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USDEC News

June 2008

Exporters Struggle with Container Shortages

United States (U.S.) exporters enjoyed record-high shipments in the first quarter of 2008, but a new logistical challenge is causing headaches for suppliers and customers alike.

Shipping containers used to move U.S. dairy products into overseas markets are in short supply. Obtaining dry containers for dairy ingredients, which suppliers previously could get in a week or less, now can take four weeks or longer. Lead times on refrigerated containers (reefers) for cheese, butter and fresh products are extended further – as much as 6-8 weeks.

U.S. trade flows have shifted, making fewer containers available. In previous years, U.S. imports outweighed exports, creating a surplus of containers in America. However, the weak U.S. economy has reduced imports, bringing fewer containers to our ports, while the declining value of the U.S. dollar and robust overseas demand for U.S. goods has been a boon to our exports, sending significantly more containers offshore. This has left a shortage of containers available to U.S. exporters.

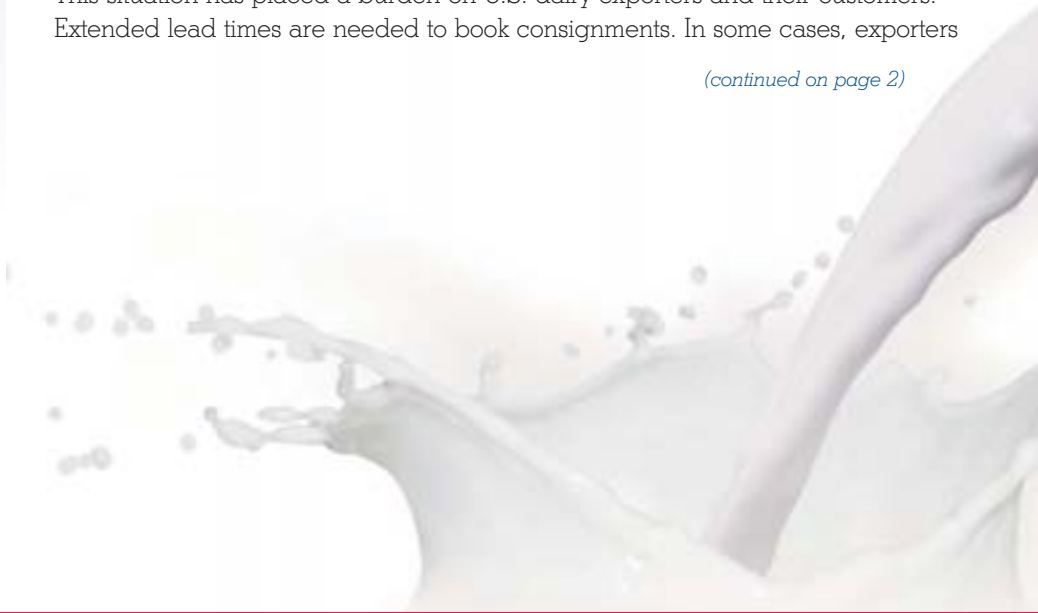
Compounding the problem, declining imports have led ocean carriers to move infrastructure and capacity away from the United States. Containers and vessels have been diverted to serve stronger and more profitable trade between Asia and Europe, as well as growing intra-Asia and South America-Asia business. Further, with space on ocean vessels limited, even when containers are filled they may still have to sit on the dock for additional time waiting to be loaded onto a ship.

This situation has placed a burden on U.S. dairy exporters and their customers. Extended lead times are needed to book consignments. In some cases, exporters

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(continued from cover editorial)

are reluctant to make sales because they can't be sure they can get the product to the customer in a timely manner. Suppliers are spending considerably more time managing after-sale logistics, regularly fighting to gain bookings and re-bookings due to cancellations.

Further, the scarcity of empty containers means they have to travel farther for loading, adding to the cost of shipping. Container lines have increased prices dramatically in recent months. Rates are commonly up 50-100% from the beginning of the year.

Delays also affect letters of credit, which typically specify a shipping date. Since suppliers often can't get containers when needed, they have to designate longer terms. Some exporters are adding freight escalation clauses in their contracts, which can protect them from rising freight rates, but can be a competitive disadvantage as well.

Container shortages affect all U.S. exports, not just agriculture, not just dairy. Moreover, it is a structural problem that may not go away soon – strong demand for U.S. goods will likely drive trade routes for years to come.



USDEC is working with the Agricultural Transportation Coalition (AgTC) on the container shortage issue. AgTC has briefed officials at the International Trade Commission and the Federal Maritime Commission, and met with private ocean carriers, to raise awareness of the severity of the problem and seek solutions. However, until carriers find it lucrative enough to move more capacity back to

the U.S., sales will continue to be stymied, AgTC says.

