Administration (FDA) has established definitions for foods, including cheese, which can be labeled as low-fat, reduced-fat, nonfat and fat-free, light or less fat. For example, under these definitions, to qualify as low-fat, a cheese must contain no more than 3 g fat per serving (or reference amount). To qualify as nonfat or fat-free, a cheese must contain less than 0.5 g fat per serving. To qualify as reduced-fat, a cheese must contain 25% less fat per serving than its full-fat counterpart.

The total combination of flavor and texture (largely due to the fat content) and nutrient contributions of cheese make it a highly preferred addition to the diet.

Table 2. Comparative Total Lipid (Fat), Fatty Acid, and Cholesterol Composition of Cheeses[1]
(amount per 1 oz/28.35 g, except as noted)

Type of Cheese Common Name	Serving Size	Kcal	Total Fat, g	Total SFA,[2] g	Total MUFA,[3] g	Total PUFA,[4] g	Total Cholesterol, mg
Soft Cheeses, Fresh							
Cottage, Creamed	4 oz	116	5.1	3.22	1.45	0.16	16.9
Cottage, Dry Curd	4 oz	96	0.5	0.31	0.12	0.02	7.9
Cream	1 oz	99	9.9	6.23	2.79	0.36	31.2
Feta	1 oz	75	6.0	4.24	1.31	0.17	25.2
Mozzarella, Part-Skim	1 oz	72	4.5	2.87	1.28	0.13	18.1
Mozzarella, Whole Milk	1 oz	85	6.3	3.73	1.86	0.22	22.4
Neufchâtel	1 oz	74	6.6	4.20	1.92	0.18	21.5
Ricotta, Whole Milk	0.5 cup	216	16.1	10.29	4.50	0.48	63.2
Soft Cheeses, Mold-Ripened							
Camembert	1 oz	85	6.9	4.33	1.99	0.21	20.4
Semi-Soft Cheeses							
Brick	1oz	105	8.4	5.32	2.44	0.22	26.6
Edam	1 oz	101	7.9	4.98	2.30	0.19	25.2
Gouda	1 oz	101	7.8	4.99	2.20	0.19	32.3
Monterey Jack	1 oz	106	8.6	5.41	2.48	0.26	25.2
Muenster	1 oz	104	8.5	5.42	2.47	0.19	27.2
Mozzarella, Low-Moisture	1 oz	90	7.0	4.41	1.99	0.22	25.2
Mozzarella, Low-Moisture, Part-Skim	1 oz	86	5.7	3.59	1.62	0.18	15.3
Provolone	1 oz	100	7.5	4.84	2.10	0.22	19.6
Semi-Soft Cheeses, Mold-Ripened							
Blue	1 oz	100	8.1	5.29	2.21	0.23	21.3
Brie	1 oz	95	7.8	4.94	2.27	0.23	28.4
Limburger	1 oz	93	7.7	4.75	2.44	0.14	25.5
Hard Cheeses							
Cheddar	1 oz	114	9.4	5.98	2.66	0.27	29.8
Colby	1 oz	112	9.1	5.73	2.63	0.27	26.9
Gruyère	1 oz	117	9.2	5.36	2.85	0.49	31.2
Swiss	1 oz	108	7.9	5.04	2.06	0.28	26.1
Hard Grating Cheeses							
Parmesan	1 oz	111	7.3	4.65	2.13	0.16	19.3
Romano	1 oz	110	7.6	4.85	2.22	0.17	29.5
Pasteurized Process Cheese							
Pasteurized Process Cheese (American)	1 oz	106	8.9	5.58	2.54	0.28	26.6
Pasteurized Process Cheese Food (Swiss)	1 oz	92	6.8	4.39	1.93	0.17	23.2
Pasteurized Process Cheese Spread (American)	1 oz	82	6.0	3.78	1.76	0.18	15.6
Cold-Pack Cheese							
Cold-Pack	1 oz	94	6.9	4.35	2.03	0.20	18.1

[1]USDA, ARS. 2005. USDA National Nutrient Database for Standard Reference, Rel.18. Nutrient Data Laboratory Home Page, http://www.ars.usda.gov/ba/bhnrc/ndl
[2]SFA, Saturated Fatty Acids
[3]MUFA, Monounsaturated Fatty Acids
[4]PUFA, Polyunsaturated Fatty Acids

Table 3. Conjugated Linoleic Aid (CLA) and Sphingolipid Content of Various Cheeses Compared to Whole Milk

	Total CLA[1] mg/g fat	Sphingolipids[2] umol/kg
Whole Milk (3.5% fat)	5.5	160
Brick	7.1	*
Muenster	6.6	*
Sharp Cheddar	3.6	*
Colby	6.1	*
Mozzarella	4.9	*
American Process	5.0	*
Romano	2.9	*
Parmesan	3.0	*
Cottage	4.5	*
Ricotta	5.6	*
Cream Cheese (37% fat)	*	1692
Cheese (29% fat)	*	1326

*Present, but level not specified in the reference cited
[1]Adapted from Chin, et.al., 1992
[2]Vesper, et.al., 1999

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8.6 CALCIUM CONTENT AND DENSITY GUIDE

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Most cheese varieties are good to excellent sources of calcium, and the use of cheese as an ingredient is an excellent choice for increasing the calcium content of menu items and prepared foods. The addition of cheese to the diet is one of the most efficient and effective ways to add significant amounts of calcium and other key nutrients to a person's diet. (See Section 7.1, Cheese for Nutrition and Health – Overview: Cheese as a Source of Nutrients)

Increased intake of dietary calcium is associated with a number of health benefits, including improved bone health (increasing bone mass, reducing bone loss), lowering of total and LDL cholesterol and moderating effects on blood pressure. Furthermore, the calcium provided by dairy foods such as cheese is readily available and more highly absorbed than from other dietary sources, especially plant sources.

The final calcium content of cheese is largely influenced by the acidity at coagulation and the degree of expulsion of whey from the curd. In ripened whole milk cheeses (e.g., cheddar, swiss, brick) the calcium and phosphorus largely remain in the curd. Cheese coagulated by lactic acid (e.g., cottage cheese) retains less calcium because the calcium salts are removed from the casein as casein is precipitated. For example, a hard grating cheese such as parmesan contains 1184 mg calcium/100 g, cheddar 721 mg/100 g, blue cheese 528 mg/100 g and dry curd cottage cheese 32 mg/100 g. Thus, the creaming mixture or other additives, and processing method can greatly affect the resulting calcium content. See Table 4 (Comparative Total Calcium (Ca) Content and Calcium Density of Cheeses) for a comparison of calcium contents and calcium density (mg/100 kcal) for cheeses of all types.

The use of the concept of nutrient density (the amount of a given nutrient per 100 kcal of a food) is gaining increasing acceptance in dietary guidance recommendations. Consumers are being advised to choose foods that are nutrient rich for the calories that they provide. Cheese is an excellent example of a food where the calcium density concept is well demonstrated.

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Table 4. Comparative Total Calcium (Ca) Content and Calcium Density of Cheeses[1]

Type of Cheese Common Name	Serving Size	Calcium mg/serving	Calcium mg/100g	kcal per 100g	Calcium Density mg/100 kcal
Soft Cheeses, Fresh					
Cottage, Creamed	4 oz	68	60	103	158
Cottage, Dry Curd	4 oz	96	32	85	038
Cream	1 oz	99	80	349	223
Feta	1 oz	75	493	264	187
Mozzarella, Part-Skim	1 oz	72	782	254	308
Mozzarella, Whole Milk	1 oz	85	505	300	168
Neufchâtel	1 oz	74	75	260	29
Ricotta, Whole Milk	0.5 cup	216	207	174	119
Soft Cheeses, Mold-Ripened					
Camembert	1 oz	110	388	300	129
Semi-Soft Cheeses					
Brick	1oz	191	674	371	182
Edam	1 oz	207	731	357	205
Gouda	1 oz	198	700	356	197
Monterey Jack	1 oz	211	746	373	200
Muenster	1 oz	203	717	368	195
Mozzarella, Low-Moisture	1 oz	163	575	318	181
Mozzarella, Low-Moisture, Part-Skim	1 oz	207	731	302	242
Provolone	1 oz	214	756	351	215
Semi-Soft Cheeses, Mold-Ripened					
Blue	1 oz	150	528	353	150
Brie	1 oz	52	184	334	55
Limburger	1 oz	141	497	4.32775	152
Hard Cheeses					
Cheddar	1 oz	204	721	403	179
Colby	1 oz	194	685	394	174
Gruyère	1 oz	287	1,011	413	245
Swiss	1 oz	224	791	380	208
Hard Grating Cheeses					
Parmesan	1 oz	336	1,184	392	302
Romano	1 oz	302	1,064	387	275
Pasteurized Process Cheese					
Pasteurized Process Cheese (American)	1 oz	175	616	375	164
Pasteurized Process Cheese Food (Swiss)	1 oz	205	723	323	224
Pasteurized Process Cheese Spread (American)	1 oz	159	562	290	194
Cold-Pack Cheese					
Cold-Pack	1 oz	141	497	331	150

[1]USDA, ARS. 2005. USDA National Nutrient Database for Standard Reference, Rel 18. Nutrient Data Laboratory Home Page, http://www.nal.usda.gov/ba/bhnrc/hdl

8.7 PROTEIN CONTENT GUIDE

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Among dairy foods, cheese is the largest contributor to the amount of protein available in the U.S. food supply. In addition, this proportional contribution of protein from cheese has increased more than five-fold since the early 1900's.

The protein of cheese is high quality, containing all of the essential amino acids in a pattern, and is proportional to the body's need for them. See Table 6 (Comparative Total Protein and Amino Acid Content and Distribution in Cheeses) for a comparison of the amino acid content and distribution of selected cheeses. Casein is the main protein in cheese, although the water-soluble milk proteins lactalbumin and lactalglobulin may also be present, depending on the amount of whey entrapped in the cheese. See Table 5 (Sample Partition of Protein and Other Macronutrients in Making Cheddar Cheese) for approximate partitioning of protein and other macronutrients in making cheddar cheese.

In general, the protein in cheese is readily digestible because some of the proteins are broken down during ripening to peptides and amino acids. Also, the method of coagulation used and the degree of ripening can influence the protein in cheese. For instance, in an enzyme-coagulated cheese (e.g., cheddar) protein is present as di- and mono-calcium paracasein. A portion of the calcium is removed by lactic acid produced during cheese making, resulting in calcium lactate and free paracasein. During curing, the rigid insoluble paracasein is hydrolyzed into smaller molecular and soluble nitrogenous forms, resulting in a softer, more pliable, partially digested food. The extent of such hydrolysis determines the characteristics of the final cheese. In some of the soft cheese varieties (e.g., camembert, limburger), much of the protein is converted to water-soluble compounds including peptides, amino acids, and ammonia. In hard cheeses (e.g., cheddar and swiss), less protein hydrolysis occurs than in soft cheeses.

In acid-coagulated cheese (e.g., cottage cheese made with a starter culture), the protein is isoelectric casein. This protein is not greatly hydrolyzed or digested before use. Acid-coagulated cheeses treated with a high temperature (e.g., ricotta) contain all three milk proteins (casein, lactoglobulin and lactalbumin) in appreciable amounts.

Cheese contributes a large share of protein, a key component of a healthy diet. This makes cheese very valuable in complementing diets based on grain/plant products.

