U.S. Dairy Export Council®

INSIDE:

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USDEC News
March 2008

U.S. Dairy Exports Top $3 Billion

U.S. dairy exports reached $3.060 billion in 2007, up 62% from the prior year, and nearly triple the export value of 2002, according to the U.S. Dairy Export Council (USDEC) analysis of U.S. Department of Agriculture (USDA) data.

Although the trend had been developing for several years, a variety of factors came together in late 2006 to set the stage for a dramatic, worldwide structural shortage of dairy products in 2007 – and U.S. suppliers stepped up to fill the need.

On the supply side, these included devastating weather-related production declines in Australia and Argentina; lack of growth in Europe due to production quotas and ongoing cuts in support prices; and export restrictions in India and Argentina.

Meanwhile, the suspension of export subsidies in Europe and the continual weakening of the U.S. dollar helped make U.S. dairy products more competitive on the world market.

And through it all, exceptional demand from developed and developing countries alike left buyers in a sellers' market for most of the year. Dietary changes in the developing countries of Asia have been a massive draw on milk components in recent years. Demand from Latin America, the Middle East and Russia have also been particularly strong in recent years.

Meanwhile, market tightness was aggravated by an absence of government stocks and low commercial inventories to fall back on.

Mexico ($858 million export value in 2007), Southeast Asia ($556 million) and Canada ($358 million) remained the largest destinations for U.S. dairy products, says USDA. The largest-growing markets were Mexico (+$413 million vs. 2006),

(continued on page 2)

Canada (+$95 million), Japan (+$70 million), the European Union (+$67 million), the Philippines (+$56 million) and Malaysia (+$49 million).

Gains were evident across nearly all product categories, due to a combination of higher export prices and increased export volumes.

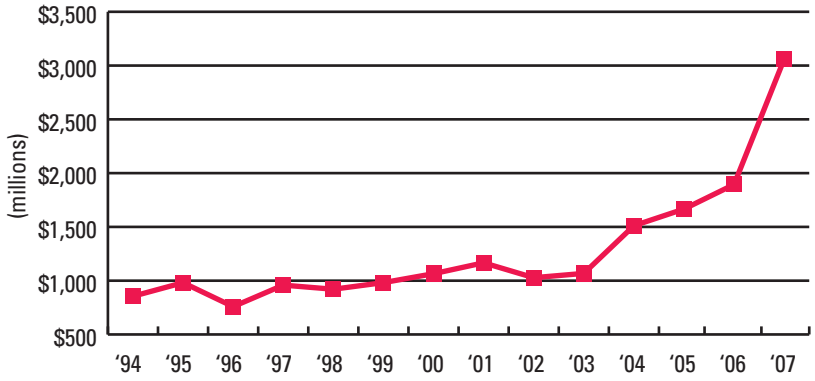
By value, the major U.S. dairy exports were skimmed milk powder (SMP) ($836 million), whey proteins ($657 million), cheese ($387 million) and lactose ($304 million). These four categories made up nearly three-quarters of the total U.S. exports.

U.S. **SMP** exports were 257,800 metric tons (MT) in 2007, down 10% from the prior year. Shipments to Mexico, our largest single market, were up 13% in 2007. However, exports to our next four largest customers by volume – the Philippines, Indonesia, Malaysia and Vietnam – were down 6%. In addition, sales to our largest customer in North Africa – Egypt – declined 45% and exports to China dropped 60%. Significant new sales volume was achieved in Thailand, Bangladesh, Libya and Israel.

Last year was another record year for U.S. **whey** exports, with combined shipments of 418,292 MT, up 21% from the year before. Exporters continued to push higher-value whey proteins: sales of whey protein concentrate (WPC) jumped 43% to 139,361 MT and exports of whey protein isolate (WPI) gained 23% to 13,899 MT. Meanwhile, exports of sweet whey increased 17% to 265,032 MT.

Exports of sweet whey to Canada and Mexico jumped 121%, to 74,019 MT. In the rest of the world, however, sales dropped 1% as higher prices curtailed demand in some developing countries. Shipments to China dropped 10% in 2007 and exports to Southeast Asia dropped 5%.

Value of U.S. Dairy Exports



2007 U.S. Dairy Export Value by Country

Country	$ (Millions)	% of Total
Mexico	$858	28.0%
SE Asia	$556	18.2%
Canada	$358	11.7%
Middle East/N. Africa	$228	7.5%
Japan	$185	6.0%
China	$153	5.0%
EU	$152	5.0%
Caribbean/Central America	$145	4.7%
South Korea	$92	3.0%
South America	$76	2.5%
Oceania	$45	1.5%
Other	$212	6.9%
TOTAL	$3,060	100%

USDECNews is published by the U.S. Dairy Export Council (USDEC) and is designed to provide up to date information about the U.S. dairy industry for the benefits of our international partners.

USDEC was formed by Dairy Management Inc. in 1995 to enhance the U.S. dairy industry's ability to serve international markets. USDEC is an independent non-profit membership organization representing dairy processors, exporters, milk producers and industry suppliers.

USDEC supports international buyers of dairy products by providing information about U.S. suppliers, their products and capabilities. We bring buyers and sellers together through conferences, trade missions and trade shows. USDEC furnishes application and usage ideas for U.S. dairy ingredients through seminars, one-on-one consultations and technical publications. We assist with foodservice promotions, menu development and education. We also work with local authorities to resolve market access issues that ensure reliable delivery for customers and importers. When you work with USDEC and its members, you are partnering with companies that manufacture and export more than 85% of all U.S. dairy products.

Once again, the bulk of the gains in exports of WPC went to Mexico, by far our largest market with 56,404 MT (+57%). Expanded sales also materialized in Canada, Japan, Russia, China and Indonesia. Further, WPI exports to Mexico, our largest market, jumped 98%, while sales to the rest of the world increased 6%.

U.S. **cheese** exports hit a record high 99,431 MT in 2007, up 40% from the prior year, says USDA. Shipments to Mexico and Japan, our two largest markets, increased 38% and 30%, respectively, while exports to the Caribbean and Central America were up 26%, South Korea gained 22% and the Middle East/North Africa increased 76%.

With changes in global cheese dynamics, U.S. suppliers shipped 6,389 MT of cheese to the European Union in 2007, nearly triple the level of the prior year.