USDEC will continue to work with the transportation policy group to identify possible solutions and seek resolution. In the meantime, exporters must wrestle with challenges that require more flexibility throughout the marketing and distribution channel.

USDEC News 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.

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Managing Price Risk through CME

In 2007, the spot price of block cheese in the United States (U.S.) ranged from \$1.2875 to \$2.2025/lb. The price of nonfat dry milk ranged from about \$1.04 to \$2.07/lb. The price of whey ran from about 41¢ to 79¢/lb.

Such wide swings in commodity pricing in the U.S. present challenges for both exporters and customers. When prices move so quickly and so dramatically, it's difficult for exporters to quote prices for future delivery, and difficult for buyers to lock in the cost of their inputs.

Exporters and customers can manage price risk with futures and options. Contracts are traded 23 hours a day, five days a week, at the CME Group in Chicago, Illinois.

The CME Group is a combined entity formed by the 2007 merger of the Chicago Mercantile Exchange (CME) and the Chicago Board of Trade (CBOT). The Exchange offers futures and options for a full range of dairy products, as well as other commodities (corn, soybeans, cattle, hogs, and many others), energy, interest rates, foreign exchange rates, equity indexes, and even alternative investment products like weather and real estate. Three-quarters of the trading volume comes from trades made electronically on the CME Group's Globex electronic trading platform.

The Dairy Complex at the CME Group includes futures and options on Class III milk, Class IV milk, butter, nonfat dry milk and whey. Because of the high correlation between cheese and the Class III milk price, Class III futures and options are often used as a proxy to hedge cheese prices. Class III milk is the most heavily traded contract; last year, more than 311,000 contracts were bought and sold.

Hedging 101

Futures contracts are standardized, legally binding agreements to buy or sell a specific product in the future. The

buyer and seller agree on a price today for a product to be traded at a future date. Each contract specifies the quantity, quality, and the time and location of delivery and payment. Futures allow both buyer and seller to hedge, or lock in a specific price now for expected future sales.

Here's an example of how this works. Note that these examples are simplified to illustrate the basic concept of hedging.

A food formulator wants to import 8 metric tons (MT) of whey per month from July through December at \$750/MT. He makes the deal in May, and then goes to the futures market and buys 4 contracts per month (each whey contract at CME is for 2 MT) at an average of \$750/MT, or 34¢/lb.

As each contract approaches its expiration date, the futures price will converge with the underlying cash price. If whey prices go up, the futures will go up as well. So, for instance, if whey prices increase to 40¢, the importer will pay 40¢ for his whey, but he will make 6¢/lb. on his futures contracts (bought at 34¢, sold at 40¢). So he has effectively locked in a price of 34¢/lb.

On the other hand, if prices go down, the value of the futures contract will go down. So if whey prices drop to 30¢, the importer will lose 4¢ on his futures contracts (bought at 34¢, sold at 30¢) but he will pay only 30¢ for his whey. Again, he has locked in a price of 34¢/lb.

Options are another useful tool for price risk management. Options give a trader the right – but not the obligation – to establish a futures position at a specific price on or before the expiration date. Options work like “price insurance”. The trader pays a premium for insurance against prices going higher or lower than desired.

An option to buy a futures contract at a specific price is referred to as a *call*. An

option to sell a futures contract at a specific price is called a *put*.

Here's how an importer might use options, using the same example as before – an importer who wants to buy 8 MT of whey per month for six months. To protect himself from price increases, he could buy *call options*. He might buy 4 call options per month, at 35¢, at a cost (premium) of 2¢/lb.

If whey prices go up, the importer can execute his option to buy futures at 35¢. As before, he has put a ceiling on the maximum he will pay. However, with options, he leaves himself open to any benefit if whey prices go down.

If prices drop, say, by 5¢, the importer can let his option expire without executing it; he will pay 30¢ for his whey, and his only cost will be what he paid for the premium.

Getting Started

Trading futures and options at the CME Group requires selecting a broker and opening a trading account. Futures and options contracts are bought and sold through brokerage firms – just like stocks. Different brokers offer different levels of service, from simple order-taking to full-service strategic counseling. Brokers charge commissions for these services. All brokers in the U.S. must pass qualifying examinations and receive a government license before they are permitted to handle customer orders.

After identifying a broker that meets a company's needs, the next step is to open a trading account. Once the account is opened, orders can be placed.