Table 5. Sample Partition of Protein and Other Macronutrients in Making Cheddar Cheese

Nutrient	% in Curd	% in Whey
Water	6	94
Total Solids	48	52
Casein	96	4
Soluble proteins (lactalbumin & lactalglobulin)	4	96
Fat	94	6
Lactose	6	94

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Table 6. Comparative Total Protein and Amino Acid Content and Distribution in Cheeses[1] (grams per 1 oz/28.35 g, except as noted)

	Total Protein	Essential – Indispensable Amino Acids								
		Hist	Isoleu	Leu	Lys	Meth	Phen	Thr	Trypt	Val
PDCAAS (mg/g protein) [2]		18	25	55	51	25	47	27	7	32
Type of Cheese/Common Name										
Soft Cheeses, Fresh										
Cottage, Creamed (per 4 oz)	14.1	0.47	0.83	1.45	1.14	0.42	0.76	0.63	0.16	0.87
Cottage, Dry Curd (per 4 oz)	19.5	0.65	1.15	2.01	1.58	0.59	1.05	0.87	0.22	1.21
Cream	2.1	0.08	0.11	0.21	0.19	0.05	0.12	0.09	0.02	0.13
Feta	4.0	0.11	0.23	0.40	0.35	0.10	0.19	0.18	0.06	0.30
Mozzarella, Part-Skim	6.9	0.26	0.33	0.67	0.70	0.19	0.36	0.26	0.10	0.43
Mozzarella, Whole Milk	6.3	0.15	0.32	0.52	0.27	0.15	0.29	0.28	0.15	0.38
Neufchâtel	2.8	0.10	0.15	0.27	0.25	0.07	0.16	0.12	0.02	0.17
Ricotta, Whole Milk (per 0.5 cup)	14.0	0.57	0.73	1.51	1.66	0.35	0.69	0.64	0.16	0.86
Soft Cheeses, Mold-Ripened										
Camembert	5.6	0.19	0.27	0.52	0.50	0.16	0.31	0.20	0.09	0.36
Semi-Soft Cheeses										
Brick	6.6	0.23	0.32	0.64	0.60	0.16	0.35	0.25	0.09	0.42
Edam	7.1	0.29	0.37	0.73	0.75	0.20	0.41	0.26	0.10	0.51
Gouda	7.1	0.29	0.37	0.73	0.75	0.20	0.41	0.26	0.10	0.51
Monterey Jack	6.9	0.24	0.43	0.66	0.58	0.18	0.36	0.25	0.09	0.46
Muenster	6.6	0.24	0.32	0.64	0.61	0.16	0.35	0.25	0.09	0.42
Mozzarella, Low-Moisture	6.1	0.23	0.29	0.60	0.62	0.17	0.32	0.23	0.09	0.38
Mozzarella, Low-Moisture, Part-Skim	7.4	0.17	0.38	0.61	0.32	0.17	0.34	0.33	0.17	0.44
Provolone	7.3	0.32	0.31	0.65	0.75	0.19	0.36	0.28	0.10	0.46
Semi-Soft Cheeses, Mold-Ripened										
Blue	6.1	0.22	0.32	0.54	0.52	0.17	0.31	0.22	0.09	0.44
Brie	5.9	0.20	0.29	0.55	0.52	0.17	0.33	0.21	0.09	0.38
Limburger	5.7	0.16	0.35	0.59	0.48	0.18	0.32	0.21	0.08	0.41
Hard Cheeses										
Cheddar	7.1	0.25	0.44	0.68	0.59	0.18	0.37	0.25	0.09	0.47
Colby	6.7	0.24	0.42	0.64	0.56	0.18	0.36	0.24	0.09	0.45
Gruyère	8.5	0.32	0.46	0.88	0.77	0.23	0.49	0.31	0.12	0.64
Swiss	7.6	0.30	0.44	0.84	0.73	0.22	0.47	0.29	0.11	0.61
Hard Grating Cheeses										
Parmesan	10.1	0.39	0.54	0.98	0.94	0.27	0.54	0.37	0.14	0.70
Romano	9.0	0.35	0.48	0.87	0.83	0.24	0.48	0.33	0.12	0.62
Pasteurized Process Cheese										
Pasteurized Process Cheese (American)	6.3	0.26	0.29	0.56	0.62	0.16	0.32	0.20	0.09	0.38
Pasteurized Process Cheese Food (Swiss)	6.2	0.25	0.29	0.55	0.62	0.16	0.32	0.20	0.09	0.37
Pasteurized Process Cheese Spread (American)	4.7	0.14	0.24	0.51	0.43	0.15	0.26	0.18	0.07	0.39
Cold-Pack Cheese										
Cold-Pack	5.6	0.23	0.26	0.49	0.55	0.14	0.28	0.18	0.08	0.3

[1]USDA, ARS. 2005. USDA National Nutrient Database for Standard Reference, Rel. 18. Nutrient Data Laboratory Home Page, http://www.nal.usda.gov/ba/bhnrc/hdl
[2]Protein digestibility corrected amino acid scoring pattern (PDCAAS).

Nonessential - Dispensable Amino Acids									
Ala	Arg	Asp Ac	Cys	Glu Ac	Gly	Pro	Ser	Tyr	
									PDCAAS (mg/g protein) [2]
									Type of Cheese/Common Name
									Soft Cheeses, Fresh
0.73	0.64	0.96	0.13	3.06	0.31	1.64	0.79	0.75	Cottage, Creamed (per 4 oz)
1.01	0.89	1.32	0.23	4.23	0.42	2.26	1.10	1.04	Cottage, Dry Curd (per 4 oz)
0.06	0.08	0.15	0.02	0.49	0.04	0.20	0.11	0.10	Cream
0.18	0.13	0.22	0.02	0.69	0.03	0.39	0.33	0.19	Feta
0.21	0.30	0.50	0.04	1.61	0.13	0.71	0.40	0.40	Mozzarella, Part-Skim
0.20	0.15	0.46	0.03	1.26	0.15	0.67	0.21	0.30	Mozzarella, Whole Milk
0.09	0.11	0.20	0.02	0.64	0.06	0.26	0.15	0.14	Neufchâtel
0.62	0.78	1.23	0.12	3.03	0.37	1.32	0.71	0.73	Ricotta, Whole Milk (per 0.5 cup)
									Soft Cheeses, Mold-Ripened
0.23	0.20	0.36	0.03	1.19	0.11	0.67	0.32	0.32	Camembert
									Semi-Soft Cheeses
0.19	0.25	0.45	0.04	1.56	0.12	0.73	0.36	0.32	Brick
0.22	0.27	0.50	0.07	1.74	0.14	0.92	0.44	0.41	Edam
0.22	0.27	0.49	0.07	1.74	0.14	0.92	0.44	0.41	Gouda
0.20	0.26	0.45	0.04	1.70	0.12	0.78	0.41	0.34	Monterey Jack
0.19	0.25	0.45	0.04	1.58	0.12	0.74	0.37	0.32	Muenster
0.19	0.26	0.44	0.04	1.43	0.12	0.63	0.36	0.35	Mozzarella, Low-Moisture
0.24	0.17	0.54	0.04	1.48	0.17	0.78	0.24	0.35	Mozzarella, Low-Moisture, Part-Skim
0.20	0.29	0.49	0.03	1.77	0.12	0.78	0.42	0.43	Provolone
									Semi-Soft Cheeses, Mold-Ripened
0.18	0.20	0.41	0.03	1.47	0.12	0.60	0.32	0.37	Blue
0.24	0.21	0.38	0.03	1.24	0.11	0.70	0.33	0.34	Brie
0.19	0.20	0.42	0.03	1.28	0.12	0.69	0.32	0.34	Limburger
									Hard Cheeses
0.20	0.27	0.45	0.04	1.73	0.12	0.80	0.41	0.34	Cheddar
0.19	0.26	0.43	0.03	1.65	0.12	0.76	0.39	0.32	Colby
0.27	0.28	0.47	0.09	1.70	0.15	1.10	0.49	0.50	Gruyère
0.26	0.26	0.44	0.08	1.62	0.14	1.05	0.46	0.48	Swiss
									Hard Grating Cheeses
0.30	0.37	0.63	0.07	2.33	0.18	1.18	0.59	0.57	Parmesan
0.26	0.33	0.56	0.06	2.07	0.16	1.05	0.52	0.50	Romano
									Pasteurized Process Cheese
0.16	0.26	0.39	0.04	1.30	0.10	0.64	0.30	0.34	Pasteurized Process Cheese (American)
0.16	0.26	0.38	0.04	1.29	0.10	0.63	0.30	0.34	Pasteurized Process Cheese Food (Swiss)
0.17	0.16	0.31	0.03	0.99	0.09	0.66	0.29	0.25	Pasteurized Process Cheese Spraed (American)
									Cold-Pack Cheese
0.14	0.23	0.34	0.04	1.16	0.09	0.57	0.27	0.31	Cold-Pack

Abbreviation Key for Amino Acids listed in Table 6.

Essential (Indispensable)	
Hist	Histidine
Isoleu	Isoleucine
Leu	Leucine
Lys	Lysine
Meth	Methionine
Phen	Phenylalanine
Thr	Threonine
Trypt	Tryptophan
Val	Valine

Nonessential (Dispensable)	
Ala	Alanine
Arg	Arginine
Asp Ac	Aspartic Acid
Cys	Cystine
Glu Ac	Glutamic Acid
Gly	GlycineProline
Ser	Serine
Tyr	Tyrosine

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9.1 APPETIZERS

U.S. cheeses, as stand-alone snack items, paired with beers or wines, or incorporated into cold dips or hot hors d'oeuvres, are uniquely suited for appetizers. Softer cheeses, such a mascarpone or cream cheese, can form the basis for dips, blending well with herbs, seasonings or other more highly flavored cheeses. Harder cheeses can be consumed with bread or crackers, paired with fruits, garnish bruchetta or form a savory crust on baked appetizers.

Deviled Eggs

Ingredients	Percent (%)
Eggs	52.00
U.S. Cream Cheese	23.00
Mayonnaise	10.00
Crab meat, chopped	5.00
Celery, chopped	5.00
Apple, chopped	5.00
Parsley, chopped	To taste
Total	**100.00**

Procedure:

1. Boil eggs, rolling them with a stick to place egg yolks in the middle.
2. Remove shells from the eggs and cut into 2 pieces, taking out the egg yolks.
3. Mix half of the egg yolks, cream cheese and mayonnaise.
4. Add finely chopped crab meat, celery and apple.
5. Sieve the remaining egg yolks and chop parsley finely.
6. Stuff equal amounts of the filling into the hollow of each egg white, and garnish with sieved egg yolks and chopped parsley.

Shimeji, Havarti, and Soy Spring Rolls

Ingredients	Percent (%)
Spring roll pastry	As needed
Shimeji mushrooms	47.50
U.S. Havarti Cheese	24.00
Corn oil	15.00
Egg white	7.50
Soy sauce	6.00
Total	**100.00**

Source: Chef Doug Santi

Procedure:

1. Add oil to a nonstick frying pan.
2. Sauté the shimeji mushrooms with the havarti cheese for a few seconds.
3. Add the soy sauce and stir for 1 minute.
4. Lightly brush the ends of the pastry sheets with egg white. (This will allow you to seal them easily.)
5. Add mushroom mixture to the spring roll pastry and shape into a roll.
6. Arrange the spring rolls on an oil coated baking pan.
7. Bake at 177°C (350°F) until golden brown.
8. Turn if necessary.