USDA's Foreign Agriculture Service stated U.S. **lactose** exports at 335,514 MT, up 41% from a year ago. However, Census Bureau reports suggest the USDA figures are overstated due to data error. USDEC members report lactose exports up modestly in 2007 vs. 2006 levels.

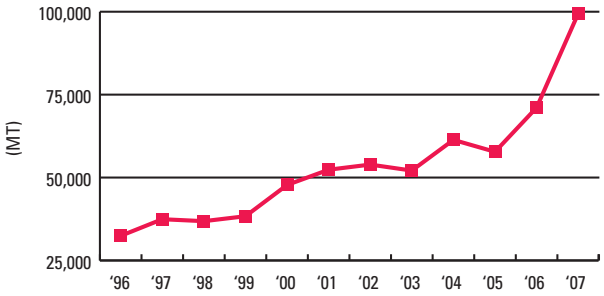
Shipments of **butterfat** increased almost four-fold, to 39,725 MT. This was the highest figure since 1995, when the majority of U.S. exports were via government programs. Of this total, more than one-third of the shipments went to the European Union, a remarkable volume for a region that imported less than 200 MT in 2006. In addition, exports to the Middle East/North Africa increased 174% and butterfat shipments to Mexico more than doubled.

Exports of **fluid milk** increased 85% in 2007, to 44.9 million liters. Shipments to Mexico, which make up nearly two-thirds of our exports, were up 91% and exports to Canada increased 82%.

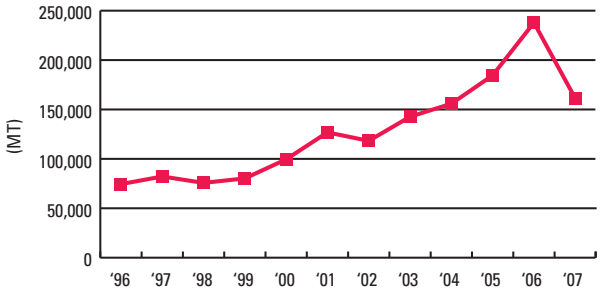
Ice cream exports dropped 3% to 25,757 MT. Exports to Mexico, our primary market, decreased by 4%.

Exports of **food preparations** increased 19% to 78,595 MT. More than one-third of our sales went to Canada, which boosted purchases by 18%.

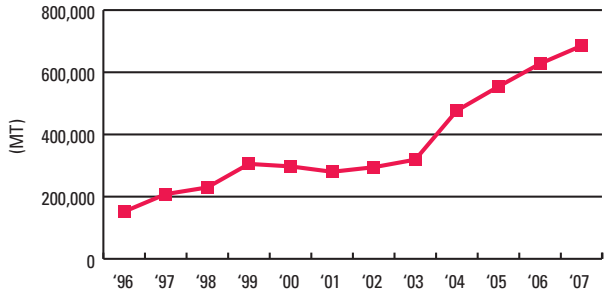
U.S. Cheese Exports



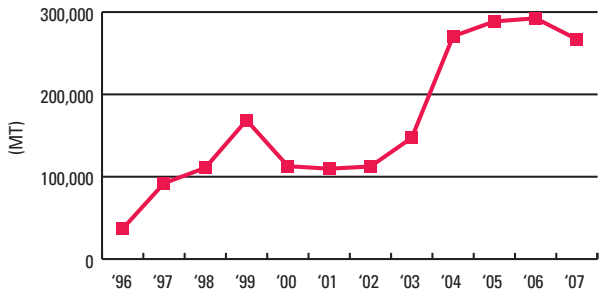
U.S. Lactose Exports



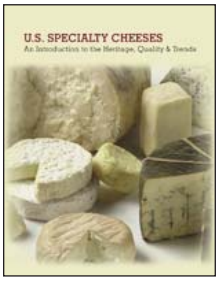
U.S. Sweet Whey, WPC and WPI Exports



U.S. Skimmed Milk Powder Exports



More from USDEC



USDEC has a new publication

U.S. Specialty Cheeses Brochure

This introduction to U.S. Specialty Cheeses offers a glimpse into the rich tradition of specialty cheese making and how the legacy continues through innovation - together with emerging trends this guide offers descriptions of U.S. specialty cheese types, varieties and cheese course suggestions. The brochure is available as a PDF in English.

USDEC**News** Survey Results

A survey was conducted in December 2007 to assess readers' satisfaction about USDEC**News** and obtain suggestions regarding topics for future issues.

The results of the survey were very positive for all five sections of the newsletter which are: U.S. Industry News, Cheese and Manufactured Products, Ingredients, Nutrition and USDEC Member Profiles. The majority of the respondents either *agreed* or *strongly agreed* that the articles were easy to read, important, contained interesting or stimulating information and met their needs and expectations.

The survey was announced by email to over 4,600 readers in eight international markets. It was designed to better understand each respondent's history and current attitude towards the newsletter. Based on the replies of the individuals who responded, 56% currently purchase U.S. dairy products and 70% plan to increase purchases in 2008. Between 85-90% replied that the newsletter achieved the following in regards to U.S. dairy products:

1. Positively influenced their perception of U.S. dairy products.
2. Helped identify new potential suppliers.
3. Helped identify new applications.
4. Increased their knowledge of the variety of products available.

The answers to the survey contained detailed comments, many of which stated how the information in the newsletter had specifically been of value to the respondent. Requests for additional information have been reviewed and will be taken into consideration for future issues of USDEC**News**.

Frequently made requests include information on market news and trends, infant nutrition, new products, new formulations, nutrition for seniors and whey protein.

USDEC would like to thank everyone who completed the survey for taking the time to provide valuable information that will be helpful in the development of future issues of USDEC**News**. All survey respondents were entered into a drawing for a chance to win a 1 GB USDEC USB Drive. Congratulations to the fifty fortunate winners.

International Whey Conference: Autumn in Paris

IWC PARIS 2008
5th International Whey Conference

The 5th International Whey Conference (IWC) is coming to Paris on September 7-9, 2008. Over the course of the program, dozens of speakers from around the world – representing both industry and academia – will address cutting-edge developments in the fields of health and nutrition, new applications for whey and new products and processes.