For more information about hedging with CME Group dairy futures and options, contact a dairy broker (two are presented in the “Meet our Members” section of this newsletter), or the CME Group, 312-930-1000, or visit the CME Group's website at www.cmegroup.com.

IFT08

ANNUAL MEETING + FOOD EXPO

The 2008 IFT Annual Meeting & Food Expo will be held from Sunday, June 29 to Tuesday, July 1, 2008 in New Orleans, Louisiana. Over 22,000 food professionals, buyers and sellers from around the world will be on hand to view the latest in products, technologies, tools, techniques and services. The expo will feature more than 1,000 exhibitors and 500 ingredient companies, including numerous suppliers of dairy ingredients. This event will provide an excellent opportunity to meet new potential suppliers and get a first-hand view of the products available for your market.

This year Dairy Management, Inc.™ (DMI) is sponsoring a scientific symposium titled “Dairy & Weight Management: Bridging the Gap Between Nutrition Science and Consumer Behavior” on Tuesday, July 1 from 10:30 AM to 12:00 noon. Additional information will be available at the DMI booth (#3926), including prototypes of innovative new products featuring dairy ingredients. The September issue of **USDECNews** will contain an overview of both the symposium and these new products.

If you are attending the 2008 IFT Expo please visit the booths of the participating USDEC members to learn more about the dairy ingredients and products they have available for export. More information on the 2008 IFT Annual Meeting & Food Expo is available at www.ift.org.

USDEC Member	Booth #
Agri-Mark Dairy Proteins	745
Dairy Management, Inc.™	3926
Glanbia® Nutritionals	4200
Hilmar Ingredients	854
Kraft Food Ingredients Corp	3127
Lactalis USA, Inc.	5119
Land O'Lakes	2815
Leprino Foods	4019
Mitsubishi Int'l Food Ingredients	1533
Mitsui & Co., LTD	1213
Monsanto Company	4941
Proliant Meat Ingredients	2317
Protient™, Inc.	1903

More from USDEC

USDEC 2007 Annual Report — Unprecedented: Markets, Demand, Delivery



“Unprecedented” is the theme of the U.S. Dairy Export Council 2007 Annual Report, because there has never before been a year equivalent to last year’s export growth.

In 2007, export value rose an outstanding 62%, to \$3.06 billion. More than 993,000 MT, the highest volume in history, of U.S. dairy production was shipped to international markets. And for the first time ever, the amount of U.S. dairy products sent to foreign buyers reached 9.5% of total production.

Please visit <http://usdec.files.cms-plus.com/PDFs/USDEC2007AnnualReport.pdf> to view the USDEC 2007 Annual Report.

In the News...

New USDEC Members

- USDEC welcomes eight new companies to the membership: **Bongards' Creameries**, a cheese and whey manufacturer from Bongards, Minnesota; **Challenge Dairy**, a Dublin, California-based butter manufacturer; **CoBank**, an agricultural lender headquartered in Greenwood Village, Colorado; **Fort Forwarding**, a New York-based company that provides global supply-chain services; **MCT Dairies**, a dairy distributor and trading house from Millburn, New Jersey; **Rabobank International**, a financial services provider from New York; **Shamrock Foods Co.**, a dairy processor and distributor based in Phoenix, Arizona; and **Swiss Valley Farms Cooperative**, a processor of milk, cheese and cultured products from Davenport, Iowa.

New Plants and Upgrades

- **Arla Foods** will invest \$15 million to increase annual production capacity at its cheese plant in Hollandtown, Wisconsin from 8,000 metric tons (MT) to 10,000 MT. Further investments are planned to bring capacity to 20,000 MT over the next 4-5 years.
- **BelGioioso Cheese** celebrated the opening of its fifth plant, an 8,360-square-meter facility in Freedom, Wisconsin, that will produce fresh mozzarella and fontina.
- **Foremost Farms** re-opened its Waumandee, Wisconsin, cheese plant after closing it a year ago. The plant will handle 500,000 liters of milk per day and produce 54 MT of cheddar daily for aging.
- **Grassland Dairy** purchased a former Land O'Lakes cheese plant in Greenwood, Wisconsin. Grassland will initially produce barrel cheddar, but

intends to add block-cheddar-forming towers as well.

- **Lifeway Foods**, the nation's leading producer of kefir, completed a \$2.5-million expansion of its Morton Grove, Illinois, plant. The project doubles production capacity.
- **Ultra Dairy**, DeWitt, New York, is investing \$9.5 million to expand its ultra-pasteurized (UP) processing plant. Ultra, a part of **Byrne Dairy**, produces UP milk, cream and ice cream mix. The project will add 4,274-square-meters, nearly doubling the size of the plant.