Nachos with Cheddar Cheese

Ingredients	Percent (%)
Corn tortillas	As needed
U.S. Cheddar Cheese	33.00
Refried beans	32.00
Guacamole	21.00
Vegetable oil	14.00
Lettuce, finely chopped	To taste
Jalapeno chili	To taste
Total	**100.00**

Procedure:

1. Heat the oil in a shallow pan until it is very hot.
2. Cut the tortilla in small triangles and fry in the oil.
3. Drain to remove excess oil and set aside.
4. Once the fried tortillas have cooled, spread the refried beans on top.
5. Sprinkle with cheddar cheese.
6. Put into the oven and bake at 177°C (350°F) until the cheese has melted.
7. Serve with chopped lettuce, guacamole and jalapeño chili.

Pepper Starters

Ingredients	Percent (%)
U.S. Hickory-Smoked Cheese, sliced	44.16
Sweet green pepper, finely chopped	25.97
Sweet red pepper, finely chopped	25.97
Mayonnaise	3.90
Mini white bread slices	As needed
Black olives, chopped	To garnish
Cherry tomatoes, sliced	To garnish
Lettuce leaves	To garnish
Total	**100.00**

Procedure:

1. Mix half of the mayonnaise with the sweet red pepper.
2. Spread mixture over half of the bread slices.
3. Mix remaining mayonnaise with the sweet green pepper and spread over remaining bread slices.
4. Top each with hickory-smoked cheese slices, black olives and cherry tomatoes.
5. Serve pepper starters on plates, garnished with lettuce leaves.

Cream Cheese Balls

Ingredients	Percent (%)
U.S. Cream Cheese	41.44
Crushed pineapple, canned, drained	27.31
Sweet red pepper, blanched, seeded, diced	11.00
Walnuts, chopped	10.45
Butter, unsalted	5.13
Sweet green pepper, finely chopped	3.30
Wheat cereal, crushed	1.37
Crisp crackers	As needed
Walnuts	To garnish
Total	**100.00**

Procedure:

1. Combine cream cheese and pineapple in a medium bowl.
2. Divide mixture into two parts, putting each in a separate bowl.
3. Mix green pepper with one half, and red pepper with the other half. Refrigerate both bowls.
4. Melt butter in a large skillet over medium heat.
5. Stir in wheat crumbs and walnuts, cooking for 3 minutes or until toasted.
6. Transfer mixture to paper towels to cool.
7. Shape cream cheese mixture into balls and roll in wheat-walnut mixture to coat.
8. Serve with crisp crackers and walnuts.

Beef, Artichoke & Mozzarella Skewers

Ingredients	Percent (%)
Artichoke hearts, quartered	36.89
U.S. Mozzarella Cheese low-fat, cubed	23.26
Cherry tomatoes	12.29
Lean beef, strips, cooked	10.25
Green olives	10.25
Vinegar	5.63
Olive oil	1.33
Dry mustard	0.10
Total	**100.00**

Procedure:

1. Mix vinegar with olive oil and dry mustard in a small bowl. Set aside.
2. Roll up beef strips, then thread into skewers with olives, cherry tomatoes, mozzarella cubes and artichoke hearts.
3. Place kebabs in a shallow dish and pour dressing over them.

Jalapeño Jack Tortilla Dip

Ingredients	Percent (%)
Chicken, cooked, shredded	64.50
U.S. Jalapeño Jack Cheese	17.22
Tomato, medium-sized, sliced	12.37
Black olives, pitted, sliced	4.85
Green onions	1.06
Tortilla chips	As needed
Sour cream	As desired
Total	**100.00**

Procedure:

1. Preheat broiler.
2. In a large oven-proof dish, arrange a layer of tortilla chips.
3. Top with shredded chicken and jalapeño jack cheese.
4. Place under the broiler until cheese has melted.
5. Garnish with tomatoes, green onions and sprinkle with black olives.
6. Serve dish with sour cream, as desired.

Parmesan Cheese Bean Dip

Ingredients	Percent (%)
White beans, canned, drained, mashed	45.54
U.S. Parmesan Cheese, shredded	29.77
Chicken stock	19.26
Olive oil	2.28
Garlic, chopped	1.05
Fresh parsley, chopped	1.05
Fresh rosemary, chopped	1.05
Fresh thyme, sprigs	For garnish
Cucumber strips	For garnish
Carrot strips	For garnish
Tortilla chips	As needed
Total	**100.00**

Procedure:

1. Heat oil in a medium-sized saucepan. Stir in rosemary and garlic, and cook until aroma is released. Remove from heat.
2. Add beans and parsley, then stock, mixing until blended.
3. Return pan to the stove and cook over medium heat, until mixture is warmed throughout. Add shredded parmesan cheese, stirring until it has melted.
4. Serve parmesan bean dip warm with tortilla chips, carrot and cucumber strips.
5. Garnish plate with thyme sprigs.

Cheese Stuffed Portobello Caps

Ingredients	Percent (%)
U.S. Ricotta Cheese	59.86
U.S. Asiago Cheese, sliced	22.18
Portobello mushrooms, whole	17.96
Total	**100.00**

Source: Regi Hise, Foodtrends, LLC

Procedure:

1. Evenly distribute ricotta cheese over each mushroom, gill side up.
2. Place slice of asiago cheese over the ricotta.
3. Bake at 163°C (325°F) oven for 30 minutes. Serve hot or cold. Reheat in the microwave or under a broiler.

9.2 BREADS AND BAKERY ITEMS

U.S. cheeses are used in bread formulations to add value, consumer appeal and improve flavor. Cheese is popular in pocket breads, Italian-style breads, such as focaccia and pizza, or as a topping for bagels. Cheddar and parmesan are favorites for flavoring bread sticks and crusty breads. Cheese powders disperse easily in bread mixes, while specialty non-melting cheeses can be incorporated into the dough and still retain their integrity during the baking process.

Nut Bread

Ingredients	Percent (%)
Dough	
Bread flour	57.20
Water	34.30
Sugar	4.60
Butter	1.75
Yeast	1.15
Salt	1.00
Total	**100.00**
Filling	
Walnuts, ground	40.00
U.S. Mascarpone Cheese	40.00
Sugar	20.00
Total	**100.00**

Procedure:

1. Place all dry ingredients for the dough in a bowl and blend.
2. Add softened butter to the dry ingredients and mix until incorporated.
3. Add water slowly and mix until the mixture comes together. Cut the dough into small pieces.
4. Working with one piece at a time, spread the dough out into a thin rectangular piece on a lightly floured surface.
5. Spread filling evenly over the dough.
6. Spread out a second piece of dough, placing it on top of the first piece and spread filling on it, repeating again with the third piece.
7. Top with a fourth piece of dough. Turn layers over, and roll together so that the last piece added is on the outside.
8. Repeat with remaining dough.
9. Cover the rolls with a towel and leave to proof for 45 minutes in a warm place at 37°C (100°F).
10. Leave for several minutes at room temperature on a lightly floured work surface.
11. Cut each roll into 16 pieces and bake on a greased pan at 177°C (350°F) for 15 minutes.

To prepare filling

1. Grind the walnuts in a food processor with part of the sugar, until very fine and even.
2. Mix the mascarpone cheese with the remaining sugar, and add to the ground walnuts.

Mascarpone Muffins

Ingredients	Percent (%)
U.S. Mascarpone Cheese	24.10
Flour, all purpose	22.50
Milk	12.60
Butter, unsalted	11.25
Egg	8.80
Sugar	8.05
Dried fruit	8.05
Almonds, ground	2.25
Rum	0.90
Baking powder	0.80
Nonfat dry milk	0.70
Almonds, slivered	To taste
Total	**100.00**

Procedure:

1. Beat the butter and mascarpone cheese until smooth.
2. Add sugar and beat well.
3. Gradually add egg, mixing each time until egg is incorporated.
4. Mix flour, ground almonds, nonfat dry milk and baking powder in a separate bowl.
5. Add to butter mixture.
6. Add milk and rum to adjust the thickness.
7. Fold in dried fruit.
8. Place the batter into a lined muffin pan and top with almond slices.
9. Bake at 177°C (350°F) for 15 to 20 minutes.

Old-World Cheese Rolls

Ingredients	Percent (%)
Warm water, 43-46°C (110-115°F)	29.00
Flour, all purpose	24.00
Semolina flour	15.50
Whole wheat flour	11.00
U.S. Provolone Cheese, grated	4.00
Olive oil	4.00
U.S. Asiago Cheese, grated	4.00
Millet flour	3.00
Granulated sugar	1.50
Salt	1.50
Yeast, active dry	0.50
Dry minced garlic	0.50
Grounded black pepper	0.30
Whole thyme, dry	0.30
Whole oregano, dry	0.30
Basil leaves, dry	0.30
Whole marjoram, dry	0.30
Total	**100.00**

Procedure:

1. Combine warm water, oil, sugar, garlic. Sprinkle yeast on top and let stand until foamy.
2. Dry blend all-purpose flour, whole wheat and semolina flours, herbs, salt and pepper.
3. Gradually add this to the yeast mixture to form a sticky dough.
4. Add millet flour and mix until completely incorporated.
5. Knead until dough is smooth and elastic (approximately 5 minutes).
6. Place dough in oiled bowl, and let rise for 90 to 120 minutes or until doubled in size.
7. Punch down and divide dough into 55 g (2 oz) portions.
8. Roll or flatten to 10 x 10 cm (4 x 4 in).
9. Combine provolone and asiago cheeses and dust tops of rolls with cheese mixture.
10. Bake at 190°C (375°F) for 18 to 20 minutes, or until golden brown.

Spicy Vegetable Corn Bread

Ingredients	Percent (%)
Milk	22.00
Cornmeal, yellow	16.50
Corn kernels, sweet	11.00
Eggs	10.00
Flour, all-purpose	7.75
Butter, unsalted, melted	7.50
U.S. Colby Cheese, shredded	7.50
Carrots, finely chopped	5.50
Onion, grated	5.50
Peppers, jalapeno, finely chopped	2.50
Sugar, dark brown	2.50
Baking powder	1.25
Salt	0.50
Total	**100.00**

Procedure:

1. Combine cornmeal, flour, baking powder, salt and brown sugar.
2. Separately, beat eggs, milk and melted butter.
3. Stir into dry ingredients.
4. Add corn, colby cheese, carrots, onion and peppers, mix until combined.
5. Fill greased pan.
6. Bake at 205°C (400°F) for 30 to 35 minutes.

Two-Cheddar Scones

Ingredients	Percent (%)
All-purpose flour	23.00
Low-fat buttermilk	21.00
Semolina flour	10.00
Whole wheat flour	10.00
Eggs	8.90
Unsalted butter	7.00
U.S. Cheddar Cheese, reduced-fat, shredded	6.00
Granulated sugar	5.00
U.S. Sharp Cheddar Cheese, shredded	5.00
Sun-dried tomato bits	3.00
Baking powder	1.00
Ground black pepper	0.10
Total	**100.00**

Procedure:

1. Combine flours, sugar, baking powder, salt and pepper. Blend well.
2. Cut butter into flour mixture with pastry blender or fork until evenly distributed.
3. In separate bowl, combine buttermilk, tomato bits and eggs. Let stand 5 min.
4. Add buttermilk mixture to flour mixture. Mix until just incorporated. Do not overmix.
5. Gently fold in reduced-fat cheddar and sharp cheddar cheeses.
6. Roll out dough on lightly floured surface to about 2.5 cm (1 in) thickness.
7. Cut into desired shapes place on lightly greased tray. Bake at 205°C (400°F) for 10 to 12 minutes.