The U.S. dairy industry will have high visibility at the event, with numerous U.S. presenters on the program and many key U.S. suppliers in attendance. In addition, USDEC (and Dairy Management Inc.) will be exhibiting at and sponsoring the event. With interest in whey proteins at an all-time high, attendance is expected to reach record numbers in 2008.

Registration is open and program information is available on the IWC website: www.iwc-2008.org

USDEC WEBINAR:

Deciphering Global Cheese and Butter Markets

A new U.S. Dairy Export Council webinar, scheduled for March 12, 2008 at 2 pm Eastern Standard Time, will provide an overview and outlook on global cheese and butter markets. A panel of international dairy trade experts will discuss how "world" cheese and butter prices are established, identify critical factors driving the markets and outline what to expect for the remainder of 2008.

A live question-and-answer session will follow the presentations.

To register, visit: www.usdec.org/goto/webinar2008

New Websites to Promote Whey Proteins

U.S. consumers (gym-goers) are being educated on the benefits of whey proteins for muscle health and body composition.

In the past, whey proteins have been heavily marketed to specialized athletes for repairing and rebuilding muscles after a strenuous workout. A number of initiatives are currently underway to increase consumer awareness to the benefits of whey proteins. Whey proteins are the ideal protein for promoting muscle health and have consistently been shown in research studies to provide the following benefits:

- Whey proteins build and maintain muscle.
- Whey proteins stimulate muscle protein synthesis.
- Whey proteins increase lean muscle and decrease fat.

Whey proteins provide the same benefits to active individuals as they do to the serious athlete. In fact, as little as 20 grams helps optimize the results of a workout to improve body composition for a well-toned physique with lean muscles and less fat.

Last November a two-month test was conducted to gauge the ability of current marketing claims to increase consumer awareness to whey proteins and increase the sales of products containing whey proteins. The Dairy Management Inc.™ sponsored initiative targeted active individuals defined as "men and women, ages 18-34, who workout (i.e. resistance training) at least two times per week". Over 400 health clubs in five major U.S. cities participated.

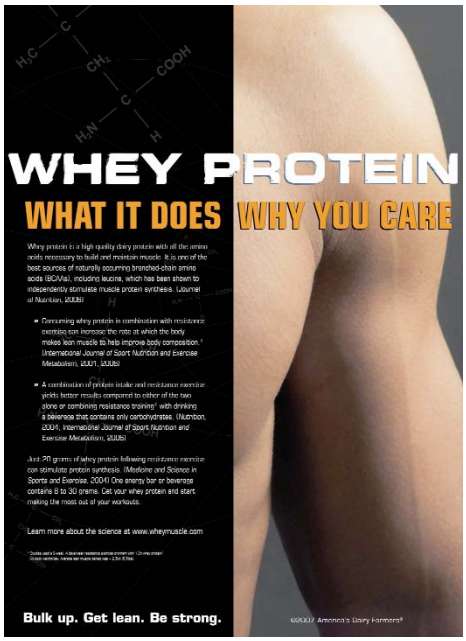
The test included the placement of eye-catching posters and the distribution of educational brochures and whey protein samples (whey protein isolate and whey protein bars). Gender specific websites were developed to provide information to consumers including the answers to frequently asked questions.

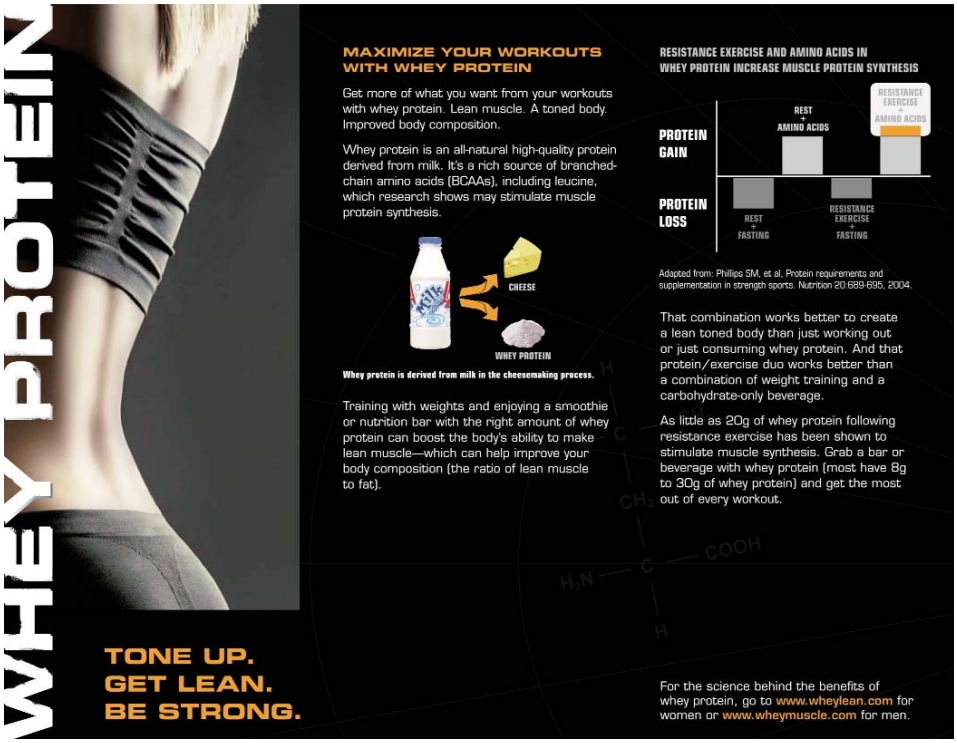
Whey proteins provide the same benefits to active individuals as they do to the serious athlete.

www.WheyMuscle.com for Active Men
www.WheyLean.com for Active Women

The results of the test are currently being evaluated to determine how effective it was in increasing consumer awareness to the benefits of whey proteins after exercise. Once the evaluation process has been completed a decision will be made on whether to expand the test or wait until more scientific research is available. In the interim, additional research studies are underway to help develop messages more relevant to a broader audience. This includes the use of whey proteins for healthy aging, weight loss and maintenance, and improved cardiovascular health, among others.

Further information will be communicated as it becomes available. Until that time, please direct any questions to your local USDEC contact.