Cheddar Muffins

Ingredients	Percent (%)
Flour, all-purpose	32.44
U.S. Medium Cheddar Cheese	26.30
Skim milk	25.49
Butter, unsalted	6.60
Egg, beaten	6.37
Thyme, fresh	1.39
Sugar	1.39
Total	**100.00**

Procedure:

1. Preheat oven to 205°C (400°F).
2. Cut half the cheddar cheese into cubes and shred the remaining half. Set aside.
3. Mix egg, milk, butter and sugar in a medium bowl.
4. Gradually pour flour into egg mixture, and stir gently until incorporated.
5. Fold in thyme and shredded cheese.
6. Fill muffin pan cups ⅔ full of batter.
7. Put 2 cheese cubes on top of muffin batter in each muffin cup.
8. Bake in oven for 15 to 20 minutes, or until golden brown.
9. Let stand for 5 minutes before removing from pan.

9.3 BREAKFAST ITEMS

U.S. cheeses are now found in a wide variety of breakfast items beyond use in traditional cheese omelets. High-moisture cheeses such as ricotta or cream cheese with a soft texture, lend themselves well to sweet applications. Semi-hard and hard cheeses, such as swiss, parmesan or asiago, enhance the flavor of and add value to savory breakfast goods.

Baked Havarti Egg

Ingredients	Percent (%)
Eggs	64.00
Light cream	16.00
U.S. Havarti Cheese	14.00
Butter, salted	5.85
Dried dill	0.15
Total	**100.00**

Source: National Dairy Council

Procedure:

1. Melt the butter in a custard cup.
2. Add the light cream.
3. Crack the egg into the cup and top with havarti cheese.
4. Sprinkle with dill.
5. Bake at 205°C (400°F) for 10 to 12 minutes or until set.

Zippy Cheese Artichoke Oven Omelet

Ingredients	Percent (%)
Eggs	30.00
Sour cream	20.00
Artichoke hearts, chopped	15.00
Salsa, hot or mild	11.50
U.S. Monterey Jack Cheese, shredded	10.50
U.S. Sharp Cheddar Cheese, shredded	10.50
U.S. Parmesan Cheese, grated	2.50
Tomato wedges	Optional
Parsley sprigs	Optional
Total	**100.00**

Source: National Dairy Council

Procedure:

1. Butter a 25 cm (10 in) quiche dish.
2. Spread the salsa on the bottom.
3. Distribute the chopped artichokes evenly over the salsa.
4. Sprinkle parmesan cheese over the artichokes.
5. Sprinkle with monterey jack cheese and cheddar cheese.
6. Blend the eggs in a blender with the sour cream until well-mixed.
7. Pour the egg mixture over the cheeses.
8. Bake uncovered at 177°C (350°F) for 30 to 40 minutes, or until set.
9. Cut into wedges and serve garnished with tomato wedges and parsley.

Cheddar Waffles

Ingredients	Percent (%)
Waffles	
Low-fat or skim milk	32.46
All-purpose flour	27.54
Butter, melted	11.12
U.S. Sharp Cheddar Cheese	11.12
Egg whites	10.92
Egg yolks	5.31
Baking powder	0.98
Salt	0.30
Baking soda	0.25
Total	**100.00**

Source: National Dairy Council

Procedure:

1. Sift flour, baking powder, baking soda and salt into a mixing bowl. In another bowl combine egg yolks and melted, cooled butter with milk.
2. Stir liquid and dry ingredients together, and add sharp cheddar cheese.
3. Beat egg whites until stiff, and fold into batter just until barely blended.
4. Pour the batter into a heated waffle iron, covering about ⅔s of the surface and cook.
5. Place waffles into pre-heated 93°C (200°F) oven, uncovered, until ready to serve.

Blue Cheese and Pear Crêpes

Ingredients	Percent (%)
Eggs	28.00
Self-rising flour	17.00
Water	16.00
Milk	14.00
Butter (for browning)	7.00
Cornflake crumbs, crushed	6.25
U.S. Parmesan Cheese	4.75
Butter, unsalted, melted	3.50
U.S. Blue Cheese, crumbled	3.50
Pears, cut into thin slices	As needed
Total	**100.00**

Source: National Dairy Council

Procedure:

1. Blend flour, half of the eggs, milk, water and melted butter in a blender until smooth.
2. Refrigerate for at least 30 minutes.
3. Heat a lightly buttered 15-20 cm (6-8 in) crêpe pan over medium heat.
4. Pour or spoon 55 g (4 tbsp) of batter into the pan and spread out to form a round crêpe.
5. Cook on each side until lightly browned. Watch closely to avoid overcooking. Set aside. Repeat with remaining batter.
6. Place 3-4 slices of pear and 5 g (1 tsp) of crumbled blue cheese on each crêpe.
7. Fold the crêpe in half, and then in half again to form a triangle.
8. Set aside filled crêpes.
9. Lightly beat the remaining eggs.
10. Combine the cornflake crumbs and parmesan cheese in a separate bowl.
11. Carefully brush both sides of each triangle with the beaten egg, and then dip in cheese mixture to coat.
12. Melt remaining butter in a large skillet, and fry on medium-low heat until golden brown on each side.
13. Sprinkle with additional blue cheese, if desired, and serve warm.

9.4 DESSERTS

With consistent quality and long shelf life, U.S. cheeses enhance the value, consumer appeal and shelf life of premium cakes and desserts. Manufacturers can also use low-fat versions of U.S. cheeses to formulate healthy, low-calorie desserts with superb flavor and performance. U.S. cream cheese particularly creates a higher value food with a gourmet image, giving products a unique, dense texture, and characteristic dairy flavor, which in turn enhances other flavors. A key application for this segment continues to be the cheesecake, a type of cake that is known the world over and where opportunities for flavor innovation are almost limitless.

Neufchâtel and Berry Crème

Ingredients	Percent (%)
Berries, mixed, fresh or frozen	45.00
Vanilla ice cream	32.00
U.S. Neufchâtel Cheese	23.00
Fresh berries	For garnish
Total	**100.00**

Source: Chef Douglas Santi

Procedure:

1. Combine all ingredients in a food processor or blender and mix until smooth.
2. Serve on a dessert plate, garnishing with additional fresh berries.

Baked Apple with Guava Paste and Havarti Cheese

Ingredients	Percent (%)
Baking apples	63.80
U.S. Havarti Cheese, grated	21.90
Guava paste	8.70
Butter	4.40
Sugar	0.90
Cinnamon	0.30
Cinnamon sticks	For garnish
Total	**100.00**

Source: Chef David Jolbert

Procedure:

1. Slice off the top of each apple and take out the pulp, making the apple into a small bowl.
2. Save the apple tops for use as lids.
3. Melt the butter and add the sugar and ground cinnamon.
4. Brush over the skin of the apples.
5. Mix havarti cheese and guava paste together, and fill the cavity of each apple bowl to the top.
6. Place a lid on top of each apple, and bake for 15 minutes at 177°C (350°F) in a baking pan lined with aluminum foil.
7. Garnish with cinnamon sticks.

Tarte au Fromage

Ingredients	Percent (%)
Crust	
Flour, pastry	48.60
Butter, unsalted	29.50
Sugar	9.70
Egg yolk	6.30
Lemon juice	4.85
Salt	1.05
Total	**100.00**
Filling	
U.S. Cream Cheese	38.00
Sugar	22.00
Butter	19.00
Eggs	18.50
Lemon juice	2.50
Total	**100.00**

Procedure:

1. To prepare the crust, mix flour, sugar and salt.
2. Make a well in the center of the dry ingredients, and add the egg yolk and lemon juice.
3. Work in with fingers until mixture is light and creamy.
4. Work softened butter into this mixture until it forms a ball and no longer adheres to finger tips.
5. Cover the dough and refrigerate for 30 minutes.
6. Roll chilled dough to 0.3 cm (⅛ in) thickness and fit into 20 or 23 cm (8 or 9 in) tart pan.
7. Weigh down with beans or pebbles.
8. Bake crust at 205°C (400°F) for 7 minutes, or until lightly browned.
9. Remove beans and prick bottom of the shell.
10. Return shell to the oven for 2 to 3 minutes more at 190°C (375°F).

To prepare filling

1. Beat cream cheese, butter and sugar together.
2. Add eggs and lemon juice and beat until combined.
3. Pour filling into partially-baked pastry shell.
4. Bake tarte on the upper rack of the oven at 190°C (375°F) for 25 to 30 minutes.
5. Tarte is done when it is puffed and brown, and a knife placed in the center comes out clean.
6. Garnish tarte with whipped cream and fresh berries, if desired.

Mascarpone Chiffon Cake

Ingredients	Percent (%)
Egg whites	24.05
U.S. Mascarpone Cheese	20.05
All-purpose flour	14.00
Sugar	13.00
Egg yolks	10.90
Plain yogurt	8.00
Vegetable oil	6.00
Lemon juice	4.00
Powdered sugar	To taste
Total	**100.00**

Procedure:

1. Beat mascarpone cheese until smooth.
2. Add egg yolk and mix well.
3. Add lemon juice, oil, plain yogurt and flour to the mixture in that order.
4. In a separate bowl beat egg whites with sugar until stiff.
5. Gently fold half of the egg whites into the cheese mixture.
6. Repeat with the remaining egg whites.
7. Place the batter in an ungreased tube pan.
8. Bake cake in 163°C (325°F) oven for 40 to 45 minutes.
9. Turn the pan upside down to cool the cake completely.
10. When the cake is cool, remove from pan and sprinkle the top with powdered sugar.

New York Style Cheesecake

Ingredients	Percent (%)
U.S. Cream Cheese	66.57
Sugar	18.00
Eggs	11.00
Flour	3.00
Sour cream	1.00
Vanilla	0.43
Total	**100.00**

Procedure:

1. Line a 23 cm (9 in) diameter, 6.5 cm (2½ in) deep spring form pan with a graham cracker crust.
2. Beat cream cheese together with the sugar.
3. Add flour and sour cream and blend until incorporated.
4. Gradually add eggs and vanilla, mixing just until incorporated.
5. Pour into prepared pan.
6. Bake at 121°C (250°F) for 50 minutes.
7. Turn off oven and crack oven door slightly, leaving the cake for 1 hour.
8. Bring to room temperature and then refrigerate overnight before serving.

Maple Mascarpone Cheesecake

Ingredients	Percent (%)
Graham cracker crust, purchased	–
U.S. Mascarpone Cheese	28.00
Maple syrup	21.00
Eggs	16.00
Sour cream	14.00
U.S. Cream Cheese	14.00
Sugar, granulated	4.00
Corn starch	2.50
Lemon extract	0.25
Orange extract	0.25
Total	**100.00**

Procedure:

1. Beat mascarpone and cream cheese until smooth.
2. Add sour cream and sifted cornstarch.
3. Mix well.
4. Gradually add eggs, extracts and syrup, mixing just until incorporated.
5. Pour cheesecake mixture into prepared crust.
6. Place pan in water bath.
7. Bake at 177°C (350°C) for 1 hour.

Low-Calorie Orange Cheesecake

Ingredients	Percent (%)
U.S. Ricotta Cheese, part-skim	35.00
Orange juice	21.00
U.S. Cream Cheese, light, softened	19.00
Sugar, granulated	8.00
Egg whites	8.00
Egg yolks	4.25
Milk	2.50
Gelatin, unflavored	1.00
Vanilla extract	0.80
Orange zest	0.30
Salt	0.15
Total	**100.00**

Procedure:

1. Sprinkle gelatin over orange juice to soften. Set aside.
2. Combine sugar, egg yolks and milk in a pan over medium heat. Stir constantly until mixture is thickened.
3. Remove egg mixture from heat and stir in gelatin mixture until dissolved.
4. Refrigerate about 30 minutes, until mixture is the consistency of unbeaten egg whites.
5. In a separate bowl beat cheese, vanilla and orange zest until light and fluffy.
6. Stir chilled gelatin mixture into ricotta and cream cheese mixture.
7. Beat egg whites until peaks form. Fold into cheese mixture.
8. Pour into greased 23 cm (9 in) spring form pan. and refrigerate.

Cream Cheese Frosting

Ingredients	Percent (%)
Powdered sugar	57.00
U.S. Cream Cheese, softened	33.00
Butter, softened	8.00
Milk	1.50
Vanilla extract	0.50
Total	**100.00**

Procedure:

1. Beat cream cheese, butter, and vanilla until smooth.
2. Gradually beat in powdered sugar until smooth and spreadable.
3. Add milk, as needed to adjust consistency, and continue to beat until light and fluffy.

Chocolate Cheese Pie

Ingredients	Percent (%)
Crust	
Flour, all-purpose	9.50
Butter	9.00
Sugar, powdered	5.00
Filling	
U.S. Cream Cheese	30.00
Sugar, granulated	14.00
Eggs	12.00
Sour cream	11.00
U.S. Cottage Cheese	6.50
Unsweetened cocoa	3.00
Total	**100.00**

Procedure:

1. To prepare crust, mix flour and sugar together.
2. Cut butter into flour and sugar until a smooth dough forms.
3. Press dough evenly into bottom and up the sides of a 23 cm (9 in) pie plate.
4. Prick bottom and sides several times with fork. Bake at 205°C (400°F) for 8 to 10 minutes.

To prepare filling

1. Beat cottage and cream cheese with sugar until smooth.
2. Add sour cream and cocoa, beating until incorporated.
3. Gradually add eggs and beat until smooth.
4. Bake at 163°C (325°F) for about 45 minutes, or until set. Chill several hours before serving.

Tiramisu

Ingredients	Percent (%)
Ladyfinger cookies	As desired
Coffee Mixture	
Coffee-flavored liqueur	57.00
Espresso coffee, cold	43.00
Total	**100.00**
Mascarpone Filling	
Cream, heavy whipping	50.00
U.S. Mascarpone Cheese	36.00
Sugar	7.40
Egg yolks	6.30
Vanilla extract	0.30
Cocoa, unsweetened	To taste
Total	**100.00**

Procedure:

1. Mix espresso and coffee-flavored liqueur together. Set aside.
2. Beat egg yolks and sugar until they are light in texture and a pale yellow color. Add mascarpone cheese and vanilla and beat on low speed just until incorporated.
3. Beat heavy whipping cream in a separate bowl until stiff peaks form, and then gently fold into the egg yolk mixture.
4. Line a square or rectangular dish with a single layer of ladyfinger cookies. Brush lightly with the coffee mixture and pour half of the cheese mixture over the ladyfingers to completely cover them. Repeat step once.
5. Cover the dish and allow it to sit at 5°C (40°F) for several hours, or preferably overnight. Dust with unsweetened cocoa before serving.

9.5 MAIN DISHES

U.S. cheeses are perfect ingredients for product developers to use in the development of frozen and refrigerated entrées. These high-value ingredients are widely used in both ethnic and American-style dishes. U.S. cheeses come in endless varieties from mild to highly-flavored, from low-melting to high, for use in applications from pasta dishes to quiches. They add flavor, texture, and binding properties to many dishes, as well as provide an excellent source of protein for vegetarian entrées.

Swiss and Parmesan Cheese Fondue

Ingredients	Percent (%)
U.S. Swiss Cheese	72.00
Dry white wine	23.75
U.S. San Joaquin Gold, shredded	4.25
Garlic	To taste
Baguette bread, cut into small pieces	To taste
Total	**100.00**

Procedure:

1. Rub the garlic cloves on the walls of a ceramic fondue pot and place pot over low heat.
2. Pour the wine into the pot and heat it until little bubbles form, but the wine is not boiling.
3. Add the swiss and San Joaquin Gold gradually to the fondue pot, stirring the mixture constantly, so the fats do not separate out.
4. Once all the cheese is added, stir vigorously and continue to cook until slightly thickened.
5. Serve fondue very hot, keeping over a low heat.
6. Place bread pieces on long forks, and dip it into the fondue.

Spinach and Provolone Quiche

Ingredients	Percent (%)
Puff pastry	23.25
Heavy cream	12.80
Eggs	12.80
Milk	12.80
U.S. Provolone Cheese	11.60
Fresh spinach, chopped	6.50
Bacon, cut in small pieces	5.80
Ham, cut in small pieces	5.80
Onion, chopped	4.90
Butter	3.50
Garlic, chopped	0.25
Salt/pepper	To taste
Total	**100.00**

Procedure:

1. Melt butter in small pan and sauté garlic and onion, until onion is transparent.
2. Add ham and bacon to the garlic and onions.
3. Add chopped spinach to the onion mixture and sauté briefly.
4. Mix the eggs with milk and cream, adding salt and pepper to taste.
5. Stir in the provolone cheese and mix well.
6. Dust puff pastry lightly with flour, and fit into a buttered quiche pan or a shallow dish with straight sides.
7. Distribute the spinach/onion mixture evenly over the pastry.
8. Pour the egg mixture over the crust and bake in a 190°C (375°F) oven for 20 minutes, or until crust is golden.

Chicken Breasts with Mozzarella Cheese

Ingredients	Percent (%)
Tomatoes, cored, peeled, diced	35.42
Chicken breasts	26.53
U.S. Mozzarella Cheese, sliced	13.26
Cooking oil	13.26
Onion, chopped	6.55
Red wine	4.37
Garlic, chopped	0.47
Dry oregano	0.12
Salt/pepper	To taste
Total	**100.00**

Procedure:

1. Heat half of the cooking oil in a frying pan.
2. Add the onions and garlic, and sauté until they become transparent.
3. Season the mixture with salt and pepper.
4. Add tomatoes and cook for 5 minutes.
5. Add wine and oregano, and cook for 5 more minutes.
6. Set the tomato mixture aside.
7. In another frying pan, heat the remaining oil, and fry the chicken breast until lightly browned and cooked through.
8. Place them in a greased baking pan.
9. Cover chicken with the tomato mixture and then top with mozzarella cheese.
10. Place baking dish in the oven, and bake at 190°C (375°F) until mixture is heated through and the cheese is melted.

Spinach Soufflé

Ingredients	Percent (%)
Egg whites	24.30
Milk	22.90
Egg yolks	11.80
U.S. Romano Cheese	11.00
Hard boiled eggs	11.00
Spinach, chopped, steamed	8.60
Onion, diced	3.00
Butter	3.00
U.S. Swiss Cheese, shredded	2.40
Salt	1.00
Flour	1.00
Total	**100.00**

Procedure:

1. Put hard boiled egg slices on the bottom of a well-greased baking dish with straight sides.
2. Place butter and onions in a medium-sized frying pan, and stir until onions are transparent.
3. Add flour and salt, cooking over medium heat for 1 to 2 minutes.
4. Add milk and continue cooking until mixture thickens. Add romano and swiss cheeses, and stir until they are melted. Remove the pan from the heat.
5. Beat the egg yolks until they become thick and pale in color.
6. Add beaten yolks and well-drained spinach to the cheese sauce.
7. In a separate bowl beat the egg whites until they are stiff and have doubled in volume.
8. Stir ¼ of the egg whites into the cheese mixture, and then gently fold in the remaining whites.
9. Pour egg mixture on top of the hardboiled egg slices in the prepared baking dish.
10. Bake soufflé at 190°C (375°F) for about 35 minutes or until it has risen and become golden brown on the surface.
11. It will collapse slightly after coming out of the oven, so serve immediately.

Lamb Loins with New Potato and Neufchâtel Pureé

Ingredients	Percent (%)
Lamb loin chops	39.25
New potatoes	19.65
U.S. Neufchâtel Cheese	19.65
Water	19.00
Olive oil	2.45
Fresh rosemary sprigs	For garnish
Salt/pepper	To taste
Total	**100.00**

Source: Chef Douglas Santi

Procedure:

1. Peel and boil the potatoes in water until tender.
2. Puree potatoes and mix with neufchâtel cheese, adding salt and pepper to taste. Keep the purée warm in a 93°C (200°F) oven.
3. Sauté the lamb loin chops in olive oil.
4. Place potato purée on a serving plate, top with lamb chops, and garnish with the rosemary sprigs.

Stuffed Eggplant

Ingredients	Percent (%)
Eggplants, halved lengthwise	47.76
U.S. Baby Swiss Cheese, shredded	21.26
Tomato, medium, chopped	15.26
Onion, small, chopped	9.36
Sweet green pepper, chopped	3.46
Mushrooms, sliced	1.31
Olive oil	1.22
Garlic, minced	0.28
Basil, dry	0.09
Salt/pepper	To taste
Tomato, sliced	For garnish
Basil leaves	For garnish
Total	**100.00**

Procedure:

1. Hollow out the eggplants, chop the pulp, and leave shells aside.
2. Heat oil in a large skillet, and add mushrooms, green pepper, onion, garlic, basil and eggplant pulp.
3. Cook ingredients over medium heat until tender. Stir occasionally.
4. Stir in tomatoes and season to taste with salt and pepper.
5. Spoon mixture into eggplant shells, and sprinkle with shredded baby swiss cheese.
6. Bake eggplant shells in oven for 15 minutes at 218°C (425°F) until cheese melts.
7. Serve garnished with tomato slices and basil sprigs.

Stuffed Crêpes with Spinach and Asiago

Ingredients	Percent (%)
Spinach, chopped and cooked	43.91
Heavy cream	23.27
U.S. Asiago Cheese, shredded	18.66
Butter	6.26
Sweet red pepper, chopped	4.06
Flour, all-purpose	3.84
Crêpes	8 each
Salt/pepper	To taste
Sweet red pepper	For garnish
Spinach leaves	For garnish
Total	**100.00**

Procedure:

1. In a large saucepan melt butter over low heat. Stir in flour, salt, and pepper.
2. Add cream and stir over medium heat until mixture thickens.
3. Add cooked spinach, red pepper and parmesan cheese. Continue to stir until cheese melts.
4. Spoon mixture in the middle of each crêpe and roll carefully.
5. Place in individual serving dishes, garnished with spinach leaves and red pepper.