In the News…

New USDEC Members

- USDEC welcomes five new companies to the membership: **Rice Dairy**, a financial brokerage from Chicago, Illinois; **Main Street Ingredients**, a developer of functional food ingredients from La Crosse, Wisconsin; **Humboldt Creamery**, a Fortuna, California-based processor of milk, ice cream, butter, cheese and milk powder; **Jana Foods**, a Secaucus, New Jersey-based dairy trading company; and **Proliant Dairy Ingredients**, a global supplier of dairy ingredients from Ankeny, Iowa.

New Plants and Upgrades

- **Blue Ribbon Cheese Co.** received approval from the Fresno County Planning Commission to proceed with construction of a cheese plant in western Fresno County, California. Groundbreaking on the $300-million facility is expected later this year. The plant, which will take in 3 million liters of milk per day, is targeted for completion by 2010.
- **Brewster Dairy** opened a third cheese production facility in Rupert, Idaho. The refurbished plant has an annual cheese capacity of 18 million kg.
- Artisan cheese maker **Cowgirl Creamery** is building a new 1,115-square-meter processing facility in Petaluma, California. The company hopes to double production in the new building.
- **Davisco Foods** is expanding whey processing capacity by 60% at its Lake Norden, South Dakota, plant. More than 4,600-square-meters of dry storage space will be added, as well. The $8.2 million project should be finished by May.
- **Leprino Foods** is narrowing its search for a new mozzarella plant site. The site of a former Western Sugar Cooperative mill in the city of Greeley, Colorado, is a leading candidate. The capacity of the new plant is expected to be about 2.2-2.6 million liters per day. A decision is expected by spring.
- **Main Street Ingredients**, a LaCrosse, Wisconsin-based supplier of dairy and food ingredients, will add more than 50 jobs over the next three years following a $2.8-million expansion. The company boosted production capacity with the 2,045-square-meter addition. Sales this year will reach approximately $150 million, nearly triple the level recorded five years ago.
- **Proliant Dairy** returns to the dairy industry by teaming with **Melrose Dairy Proteins** to build a dairy permeate (deproteinized whey) processing operation next to Melrose's cheese plant in Melrose, Minnesota. Proliant had previously handled whey exports for Hilmar, but exited the business in 2004. Production is expected to begin later this year.
- **Sargento Foods** will expand operations in Hilbert, Wisconsin, over the next five years. The project will add 4,800-square-meters to the existing 6,500-square-meter facility. The expansion of the plant, where Sargento makes sauces and pasteurized cheese products, should be complete by September. The company's previously announced 5,600-square-meter expansion of its Kiel, Wisconsin, plant is due to be finished in May.

Moves and Consolidations

- **Wendt's Dairy**, Niagara Falls, New York, will close in May. The company was acquired in 2006 by **Upstate Farms Niagara**, which has larger plants elsewhere in the state (Cheektowaga and Rochester).

Acquisitions and Mergers

- **Agropur**, Canada's largest dairy cooperative, will acquire **Trega Foods**, a cheese and whey manufacturer based in Little Chute, Wisconsin. Trega, the combined company of **Weyauwega Milk Products**, **Krohn Dairy Products** and **Simon's Specialty Cheese**, has annual sales of about $300 million, and processes about 660 million liters of milk per year.
- **Saputo Inc.** entered an agreement to acquire **Alto Dairy Cooperative**, Waupun, Wisconsin, for $160 million. Alto produces cheese and whey proteins. The co-op's members will vote on the offer at a special February 27 meeting. Saputo is the largest cheese processor in Canada and among the five largest in the United States.
- To concentrate on expanding its ice cream business, **Wells' Dairy** sold its Le Mars, Iowa, milk plant to **Dean Foods** and its Omaha, Nebraska, yogurt plant to **Grupo Lala**. Dean, the largest milk processor in the U.S., plans to continue to run the milk plant, which is its first in Iowa. Lala, the leading dairy company in Mexico, has been exporting to the U.S since 2005, but this is its first manufacturing facility in the country.

Leading-Edge Innovation in U.S. Cheese Packaging

When consumers purchase cheese at the supermarket or order a cheese-based dish at their favorite restaurant, taste is likely their primary concern. While cheese certainly delivers the creamy, flavorful taste that consumers crave, it also offers freshness, shelf life and convenience – benefits all made possible by packaging. Innovations in the dairy case often focus on packaging, which can make products safer, tastier and more consumer-friendly. Ongoing developments by U.S. processors, scientists and suppliers have made cheese packaging a constantly evolving, forward-looking element of dairy innovation.

Over the last two decades, perhaps no cheese packaging innovation has been more significant than modified atmosphere packaging (MAP). MAP is a technique that prolongs the shelf life of fresh, minimally processed foods including dairy. It removes oxygen, which can feed spoilage bacteria and cause discoloration, and replaces it with nitrogen, carbon dioxide or a combination of both that can prevent the growth of bacteria. MAP was popularized in the mid-1980s and is still widely used in shredded and chunk cheeses. Its use may soon extend to cottage cheese, as recent research has suggested that MAP can effectively extend the shelf life of this product.

Although MAP is a powerful technology, its effectiveness is contingent on proper package sealing. Unfortunately, the scientifically sound seals of the past did not offer a user-friendly packaging experience. In 1986 Sargento recognized the unmet need for re-closeable cheese packaging and launched press-to-close resealable packages for shredded cheese. A pioneer in innovative packaging, Sargento also introduced the first zipper packaging for cheese in 2000. Using the Slide-Rite® Advanced Closure System, the Wisconsin-based cheese processor revolutionized convenient cheese packaging and motivated the entire U.S. cheese industry to follow its lead.

A variety of packaging options maximizes cheese freshness and convenience.

With today's on-the-go lifestyle, convenience is even more important than it was when zipper seals were first launched. In fact, according to the Mintel Global New Products Database (GNPD), convenience claims were among the top five overall claims for all U.S. cheeses in 2007. GNPD reports that 37 "convenience" cheeses were introduced last year – a 76% increase from 2005.

The entire dairy industry has been motivated to develop packaging that offers greater convenience and portability. U.S. fluid milk processors have been among the most innovative in revamping their packaging to enhance convenience and freshness. The single-serve plastic bottle, which offers more functionality and consumer appeal than the traditional paperboard gable-top carton, is today's new standard for fluid milk. Processors such as Dairy Farmers of America (DFA), with its Moo Kooler™ line of flavored milks, were trailblazers in this packaging revolution.