Monterey Jack Tortillas

Ingredients	Percent (%)
Chicken, cooked, chopped	51.10
U.S. Monterey Jack Cheese, shredded	24.88
Tomato sauce	13.70
Carrots, shredded	3.95
Green peppers, cooked, sliced diagonally	3.07
Coriander, chopped	1.32
Parsley, chopped	1.32
Garlic, minced	0.66
Flour tortillas	–
Salt/pepper	–
Total	**100.00**

Procedure:

1. In a food processor blend parsley, coriander, tomato sauce, garlic, salt and pepper.
2. In a large bowl mix half of the monterey jack cheese with chicken, carrots and green peppers.
3. Divide mixture evenly between the tortillas. Roll each filled tortilla and place in a baking dish.
4. Pour tomato-parsley mixture over the tortillas and cover the baking dish.
5. Bake tortillas in oven for 15 minutes at 190°C (375°F).
6. Sprinkle remaining cheese over tortillas and bake for another 5 minutes until cheese is melted.

Spaghetti & Meatballs with Parmesan

Ingredients	Percent (%)
Spaghetti, cooked	53.58
Tomatoes, chopped coarsely	18.15
Ground meat	14.88
Tomato sauce	9.30
U.S. Parmesan Cheese, shredded	2.08
Olive oil	2.01
Salt/pepper	To tasate
Lettuce	For garnish
Tomato rosettes	For garnish
Total	**100.00**

Procedure:

1. In a small bowl mix meat with salt and pepper.
2. Shape mixture into small balls.
3. In a large saucepan heat oil and cook meatballs until browned.
4. Add tomatoes and stir for 2 minutes.
5. Pour tomato sauce and cook for another 3 minutes until tomatoes are soft.
6. Lower the heat and stir in pasta. Continue to cook until heated (about 3 minutes).
7. Sprinkle with parmesan cheese and serve.

Beef Steaks with Parmesan Sauce

Ingredients	Percent (%)
Beef steaks	70.20
Beef stock	17.00
Haricot beans, boiled	3.85
U.S. Parmesan Cheese, grated	3.32
Onions, chopped	2.16
Butter, unsalted	2.16
Walnuts, crushed	1.08
Flour, all-purpose	0.23
Salt/pepper	To taste
Rosemary sprigs	For garnish
Total	**100.00**

Procedure:

1. Season beef steaks with salt and pepper.
2. Melt 1 tbsp butter in a large frying pan and cook steaks for 3 minutes on each side.
3. Transfer to paper towels to remove excess fat. Keep warm.
4. Meanwhile, in a medium-sized saucepan, melt remaining butter and stir in onions, cooking until soft.
5. Stir flour into beef stock, then pour into saucepan and continue stirring.
6. Add walnuts and season mixture with a dash of salt and pepper.
7. Bring the stock to a boil over medium heat.
8. Add parmesan cheese and stir until cheese is melted. Set sauce aside.
9. Place beef steaks on top of the beans, and pour parmesan cheese sauce over steaks.

9.6 SALADS AND SOUPS

Salads or soups are often used as the first course or introduction to a meal. Both start with similar ingredients, primarily fruits or vegetables, but result in very different end products. Salads usually consist of fresh, uncooked ingredients while soups generally are cooked and sometimes puréed. Fruit, as the basis for either a salad or soup, is complimented by cheese, or a sauce or dressing that includes cheese. Vegetables, whether in salads or soups, are enhanced by the savory flavor notes of cheeses. In either case, U.S. cheese adds texture, color and flavor to fruit or vegetable salads and soups, increasing their appeal.

Gouda and Strawberry Salad

Ingredients	Percent (%)
Salad	
Romaine, spinach or radicchio greens	42.00
U.S. Gouda Cheese	29.00
Fresh strawberries, sliced	22.00
Pecans, toasted, ground	7.00
Total	**100.00**
Strawberry Vinaigrette	
Olive oil, extra virgin	44.00
Red wine or raspberry vinegar	36.00
Strawberry jam or preserves	20.00
Salt/pepper	To taste
Total	**100.00**

Source: National Dairy Council

Procedure:

1. Tear greens into bite-sized pieces, and arrange on four salad plates.
2. Cut gouda cheese into wedges.
3. Arrange cheese and strawberries alternately on greens, using approximately the same amount on each plate.
4. Divide dressing between the four plates, and garnish with toasted ground pecans.
5. To prepare strawberry vinaigrette, whisk all ingredients together in a small bowl.
6. Place in covered container, and chill until ready to use.

Pasta and Cheddar Cheese Salad

Ingredients	Percent (%)
U.S. Cheddar Cheese	18.17
Sweet red pepper, chopped	15.85
Corkscrew pasta, cooked	12.82
Pineapple chunks, canned, drained, 3 tbsp juice reserved	12.49
Broccoli florets, blanched	10.65
Cauliflower florets, blanched	10.65
Vinegar	8.81
Almonds, chopped	4.56
Olive oil	4.56
Prepared mustard	1.20
Garlic, minced	0.24
Salt/pepper	As needed
Endive leaves	For garnish
Total	**100.00**

Procedure:

1. Place reserved pineapple juice, olive oil, vinegar, mustard, garlic, salt and pepper in a jar and shake well. Set aside.
2. Combine pasta and cauliflower in a large bowl and pour dressing over, tossing gently to coat.
3. Add broccoli, red pepper, cheddar cheese and almonds. Toss again.
4. Serve salad with endive leaves.

Rice and Mozzarella Salad

Ingredients	Percent (%)
U.S. Mozzarella Cheese	22.87
Celery stalks, chopped	17.12
Carrots, grated	14.10
Rice, cooked	11.48
Sweet green pepper, sliced	9.97
Onion, finely sliced	8.56
Mayonnaise	6.04
Prepared mustard	6.04
Raisins	2.01
Walnuts, chopped	1.81
Salt	As needed
Pepper	As needed
Lettuce leaves	For garnish
Cherry tomatoes	For garnish
Total	**100.00**

Procedure:

1. In a small bowl mix mayonnaise, mustard, salt and pepper until well-blended.
2. In another bowl combine half of the mozzarella cheese, cooked rice, celery, carrots, green pepper, onions, walnuts and raisins.
3. Add dressing and mix gently.
4. Sprinkle remaining mozzarella on top.
5. Serve salad on lettuce leaves and garnish with cherry tomatoes.

Fruit and Colby Jack Cheese Salad

Ingredients	Percent (%)
U.S. Colby Jack Cheese	39.78
Apples, cored, sliced	20.86
Grapefruit, sectioned, chopped	15.78
Kiwi, peeled, cubed	15.78
Lemon juice	7.54
Lemon rind	0.26
Lettuce leaves	For garnish
Dill sprigs	For garnish
Total	**100.00**

Procedure:

1. In a large bowl mix apple slices with lemon juice and rind.
2. Add grapefruit sections, kiwi and colby jack cubes. Toss gently.
3. Arrange lettuce leaves and dill sprigs on salad dishes.
4. Spoon mixture and serve.

Caesar Salad

Ingredients	Percent (%)
Salad	
Romaine lettuce, washed, broken into small pieces	86.50
Garlic croutons	7.00
U.S. Parmesan Cheese, freshly grated	6.50
Total	**100.00**
Caesar Dressing	
Olive oil	57.80
Anchovy filets	22.70
Lemon juice	15.00
Garlic	4.50
Salt	To taste
Total	**100.00**

Procedure:

1. Chill washed lettuce in refrigerator until salad is needed.
2. To prepare Caesar dressing, place oil in a blender.
3. Mash the garlic and anchovies together, and add to the oil.
4. Blend until smooth and creamy.
5. Add lemon juice and salt and mix until combined.
6. Pour dressing over Romaine lettuce, and toss until leaves become coated and shiny.
7. Add croutons and toss lightly to mix.
8. Sprinkle parmesan cheese over salad immediately before serving.

Three Cheese Soup with Grapes

Ingredients	Percent (%)
Chicken broth	50.00
Heavy cream	10.50
Green grapes	10.20
Onion, sliced	7.50
U.S. Brie Cheese	5.25
U.S. Camembert Cheese	5.25
U.S. Gruyère Cheese	5.25
Butter	3.50
Flour	1.50
Salt	0.55
Dry chicken bouillon	0.50
Black pepper	To taste
Total	**100.00**

Procedure:

1. Sauté onion and butter in a large saucepan until onion becomes transparent.
2. Add the flour and stir constantly for 2 to 3 minutes.
3. Add liquid chicken broth and dried chicken bouillon, and stir until everything is dissolved and mixture has thickened slightly.
4. Add heavy cream, brie, camembert and gruyère cheeses.
5. Continue to stir until the cheeses have melted.
6. Place in the blender and blend until smooth.
7. Strain with a colander and adjust seasoning.
8. Serve garnished with grapes.

Carrot Zucchini Soup

Ingredients	Percent (%)
Milk	24.00
Zucchini, sliced	20.00
Chicken broth, condensed	20.00
Carrots, sliced	16.00
U.S. Cottage Cheese	15.00
Onion, chopped	5.00
Marjoram, crushed	To taste
Pepper, black	To taste
Total	**100.00**

Procedure:

1. Combine zucchini, carrots, onion, chicken broth and majoram in saucepan.
2. Bring to a boil and cover.
3. Turn heat down and simmer 10 to 15 mintues or until vegetables are tender.
4. Blend half of the soup mixture and half of the cottage cheese in a food processor until smooth.
5. Pour into pot.
6. Repeat with remaining soup and cottage cheese.
7. Mix all of the blended soup with milk and pepper.
8. Adjust seasoning, if desired.
9. Heat soup, but do not boil.

Cheesy Garden Vegetable Soup

Ingredients	Percent (%)
Milk	24.00
Chicken stock	23.00
Tomatoes, chopped	18.00
U.S. Sharp Cheddar Cheese, shredded	11.00
Zucchini, chopped	10.00
Corn kernels	8.00
Butter	4.50
Flour	1.50
Total	**100.00**

Procedure:

1. Heat butter until sizzling.
2. Stir in flour.
3. Cook 1 to 2 minutes over medium heat until bubbly.
4. Gradually add milk, stirring until smooth.
5. Add chicken stock and continue cooking until slightly thickened.
6. Add sharp cheddar cheese and stir until smooth.
7. Add remaining ingredients.
8. Cook over low heat until vegetables are heated through.

Mexican-Style Corn Soup

Ingredients	Percent (%)
Chicken broth, condensed	40.00
Salsa	20.00
Corn kernels	19.00
U.S. Monterey Jack Cheese, shredded	12.00
Green pepper, chopped	3.00
Butter	3.00
Flour	2.00
Green onions, chopped	1.00
Black pepper	To taste
Pepper	To taste
Oregano	To taste
Total	**100.00**

Procedure:

1. Melt butter.
2. Sauté green pepper, onion and garlic until tender (about 5 minutes).
3. Stir in flour and seasonings and cook for 1 to 2 minutes.
4. Gradually stir in chicken broth and salsa.
5. Bring to a boil, stirring constantly for 1 minute.
6. Stir in monterey jack cheese and corn.
7. Stir until cheese is completely melted.
8. Do not boil soup once cheese is added.

Swiss Cheese Broccoli Soup

Ingredients	Percent (%)
Broccoli, frozen, cooked, drained	33.19
Milk	27.39
Chicken broth	18.26
U.S. Swiss Cheese, fat-free, grated	18.84
Onion, minced	1.16
Butter, unsalted	1.16
Salt/pepper	As needed
Green onion, strips	For garnish
Carrot florets	For garnish
Paprika	For garnish
Total	**100.00**

Procedure:

1. In a large saucepan melt butter over medium heat, and sauté onions until soft.
2. Stir in chicken broth, milk and broccoli.
3. Lower heat and cook until heated through.
4. Add fat-free swiss cheese, salt and pepper.
5. Cook soup until cheese melts, stirring frequently. Pour into individual bowls.
6. Serve garnished with green onion, carrot florets and paprika.

Cheese Chowder Soup

Ingredients	Percent (%)
Red potato, peeled, diced	26.00
Milk	20.00
Carrots, diced	19.00
Chicken broth	12.00
Wine, dry white	7.00
Celery, sliced	6.00
U.S. Cheddar Cheese, sharp, shredded	4.50
Green onion, chopped	2.00
U.S. Swiss Cheese, shredded	2.00
Flour, all-purpose	1.50
Salt	To taste
Pepper, white	To taste
Nutmeg	To taste
Total	**100.00**

Procedure:

1. Sauté carrot, celery and green onions for 8 minutes.
2. Add potato and chicken broth. Bring to a boil. Cover, reduce heat and simmer for 25 minutes, or until tender.
3. Separately, gradually mix flour with milk using a wire whisk. Add to vegetable mixture.
4. Stir in salt, pepper and nutmeg. Cook over low heat until thickened, about 2 minutes.
5. Add wine. Cook 1 minute.
6. Remove from heat. Add cheddar and swiss cheeses, stirring until cheeses melt.

9.7 SANDWICHES AND PIZZA

From the traditional ham and swiss cheese on rye bread, to tacos topped with grated cheddar, sandwiches or other handheld items continue to be a popular choice for lunch. U.S. cheese alone, or with meats and vegetables, remains a preferred filling for sandwiches. U.S. cheeses are available in hundreds of variations from processed, pre-sliced and individually wrapped, to gourmet, highly-flavored, aged cheeses such as brie or blue. All of these add value, flavor and nutrition to sandwiches.

U.S mozzarella, provolone and parmesan are common ingredients for pizza, but today's market is seeing the use of many non-traditional cheeses, offering an almost endless variety of taste and value. Ready-to-use, pre-shredded and blended cheeses provide product consistency, while controlling costs. U.S. suppliers also offer many custom-made products to comply with specifications for color, melt and flavor profile.

Cheddar and Monterey Jack Panini

Ingredients	Percent (%)
Tomato, sliced thin	35.00
U.S. Cheddar Cheese, sliced	24.25
U.S. Monterey Jack Cheese, sliced	24.25
Mayonnaise	8.50
Butter	8.00
French bread, sliced thick	To taste
Fresh basil leaves	To taste
Black pepper, freshly ground	To taste
Total	**100.00**

Source: National Dairy Council

Procedure:

1. Allow 2 slices of French bread for each Panini sandwich.
2. Spread mayonnaise on 1 side of each slice.
3. Layer 1 slice each of cheddar and monterey jack cheeses, 2 slices tomato, and basil leaves.
4. Add pepper to taste.
5. Spread butter on the outside of bread slices, and grill until cheese melts.

Cheesy New York High Rise Club

Ingredients	Percent (%)
Onion rye bread, uncut loaf	34.25
U.S. Brie Cheese, rind removed	11.40
U.S. Aged Swiss Cheese, sliced	11.40
Pastrami, sliced	11.40
Baby spinach, washed	10.05
Red onion, sliced	9.95
Butter, unsalted	5.70
U.S. Caraway Havarti Cheese, sliced	5.70
Dried red pepper flakes	0.08
Black pepper	0.07
Dijon mustard	To taste
Total	**100.00**

Source: National Dairy Council

Procedure:

1. Slice loaf of bread lengthwise in thirds.
2. Soften brie cheese for 1 minute in the microwave.
3. Crush or mash brie cheese with butter, red pepper flakes and black pepper in a bowl or food processor.
4. Spread brie mixture over cut sides of the bread, including both sides of the middle piece.
5. Add half the onions, the swiss cheese slices, pastrami slices, and half the spinach on the bottom slice of bread spread with brie mixture.
6. Top with the middle slice of rye bread; add the remaining onions, havarti cheese and remaining spinach.
7. Close the sandwich with remaining slice of brie-buttered bread.

Peachy Blue Cheese Blockbuster

Ingredients	Percent (%)
French bread, whole loaf, split lengthwise	34.00
Raspberry jam, seedless	17.00
U.S. Blue Cheese, crumbled	12.75
U.S. Provolone Cheese, sliced	12.75
U.S. Swiss Cheese, sliced	12.75
Fresh peach, cut into thin wedges	6.50
Almonds, sliced, toasted	4.25
Total	**100.00**

Source: National Dairy Council

Procedure:

1. Gently stir jam and crumbled blue cheese together until well-mixed.
2. Spread jam and blue cheese mixture on both cut surfaces of bread.
3. Place peach slices, provolone cheese, and swiss cheese slices on the bottom layer of the french bread.
4. Sprinkle sliced almonds evenly over cheese.
5. Top with the remaining half of french bread with the jam side down.
6. Secure the pieces with toothpicks.

Provolone Club Sandwich

Ingredients	Percent (%)
White bread, sliced, crust removed	25.05
U.S. Provolone Cheese, shredded	23.70
Smoked chicken breast, sliced	20.88
Sweet red pepper, grilled	20.66
Milk	6.16
Mayonnaise	3.13
Sugar	0.42
Total	**100.00**

Procedure:

1. Peel red peppers, remove seeds, chop and set aside.
2. In a medium bowl mix provolone cheese, milk, red pepper and sugar.
3. Spread mayonnaise on each bread slice and top 4 with chicken breast slices.
4. Spoon cheese mixture on 4 other bread slices and put over chicken breast layer.
5. Add remaining bread slices.
6. Cut the sandwich diagonally and serve.

Toasted Salami & Pepato Sandwich

Ingredients	Percent (%)
U.S. Pepato Cheese, shredded	50.00
White bread, sliced	23.53
Salami, finely chopped	22.06
Butter, unsalted, softened	4.12
Dry mustard	0.29
Black olives	–
Total	**100.00**

Procedure:

1. In a medium bowl mix half of the pepato cheese, the salami, and dried mustard.
2. Spread bread slices with butter, then sprinkle each with cheese mixture.
3. Toast bread slices until cheese melts.
4. Serve with black olives and remaining pepato cheese.

Blue Cheese and Buffalo Chicken Pizza

Ingredients	Percent (%)
Pizza crust, pre-baked, 30 cm (12 in)	1 crust
Chicken breast, cooked, 1 cm (1/2 in) cubes	25.04
Buffalo wing pepper sauce (Red Hot brand)	16.64
Sour cream	16.64
U.S. Monterey Jack Cheese, shredded	12.52
Blue cheese, crumbled	12.52
Celery, chopped finely	12.52
Green onion, chopped	4.12
Total	**100.00**

Source: Regi Hise, Foodtrends, LLC

Procedure:

1. Toss cooked chicken with buffalo wing pepper sauce and marinate overnight.
2. Spread sour cream over pizza crust.
3. Top sour cream with monterey jack cheese.
4. Arrange chicken over the cheese.
5. Bake* for 8 minutes or until cheese is melted.
6. Remove from oven and top with celery, green onions and blue cheese crumbles.
7. Bake 2 additional minutes to warm all ingredients and soften blue cheese.

Mozzarella and Dry Jack Margherite Pizza

Ingredients	Percent (%)
Pizza crust, pre-baked, 30 cm (12 in)	1 crust
Roma tomatoes	39.20
U.S. Whole Milk Mozzarella, shredded	19.52
U.S. Aged Asiago Cheese, shredded	19.52
Fresh basil, whole leaves or torn in half	14.68
Pine nuts	4.83
Garlic-flavored olive oil	2.25
Total	**100.00**

Source: Regi Hise, Foodtrends, LLC

Procedure:

1. Place fresh basil on baked pizza crust.
2. Place sliced tomato slices over, overlapping with basil leaves.
3. Spread mozzarella over tomatoes and crust.
4. Top with asiago cheese.
5. Sprinkle pine nuts over pizza.
6. Drizzle garlic-flavored olive oil over pizza.
7. Bake* until cheese and crust are nicely browned, and pine nuts are toasted.

Fontina, Asparagus and Prosciutto Pizza

Ingredients	Percent (%)
Pizza crust, pre-baked, 30 cm (12 in)	1 crust
U.S. Fontina Cheese, shredded	45.22
Asparagus, 2.5 cm (1 in) bias cut, blanched	22.51
Prosciutto, sliced thin and julienned	16.93
Red onion, sliced into rings	11.35
Olive oil	2.59
Garlic, minced	0.80
Shallots, minced	0.60
Total	**100.00**

Source: Regi Hise, Foodtrends, LLC

Procedure:

1. Combine garlic, shallots, and olive oil, and spread over crust.
2. Place about 2/3 of the fontina cheese on top of the garlic/shallot mixture.
3. Arrange asparagus, prosciutto and red onions on top of the fontina.
4. Bake* for 10 to 12 minutes or until cheese is melted and slightly browned.

*Oven Temperatures
Convection Oven: 218° – 232°C (425° – 450°F)
Standard Oven: 260°C (500°F)
Pizza Deck Oven: 288° – 316°C (550° – 600°F)

Gorgonzola, Cream Cheese, and Caramelized Onion Pizza

Ingredients	Percent (%)
Pizza crust, pre-baked, 30 cm (12 in)	1 crust
Onions, sliced	46.20
U.S. Cream Cheese	23.10
U.S. Gorgonzola Cheese, cubed	23.10
Pecans, chopped	7.60
Total	**100.00**

Source: Regi Hise, Foodtrends, LLC

Procedure:

1. Caramelize onions in hot oven, or sauté in a pan over high heat until well-browned. Remove from heat and let cool.
2. Spread cream cheese evenly over pizza crust.
3. Top cream cheese with cooled, caramelized onions.
4. Place gorgonzola cubes over the pizza and sprinkle with chopped pecans.
5. Bake* 7 to 10 minutes or until crust is slightly browned and gorgonzola is melted.

*Oven Temperatures
Convection Oven: 218° – 232°C (425° – 450°F)
Standard Oven: 260°C (500°F)
Pizza Deck Oven: 288° – 316°C (550° – 600°F)

Brie, Monterey Jack, Spinach and Ham Pizza

Ingredients	Percent (%)
Pizza crust, pre-baked, 30 cm (12 in)	1 crust
Tomato, peeled, chopped, drained	22.70
Pizza sauce	15.08
U.S. Brie Cheese, sliced 1 cm (1/2 in) thick	15.08
U.S. Monterey Jack Cheese, shredded	15.08
Red onion, chopped coarsely	11.35
Ham, 1 cm (1/2 in) dice	11.35
Spinach leaves, torn	7.62
Fresh oregano, chopped	0.67
Olive oil	0.60
Cumin, ground	0.27
Garlic, minced	0.20
Total	**100.00**

Source: Regi Hise, Foodtrends, LLC

Procedure:

1. Combine onion and garlic, and toss with 1 tsp olive oil. Roast or sauté until soft.
2. Place tomatoes on crust and sprinkle with chopped oregano.
3. Spread monterey jack cheese over, followed by diced ham, onion mixture, and brie slices. Sprinkle with cumin.
6. Toss spinach with 1 tsp of olive oil and place around pizza, slightly covering brie.
7. Bake* 8 to 10 minutes or until brie is well-melted and the crust is lightly browned.