It is likely that the U.S. cheese industry has been inspired by the packaging innovations in other dairy categories. Just as single-serve plastic bottles revolutionized fluid milk, single-serve packs have transformed the U.S. cheese market. Over the years processors have redefined cheese as a convenience food through innovation in individually wrapped string and slice cheeses.

In 2004, DFA rolled out Double Twist™, a dual-color string cheese under their Borden Brand. The mozzarella-based product combined the fun of two "twisting" cheeses with the portability of traditional string cheese.

Cabot Creamery has also been an innovator in convenience cheese with the launch of its individually packed cheese slices. Both of these groundbreaking products enhanced product value with freshness and convenience benefits.

Single-serve formats have continued to be one of the most important areas of cheese packaging innovation. Recently Land O'Lakes repackaged its Snack'N Cheese To-Go® product in easy-open 113g snack portions. Lactalis USA has also embraced convenience packaging with its Président Wee Brie™ product. Brie – a cheese not normally associated with portability – can now be enjoyed on-the-go by consumers who buy these individually sealed mini cheese wedges.

Even specific cheese varieties have reinvented themselves with packaging developments. In 2002, Kraft Foods gave its parmesan an upscale edge with restaurant-style shaker packaging. Four years later it launched another product based on packaging innovation. The *Grate-It-Fresh* parmesan contains a built-in grater for consumers to shred their own cheese. With these advancements, Kraft has transformed cheese eating into an interactive experience that focuses on freshness and quality.

An area of tremendous opportunity for cheese packaging innovation is the offering of dairy and non-dairy products in one convenient package.

An area of tremendous opportunity for cheese packaging innovation is the offering of dairy and non-dairy products in one convenient package. In the past consumers who wanted dairy products paired with other foods had to create their own snacks. Now manufacturers are starting to eliminate that hassle by providing all-in-one products that highlight the goodness of cheese. Recently Kraft introduced its *Duets* and *Trios* lines, which pair various cheeses and cheese-based spreads with complementary sides. Some versions match cheeses including cheddar and monterey jack with crackers, while others offer more unique combinations like Philadelphia™ cheesecake spread, strawberry sauce and graham sticks.

Given the importance that packaging has played in cheese development, there is no doubt that U.S. processors will continue to launch pioneering, consumer-friendly packages. An area of tremendous opportunity is sustainable packaging – an issue that has recently garnered considerable public attention. As more consumers seek "green" packages and retailers like Wal-Mart mandate eco-friendly packaging for their suppliers, cheese processors will inevitably develop smaller packages or use new formats such as compostable polylactic acid (PLA) packaging. The possibilities for cheese packaging that enhances shelf life, taste, freshness, convenience and now sustainability are limitless.

Wheys to Softness, Fluffiness and Moistness in Bakery Goods

By Dr. Tom Neuhaus, California Polytechnic State University, California

The growing demand for soft, moist wheat products is a global trend. In the Middle East, fast-food businesses offer their burgers and sandwiches on soft buns; people enjoy the break from the chewy flatbreads. In China, Korea and Japan, supermarket bakeries produce popular soft breads and foamy cakes; softness, fluffiness and moistness are three attributes that match their cultural culinary expectations. Throughout West Africa, hundreds of Lebanese-owned bakeries produce sandwich breads daily; puffy, light sandwich breads provide welcome relief from a diet of corn, cassava and rice.

Softness, fluffiness and moistness are not attributes that occur naturally in wheat-based baked goods, at least not for extended periods of time. They have to be nurtured and maintained, usually through the use of baking additives – such as emulsifiers, anti-staling agents and yeast food. Sodium stearoyl lactylate, an emulsifier, does not look very appetizing on a bread label. The same is true of "mono- and di-glycerides", which are used to prevent staling. Another unnatural sounding additive is ammonium sulfate, which provides nitrogen for optimal yeast growth. The good news for bakers is that whey, a natural component of milk and a food associated with the maintenance of health, is capable of serving many of the functions for which additives are added to baked goods.

One milk ingredient used extensively by bakers is nonfat dry milk (NDM) or skimmed milk powder. It softens crumb, adds a dairy note, feeds the yeast and creates a richly browned surface during baking. Today, as the cost of NDM follows the upward trend of all commodities, the spotlight turns from NDM to dried whey products as bakery additives.

U.S. whey products are recognized for their high nutritional value and versatile functional properties. For example, whey protein is one of the best sources of branched-chain amino acids (BCAAs), which have been shown to independently stimulate muscle protein synthesis. Whey proteins have emulsifying and gelling properties which produce breads and rolls with a soft, light texture.

Whey proteins are excellent water-binders, maintaining moistness and pliability in baked goods. As doughs ferment and bake, whey proteins contribute a dairy note that is unique and alluring. Lactose, the sugar of whey, binds water, softens crumb and develops crust color while contributing only one-sixth the sweetness of sucrose.

Whey is obtained as a co-product of cheese manufacturing. Upon further processing, liquid whey is fractionated and converted into a host of derivative products which are then dried. In the baking industry, the three most important whey ingredients are: WPC 34, WPC 80 and permeate. WPC 34 was designed by dairy processors to imitate the capabilities of NDM. WPC 80 was designed to partially replace egg yolks and egg yolk solids in baking formulas. Permeate, a mixture of lactose and minerals, is what remains after the proteins of whey are removed. Not surprisingly, permeate is the least expensive of the whey derivatives. If your application calls for Maillard browning combined with a mineral note for flavor complexity and is associated with calcium and phosphorus ions, whey permeate is your best choice.

Whatever continent you are baking on, consider replacing NDM with one of the whey derivatives. While your initial motivation may be to reduce cost, you will soon discover that whey is much more than a mere replacement. It will open a new realm of baking options for your customers.

There are numerous proprietary whey mixtures that will yield excellent results when incorporated into your recipes. USDEC can direct you to companies that produce and market these products.

Following are two recipes featuring generic whey additives. The first recipe for sandwich bread helps demonstrate the differences between finished products when either sweet dairy whey, permeate or WPC 34 is used as a replacement for NDM.

The swiss roll recipe replaces egg yolks with WPC 80 in both the cake formula and the buttercream formula. WPC 80 is an excellent substitute for the egg yolks in the recipe and improves the quality of the final product.

Nutrient Profile of Select Dry Dairy Ingredients

Nutrient	Whey Permeate	Sweet Whey	NDM	WPC 34	WPC 80
Protein	3.0 - 8.0%	11.0 - 14.5%	34.0 - 37.0%	34.0 - 36.0%	80.0 - 82.0%
Carbohydrate	65.0 - 85.0%	63.0 - 75.0%	49.5 - 52.0%	48.0 - 52.0%	4.0 - 8.0%
Fat	1.5% Maximum	1.0 - 1.5%	0.6 -1.25%	3.0 - 4.5%	4.0 - 8.0%
Ash	8.0 - 20.0%	8.2 - 8.8%	8.2 - 8.6%	6.5 - 8.0%	3.0 - 4.0%
Moisture	3.0 - 5.0%	3.5 - 5.0%	3.4% (non-instant) 3.5 - 4.5% (instant)	3.0 - 4.5%	3.5 - 4.5%

Sandwich Bread with Various Whey Derivatives

(Sweet whey, permeate or WPC 34)

All four recipes were prepared under similar mixing, fermentation, and proofing conditions. **NDM's** (A) crown is more rounded, showing that it could have proofed for a longer period, and it has a dark crust. On the other hand, the bread made with **whey permeate** (B) proofed more quickly and has a flatter crown. Its crust is a more acceptable gold color, typical of bread or pastry dough made with permeate. **Sweet whey** (C) yielded a smaller loaf volume with a crust color similar to the loaf containing permeate. The loaf formulated with **WPC 34** (D) shows an open crumb with a crust similar to that of NDM.

Ingredients	Metric	English	Bakers' % **
All-purpose flour	450 g	1 lb	100
Sugar	30 g	1 oz	6
Salt	9 g	0.3 oz	2
Melted butter	30 g	1 oz	6
Dairy powder*	30 g	1 oz	6
Dry yeast (Instant)	9 g	0.3 oz	2
Lukewarm water	250 ml	9 oz	55

** NDM, sweet dairy whey, permeate or WPC 34*
*** Bakers' Percent: A key ingredient (usually flour) is used to define 100% and the other ingredients are expressed as a percentage of the key ingredient.*

A NDM

B Whey Permeate

C Sweet Whey

D WPC 34

Swiss Roll with WPC 80

(WPC 80 is used as a replacement for the egg yolks in a standard recipe)

A génoise sponge cake formula with two egg yolks is pictured on the left. The cake has cracked severely, most likely because of the non-plastic nature of an ovomucin foam. Ovomucin is one of the primary proteins of egg white, specifically the thick white next to the yolk. Egg yolk acts as a plasticizer. In the cake shown on the right, the egg yolk has been replaced with WPC 80, which turns out to be a much better plasticizer. Consequently, the cake retains pliability after baking and will roll without cracking.

The WPC 80 only buttercream formula has an improved mouthfeel and flavor compared to a formula with egg yolks. Egg yolk lecithoproteins leave a filmy texture on the palate unlike WPC 80 which does not leave a filmy finish. The WPC 80 does an excellent job at performing the emulsifying tasks and is an excellent substitute for the egg yolks. Replacing the eggs in the buttercream with WPC 80 should also extend the shelf life and yield a safer product as it avoids the threat of contamination from the eggs.

Cake Formula

Ingredients	Metric	English
Pastry flour	180 g	6 oz
Sugar	180 g	6 oz
Eggs, whole	200 g	4 eggs
WPC 80**	25 g	1 oz
Water	60 ml	¼ cup
Yellow food color	As needed	As needed
Confectioner's sugar	As needed	As needed

***WPC-80 replaced the two egg yolks used in the control cake formula.*

Buttercream Formula

Ingredients	Metric	English
Butter, unsalted	225 g	8 oz
WPC 80	30 g	1 oz
Water for WPC 80	60 ml	2 Tbsp
Sugar	90 g	3 oz
Water	60 ml	2 oz
Lemon zest	3 g	1 tsp
Lemon juice	30 ml	1 oz

Eggs Only

WPC 80

Whey Proteins Benefit Active Individuals

The 2008 Summer Olympics in Beijing, China are quickly approaching and the focus will be on some of the best athletes in the world. Elite athletes have followed strict diets dating as far back at 580 B.C. Nutritionists, sports trainers and coaches, among others, support the discipline of sports nutrition and believe in its positive effect on sports performance. However, you don't need to be a serious or elite athlete to benefit from a diet based on the principles of sports nutrition. Today, governments and health organizations around the world promote an active lifestyle, combined with a nutritious diet, for individuals of all ages. Protein is an essential part of a nutritious diet and the regular consumption of high quality dairy proteins (whey, casein and milk protein) helps active individuals of all ages meet their daily protein requirements.

Food companies have historically marketed sports nutrition products (i.e. bars, beverages and protein supplements) to the more serious athlete. The focus has shifted to a broader consumer market that includes physically active, health conscious individuals who value the nutritional benefits provided by these products. In 2006, the retail sales of sports nutrition products in the U.S. grew 23% versus the prior year, with the growth being driven by sports beverages. Although not as strong, other parts of the world are also seeing excellent growth in sports nutrition products including Europe, the Middle East, China and Japan. Consumers buying these products associate regular exercise and good nutrition with a variety of health benefits including the following:

- Strong bones and muscles
- Maintaining a healthier weight
- Decreased risk of type 2 diabetes and heart disease
- Improved sleep
- A more positive mental outlook

Active Adults

Whey protein is one of the two proteins in milk and is known for its high quality rating compared to proteins from other sources. Adult athletes, both male and female, have long endorsed whey protein as their "protein of choice" to promote muscle repair and growth. Research studies support this endorsement and consistently show positive changes in body composition when whey protein is consumed after a workout. The results for both men and women include stronger muscles, a more lean and toned physique and higher energy levels.

Whey protein is a very easy to digest and rapidly absorbed protein. It has the highest concentration of essential and branched-chain amino acids (BCAAs) of any single protein source. BCAAs are important for the maintenance and development of muscle mass.[1] They are the first amino acids used by the body to provide energy during exercise; low levels may cause fatigue.