Pineapple, Coconut and Cream Cheese Pizza

Ingredients	Percent (%)
Pizza crust, pre-baked, 30 cm (12 in)	1 crust
U.S. Cream Cheese, softened	32.76
Pineapple, chopped in small pieces	27.36
Macadamia nuts, toasted, chopped	10.98
Coconut, shredded	10.98
Egg, beaten	10.60
Chocolate, shavings or sprinkles	5.40
Powdered sugar	1.25
Vanilla	0.67
Total	**100.00**

Source: Regi Hise, Foodtrends, LLC

Procedure:

1. Blend vanilla and egg with cream cheese and half of the shredded coconut. Mix well.
2. Spread mixture over curst.
3. Top mixture with chopped pineapple.
4. Spread remaining coconut and toasted macadamia nuts over the pineapple.
5. Bake* for 10 to 12 minutes or until crust is lightly browned and coconut is toasted.
6. Top with chocolate shaving or sprinkles.

9.8 SAUCES AND DRESSINGS

New varieties of U.S. cheeses or blends of old favorites add flavor, texture and protein to ordinary sauces or dressings. Sauces can be used in or over many applications from appetizer dips and vegetable toppings to accompaniments for pasta. Surface-ripened cheeses such as brie add creaminess and richness, while sharper aged cheeses add distinct, piquant notes.

Alfredo Sauce

Ingredients	Percent (%)
Cream, heavy	64.00
U.S. Parmesan Cheese, grated	21.00
Butter	15.00
Salt	To taste
Pepper	To taste
Total	**100.00**

Procedure:

1. Heat cream, butter and salt over medium heat.
2. Bring this mixture to a boil.
3. Continue to cook, stirring constantly, until the mixture has thickened somewhat.
4. Remove from the heat and stir in parmesan cheese.
5. Season to taste with fresh ground pepper.

Cheddar Cheese Sauce

Ingredients	Percent (%)
Milk	70.00
U.S. Aged Cheddar Cheese, shredded	17.00
Butter	8.00
Flour, all-purpose	5.00
Salt	To taste
Pepper	To taste
Total	**100.00**

Procedure:

1. Slowly melt butter over low heat (45°C/115°F) in a saucepan.
2. Add flour, salt and pepper, and stir to make a smooth paste.
3. Cook for 1 to 2 minutes with continuous stirring.
4. Gradually add milk to flour mixture, stirring until completely incorporated.
5. Bring the mixture to a boil while stirring continuously and cook until mixture is thickened (about 1 minute).
6. Remove from heat and add cheddar cheese, stirring until melted.

Home Made Blue Cheese Dressing

Ingredients	Percent (%)
Buttermilk	33.03
Mayonnaise	33.03
U.S. Blue Cheese, crumbled	33.03
Lemon juice, fresh	0.51
Garlic, minced	0.29
Black pepper, ground	0.11
Cayenne pepper	–
Total	**100.00**

Source: Regi Hise, Foodtrends, LLC

Procedure:

1. Combine all ingredients, except the blue cheese, mixing well.
2. Fold coarsely crumbled blue cheese into the dressing mix.
3. Let dressing rest overnight for flavors to blend.

Note: As the dressing sits, it will thicken. It may be thinned to desired consistency with cream. Additional blue cheese crumbles may be used to top salads.

Caesar Dressing

Ingredients	Percent (%)
Olive oil, extra virgin	45.52
U.S. Parmesan Cheese, grated	15.13
Red wine vinegar	14.73
U.S. Parmesan Cheese, shredded	7.63
Anchovy filets	7.63
Lemon juice, fresh	3.88
Worcestershire sauce	2.14
Prepared yellow mustard	2.01
Garlic, minced	0.80
Tabasco sauce	0.33
Black pepper, ground	0.20
Lettuce leaves, torn	For garnish
Croutons	As desired
Lemon wedges	For garnish
Total	**100.00**

Source: Regi Hise, Foodtrends, LLC

Procedure:

1. Combine all ingredients, except olive oil, and mix together using a food processor or blender. Process until all ingredients are well chopped and blended.
2. Slowly add olive oil in a thin stream, and continue to process the mixture until olive oil is incorporated. Dressing should be thick and well-emulsified when done.
3. Pour dressing over chopped or torn romaine lettuce and toss well to coat evenly.
4. Top with croutons, shaved or shredded cheese and garnish with a lemon wedge.

9.9 SIDE DISHES

Side dishes include a wide variety of products that could be meat, vegetable or starch-based, minimally-processed or cooked. One of the most important functions of cheeses in this category, besides flavor, is probably the added-value and consumer appeal. Several types of U.S. cheeses can be extruded or used as fillings in side dishes. Non-melting cheeses can be used wherever maintaining product integrity is important.

Cheddar and Radicchio Risotto

Ingredients	Percent (%)
Chicken broth, hot	59.90
Arborio rice, uncooked	16.50
U.S. Cheddar Cheese, shredded	7.70
Radicchio, chopped	4.80
U.S. Parmesan Cheese, shredded	3.90
Butter	3.90
Onion, minced	1.90
Olive oil	1.40
Salt/pepper	To taste
Total	**100.00**

Source: Chef Douglas Santi

Procedure:

1. Add olive oil to a heated pan and sauté the minced onion.
2. Add the rice and stir so that the rice is coated with oil.
3. Add 220 g (1 cup) broth.
4. Continue stirring so the rice does not stick.
5. Add small amounts of the remaining hot broth periodically until all broth is absorbed by the rice.
6. Stir in the butter and cheddar cheese.
7. Add the radicchio and cook over low heat for 5 minutes.
8. Add salt and pepper to taste.
9. Sprinkle the parmesan cheese and serve immediately.

Shrimp and Asiago Cheese Stuffed Potatoes

Ingredients	Percent (%)
Potatoes, medium, baked	59.36
U.S. Asiago Cheese, shredded	22.32
Baby shrimp, cooked, peeled	15.76
Mayonnaise	1.97
Lemon juice	0.59
Salt/pepper	To taste
Lettuce	As desired
Lemon slices	To garnish
Total	**100.00**

Procedure:

1. Cut the potatoes in half lengthwise, and scoop out the inside of the potato.
2. In a medium bowl mix potato with shrimp, mayonnaise, lemon juice, and half of the asiago cheese, salt and pepper.
3. Distribute potato mixture evenly between the potato shells and sprinkle with remaining asiago cheese.
4. Bake potatoes in 177°C (350°F) oven for 30 minutes or until heated through and cheese is melted.
5. Serve with lettuce and garnish with lemon slices.

Potatoes, Twice Baked

Ingredients	Percent (%)
Potatoes, baking	68.00
U.S. Cottage Cheese	24.50
Butter, softened	5.50
Pimiento, chopped	1.00
Green onion, chopped	1.00
Salt	To taste
Pepper	To taste
Total	**100.00**

Procedure:

1. Bake potatoes for 1 hour at 205°C (400°F).
2. Cut hot potatoes into half lengthwise.
3. Scoop out potato, saving the shells.
4. Whip potatoes, cottage cheese, butter, chives, salt and pepper until fluffy.
5. Fold in pimiento.
6. Place potato mixture back into potato shells.
7. Increase oven temperatue to 232°C (450°F) and bake for 12 to 15 minutes or until tops are golden brown.

Scalloped Potatoes Au Gratin

Ingredients	Percent (%)
Potatoes, 1 cm (1/2 in) slices (Idaho or Yukon Gold)	37.92
Whole milk	13.84
White onions, sliced thin	10.49
U.S. Mild Cheddar Cheese, shredded	7.13
U.S. Aged Cheddar Cheese, shredded	7.13
U.S. Gruyère Cheese, shredded	7.13
U.S. Swiss Cheese, shredded	7.13
Light cream	4.45
U.S. Parmesan Cheese, shredded	4.45
Garlic, minced	0.33
Salt/pepper/nutmeg	To taste
Total	**100.00**

Source: Regi Hise, Foodtrends, LLC

Procedure:

1. Toss together mild cheddar, aged cheddar, gruyère, and swiss cheeses.
2. Butter or spray pan release around the sides of an 28 x 43 cm (11 x 17 in) baking dish.
3. Place a layer of potato slices (about 1/3 total) on the bottom of the dish.
4. Top with half of the onions and half of the minced garlic, salt, pepper, nutmeg and 1/3 of the shredded cheese mixture.
5. Repeat the layer of potatoes, onion, garlic, shredded cheese, salt, pepper and nutmeg.
6. Place a final layer of potatoes on top, and sprinkle with the remaining 1/3 of shredded cheese.
7. Pour milk and cream over the potato mixture in the baking dish, and top with parmesan cheese.
8. Bake at 163°C (325°F) for about 2 hours, or until top is golden brown and crusty. Cover loosely with foil if it is browning too quickly, before the potatoes are done.
9. May be cooked ahead and reheated.

Sharp Cheddar Cheese Rice Casserole

Ingredients	Percent (%)
Tomatoes, large, sliced	23.00
Milk	18.98
U.S. Sharp Cheddar Cheese, shredded	13.05
Pepperoni, chopped	12.88
Onion, large, chopped	11.50
Rice, cooked	6.56
Celery stalks, chopped	6.50
Bread crumbs	2.87
Butter, unsalted	2.41
Prepared mustard	1.73
Flour, all-purpose	0.52
Salt/pepper	To taste
Total	**100.00**

Procedure:

1. Set aside cooked rice, but keep warm.
2. Meanwhile, melt butter in a large saucepan. Stir in onions, celery and pepperoni, cooking until golden.
3. Lower the heat, add flour and cook for 2 minutes.
4. Gradually blend in milk and stir until sauce thickens. Simmer for 3 minutes.
5. Add mustard, half of the cheddar cheese, salt and pepper.
6. Add sauce to rice mixture, and blend well. Place in baking dish.
7. Arrange tomato slices in the center; sprinkle bread crumbs and remaining cheddar cheese over rice mixture.
8. Bake in 218°C (425°F) oven for 15 minutes.

Beefsteak Tomatoes, Stuffed with Couscous

Ingredients	Percent (%)
Beefsteak tomatoes	52.35
U.S. Blue Cheese, crumbled	15.10
Water, boiling	10.65
Red onions, cut into quarters	7.45
Couscous	5.30
Chorizo (or other spicy sausage), cooked, drained	5.30
Garlic, minced	1.70
Olive oil	1.50
Fresh basil	0.65
Salt/pepper	To taste
Total	**100.00**

Recipe and photo courtesy of Arla Foods

Procedure:

1. Place onions and garlic on a baking pan, drizzle with olive oil and roast for 30 to 45 minutes at 177°C (350°F), or until soft.
2. Chop into smaller pieces when they are cool.
3. Add boiling water to couscous and cover.
4. After 5 minutes remove cover and fluff couscous with a fork.
5. Add garlic and onions to couscous.
6. Slice tops off the tomatoes and carefully scoop out centers.
7. Chop tomato centers and add to couscous.
8. Stir blue cheese, chopped basil and spicy sausage into couscous mixture, seasoning to taste with salt and pepper.
9. Place mixture back into hollowed tomatoes and put tops back on.
10. Bake in shallow dish at 177°C (350°F) for 20 to 25 minutes.

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