People today have much more information than in the past on the role of protein in the diet and how it impacts good health and longevity. There is a better understanding of individual's protein needs and why they vary. Physically active adults are known to require more protein than those who are inactive or sedentary.

Leucine and BCAAs Content of Foods*

	Leucine	BCAAs
Whey protein isolate	11-14	26
Milk protein	10	21
Egg protein	8.5	20
Muscle protein	8	18
Soy protein isolate	8	18
Wheat protein	7	15

** Values reflect grams of amino acids/100 grams of protein*

Source: USDA Food Composition Table

Whey protein beverages and bars are a convenient source of protein and products containing 20 grams of whey proteins combined with carbohydrates have been shown to increase muscle protein synthesis. More recent research indicates that levels as low as 10 grams are also beneficial.[2]

Whey protein is available to consumers in many countries in powdered form as either whey protein concentrate, with 80% protein (WPC 80), whey protein isolate, containing no less than 90% protein (WPI), or a combination of both. WPC 80 contains a small amount of carbohydrate in the form of lactose for energy, while WPI is almost pure protein. These products may be easily added to water and every day foods and beverages (i.e. milk, oatmeal, juice, yogurt, etc.) to increase the protein content.

Products are also available which contain both WPC or WPI and casein. Casein is the most abundant protein in milk, and it is a more slowly digested protein that steadily releases amino acids into the body over time.[3] The combination of whey and casein have been shown to be beneficial during extended periods of physical activity.

The large numbers of overweight and obese individuals working to become more active and eat healthier are fueling the growth of protein based weight loss products. Many of these products are formulated with milk and/or whey proteins. Whey proteins have been found to be effective in promoting satiety, or a feeling of fullness, after a meal and research is ongoing in this area.[4]

Youth & Teens

Youth have special nutritional needs during adolescence and often require additional calories and protein, especially when they are involved in after-school activities and sports programs, such as soccer.

Drinking milk or beverages containing high amounts of dairy ingredients provides the bopy with natural sources of high quality dairy proteins (casein and whey), bio-available calcium and other important nutrients. It is an easy and economic way for young adults to get the protein they need. Recent European studies have shown that drinking fat-free milk after a workout is better at promoting muscle recovery and re-hydration than water or an isotonic sports drink.[5] Another study in Canada found that drinking fat-free milk after exercise was more beneficial in helping to increase muscle mass compared to soy or carbohydrate based beverages in healthy young men.[6]

Healthy muscles require the support of strong bones, which reach their peak strength by approximately age 30. The regular intake of dietary protein and calcium during the teen years is critical to bone development. Research indicates that in the U.S., youth ages 9-18 consume inadequate amounts of calcium and dairy products. Three servings of low-fat dairy foods (e.g. 237ml milk, 170-227g yogurt, or 28.4-42.5g natural cheese) are recommended daily and one serving provides approximately 300 mg of calcium.

Seniors

Seniors, the fastest growing age group in the world, are living longer than in past thanks in part to healthier, active lifestyles. As we age, the body becomes more fragile and muscles weaken. Resistance exercise has been shown to be beneficial for maintaining and building muscle tone in all age groups and seniors respond well to exercise, even after age 60. The benefit is even greater when exercise is combined with the intake of proteins rich in the essential amino acid, leucine.[7] Whey proteins are one of the richest available dietary sources of leucine.

Whey proteins are not recommended just for active adults and seniors. Individuals who are less active will also benefit from whey proteins and other protein rich dairy products which help preserve muscle mass and reduce body fat, even in the absence of resistance training.[8]

In summary, whey and other dairy proteins are high quality sources of protein and beneficial for active individuals of all ages. For more information, please refer to the USDEC monographs on Sports Nutrition and Body Composition which are available at:

www.usdec.org/publications/monographs.cfm.

Protein Requirements by Activity Level

Activity Level	Protein (g/kg body weight) Per Day
Sedentary or Inactive	0.8
Regularly Active in Endurance Exercise: aerobics, jogging, etc.	1.2-1.4
Power/Speed Athletes: sprinters, track cyclists, etc.	1.3-1.6
Power/Strength Athletes: weightlifting, boxing, judo, etc.	1.5-2.0
Endurance Athletes: marathon runners, road cyclists, etc.	1.5-2.0

Source: USDEC Reference Manual for U.S. Whey & Lactose Products

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Brewster Dairy, Inc.

Brewster Dairy, Inc., the largest swiss cheese processor in the United States, introduced its all-natural swiss cheese products globally in January 2008 with a shipment to Morocco. Well-established as an international dairy ingredients provider, Brewster is actively marketing cheese to international retail/deli, food service and food processing channels under its "Make It Swiss" marketing program.

Brewster's all-natural swiss cheese varieties include: regular, aged, reduced-fat, baby and lacy. Swiss cheese is a semi-hard, light-colored and mild-tasting cheese known for visible "eyes" or "holes" and reduced lactose content. These attributes are naturally created by the cheese making process. Mike Walpole, Brewster Cheese sales director, notes that swiss cheese's functionality and sweet nutty taste profile make it an ideal substitute for other cheeses in most recipes. "Swiss cheese is particularly well-suited for the export market and it is a great option for people who are concerned with lactose intolerance," says Walpole.

Swiss cheese production reflects the family-owned and -operated company's heritage. Swiss immigrant John Leeman settled in Brewster, Ohio, a U.S. region known as "Little Switzerland", and by 1933 was named manager of the local cheese plant. In 1965, he and his son Fritz purchased the facility to form Brewster Dairy. Today, Fritz Leeman continues to serve as chief executive officer.

Operations Overview

Brewster's two state-of-the-art, continuous-operation cheese plants in Ohio and Illinois manufacture the company's current cheese and dairy ingredient volume. A third production facility in Rupert, Idaho, is newly operational. Brewster acquired the plant in January 2007 and installed cutting-edge technology for low-fat cheese production. The refurbished facility went online in December 2007, adding 18 million kg in cheese production capacity. With ample milk supply and access to West Coast shipping channels, the Idaho facility is expected to offer advantages to export customers in terms of pricing and transportation costs, according to Walpole.

Extensive quality control testing procedures are in place for milk, cheese, whey and finished dairy ingredients. Food safety initiatives include facility "lock-downs" for the prevention of potential tampering and strict receiving guidelines for incoming materials. In addition, Brewster's products meet the certification requirements to carry both kosher and halal symbols.

The creation of consistently superior quality cheese and whey products in a cost-effective manner is Brewster Dairy's stated mission. The company's Research & Development department is available to assist export customers with product development and applications.

Dairy Ingredients

Swiss cheese making creates sweet, light-colored dairy whey, which Brewster converts into 5.9 million kg of whey protein concentrate with 34% protein (WPC 34) and nearly 5 million kg of lactose powder annually. These dairy ingredients make up approximately 25% of their total annual sales. Brewster Dairy's WPC and lactose powder products have been marketed in Mexico, South America and Asia since 1993. Currently, about 75% of Brewster's WPC volume is exported, whereas most of its lactose is used in the U.S. Brewster handles export sales and marketing internally, utilizing broker-assisted shipping.

Product Line-Up

Brewster's WPC 34 is a free flowing crystalline powder with 34%-35% protein and 48%-52% lactose. It has a bland flavor, clean odor and is white to light cream in color. It is well-suited for use in ice cream, bakery and infant formula applications and is available in sewn paper bags with a polyethylene liner (25 kg and 23 kg) and bulk totes (907 kg).

Swiss cheeses from Brewster carry variations of sweet and nutty flavors. Cheeses are available in deli and restaurant/food-service vacuum-sealed packages (3.7 kg and 5 kg) and blocks (82 kg) for further processing. Varieties include:

- Swiss – Shiny and yellow in color; mellow flavor; eyes (holes) size of small coins.
- Swiss Select – Reduced-fat variety; slightly less shiny and paler color; drier texture and mild flavor; eyes (holes) size of small coins.
- Aged Swiss – Shiny and darker yellow; stronger flavor; eyes (holes) size of small coins.
- Baby Swiss – Ivory to pale yellow; buttery, mild flavor; eyes (holes) slightly smaller than standard variety.
- Lacy Baby – Ivory to pale yellow; stronger flavor; numerous small eyes (holes) look like lace fabric.

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Land O'Lakes, Inc.

Land O'Lakes, Inc. is a leading U.S. farmer-owned dairy food manufacturer and agricultural cooperative with total 2007 sales of $8.9 billion. Butter, cheese and dairy ingredients sales topped $4.2 billion in 2007, making Land O'Lakes the third-largest U.S. dairy manufacturer.

Arden Hills, Minnesota-based Land O'Lakes is also the third largest U.S. dairy cooperative. Its 10-plant dairy manufacturing system spans the U.S. Upper Midwest and West Coast with facilities in the states of Minnesota, Wisconsin, Ohio, Pennsylvania and California. Land O'Lakes' 3,600 dairy farmer member-owners supply more than 5.4 billion liters of milk annually.

Founded in 1921, the cooperative immediately became a market innovator by manufacturing high quality stick-butter from sweet cream (not sour). U.S. butter standards were later adopted based on Land O'Lakes methods.

The cooperative is also one of the country's largest cheese processors. Its products consistently receive high quality honors in competitions including the World Dairy Expo Cheese and Butter Contest.

The Land O'Lakes brand holds the number one position in U.S. market share in both butter and deli cheese category sales. Introduced 80 years ago, the now-iconic Land O'Lakes brand Indian Maiden is also recognized worldwide.

Export Expertise

Land O'Lakes pioneered U.S. dairy exports with a 1925 shipment to Peru. Today, Land O'Lakes exports its branded butter, cheeses and dairy ingredients to 50-plus countries for use in retail, food service and food processing channels.

Export customer needs are served directly by products from three distinct Land O'Lakes divisions: International Dairy Foods, Ingredients & Aseptic Products and Industrial Cheese & Dairy Proteins.

Export customers have access to expertise in Land O'Lakes' Research & Development division, Test Kitchens (for recipe development/meal planning) and pilot manufacturing plant.

Export Product Portfolio

Land O'Lakes brand retail and food service exports are handled by the International Dairy Foods division and include:

- **Grade AA Butter** – Rich flavor, 80% butterfat; ideal for cooking, baking and seasoning; salted, unsalted, flavored and whipped; range of pack sizes and types; case/pallet quantities.
- **Natural Cheese Chunks** – High nutritional value with award-winning taste. Swiss, mozzarella, chedarella, co-jack, monterey jack, hot pepper monterey jack, colby and a variety of cheddars. Chunk sizes in 227 g, 454 g and 907 g packages and Snack 'N Cheese To-Go!® convenience packs.
- **Natural Deli Cheeses** – Pre-sliced 170 g and 227 g retail packs of baby swiss, swiss, havarti, co-jack, colby, medium yellow cheddar, muenster, mozzarella, chedarella/half moon, provolone, sharp cheddar, pepper jack. Pre-sliced 0.7 kg loaves of mild yellow cheddar, provolone and muenster and a variety of 2.3 kg and 4.5 kg deli cheese loaves.
- **Processed Cheese** – Natural cheese blend; creamy and melts evenly without separating. Processed cheese varieties include american (yellow, white, sharp yellow), swiss and american, jalapeno jack and flavored varieties including onion, jalapeno and pepperoni.

The Ingredients & Aseptic Products division handles exports of high-quality dairy ingredients to food processor and food service markets, including:

- **Cheese Powders** – Dry cheese sauces and prepared food mixes; supplied in 22.7 kg and 24 kg bags. Applications include snack-food coatings.
- **Cheese Sauces** – Ready-to-use in shelf-stable 3 kg cans for food service; consistent flavor and texture; flavors include cheddar cheese and cheddar jalapeño.
- **Dairy Dips** – Shelf-stable dips in 250 g aluminum cans; typically sold with chips in retail stores. Varieties include sour cream and onion, cheddar and cheddar jalapeño.

The Industrial Cheese & Dairy Proteins division offers a variety of cheese and protein products to export markets, including:

- **American & Italian Style Cheeses** – Available in 18 kg blocks, 290 kg blocks and 227 kg barrels.
- **Dairy Proteins** – Sweet whey, whey protein concentrate and deproteinized whey.

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