Moves and Consolidations

- **Southeast Milk Inc. (SMI)** will close its Atlanta, Georgia, dairy operation. **Mayfield Dairy**, a part of **Dean Foods**, which has a processing plant northeast of Atlanta, will take over SMI's distribution routes and will acquire some of SMI's assets, including trademarks needed to serve Atlanta customers.
- **Dean Foods' Fairmont Products** will close its cottage cheese and ice cream plant in Belleville, Pennsylvania, in October.

Acquisitions and Mergers

- **Kantner Group**, a supplier of analog cheese, will expand into natural cheese with the acquisition of Las Vegas, Nevada-based **Custom Dairy Products**. Custom, formed in 2004, is a processor and packager of specialty cheese and distributor throughout the southwestern United States.
- **Monterey Gourmet Foods**, Salinas, California, assumed full ownership of **Sonoma Foods**, acquiring the remaining 20% of the business for \$2.4 million. In 2005, Monterey Gourmet Foods had acquired an 80% stake in Sonoma.

- **Southeast Milk Inc.** will acquire two fluid milk plants – in Plant City, Florida, and Hammond, Louisiana – from **Winn-Dixie Stores**. SMI handles most of the milk produced in Florida and supplies to processors throughout the region.

New Products

- **Kraft Foods** introduced a frozen, microwavable bagel stuffed with Philadelphia® cream cheese this spring. With *Bagel-Fuls*, the company hopes to tap into the large segment of consumers eating breakfast on-the-go.
- **Dairy Farmers of America, Inc.** introduced 2% singles and mozzarella string cheese with antioxidants under the Borden Essentials™ line. The launch is a response to consumers' desire to increase antioxidants in their diets, the company says.

Miscellaneous

- The 27th **World Cheese Championship Contest®** (WCCO) was held in March in Madison, Wisconsin and cheeses and butter from around the world were evaluated by class. Please visit <http://www.wis-cheesemakersassn.org/wccc/2008/index.html> to view the contest results.
- **"Refuel with Chocolate Milk"** is a new and powerful part of the **"Body By Milk"** campaign designed to educate teens on the muscle recovery benefits of chocolate milk post-exercise. The "Body By Milk" campaign was developed by the Milk Processor Educator Program (MilkPEP), which is funded by U.S. milk processors. To learn more about the program visit <http://refuel.bodybymilk.com>.

Demystifying the Health Benefits of Cheese

Finding great-tasting, nutrient-rich foods can be a challenge for consumers trying to follow healthier diets. However, taste and nutrition need not be mutually exclusive. Consumers need to look no further than the cheese case in their local supermarket to find rich-tasting, flavorful options that offer functional benefits and support healthy eating plans.

Despite cheese's robust nutritional profile, some consumers harbor misconceptions about this dairy product.

Misconception #1 **Lactose intolerant consumers cannot eat cheese**

One of the most frequently heard cheese myths surrounds lactose intolerance. While many people who have trouble digesting lactose believe that all dairy products should be avoided, that is not the case. In fact, cheese is a great choice for consumers with lactose intolerance. In particular, hard, aged cheeses, including cheddar and swiss, which contain little, if any, lactose since most of the milk sugar is removed when these cheeses are made.¹

Misconception #2 **Cheese is too fattening to be a part of daily eating routines**

While certain consumers avoid cheese because of lactose intolerance confusion, others mistakenly remove it from their diets because they think it is fattening. In reality, there are many options for both full-fat and lower-fat cheeses, allowing consumers to incorporate a variety of cheeses into their daily eating routines. A serving of low-fat cheddar, for instance, contains less than 3 g of fat. Regardless of fat content, all foods, including cheese, can fit into a healthy diet "if consumed in moderation with appropriate portion size and combined with regular physi-



Photo Courtesy of Dairy Management Inc.™

Despite cheese's robust nutritional profile, some consumers harbor misconceptions about this dairy product.

cal activity," according to the American Dietetic Association.²

Misconception #3 **Cheese is high in trans fat**

Trans fat has been linked with an increased risk of cardiovascular disease. Therefore, some consumers avoid that particular kind of fat and in doing so have reduced their cheese intake. Unfortunately, many consumers do not understand the differences between naturally occurring and industrially produced trans fat and the differences in how they impact health risks, such as blood cholesterol. Trans fat occurs naturally in small amounts in dairy foods, but the amount per serving often is less

than the U.S. Food and Drug Administration's labeling threshold of 0.5 g per serving. In addition, most consumers are concerned with the type of trans fat that is created through industrial hydrogenation. Since dairy trans fats are naturally occurring and exist in such small quantities, they are responsible for only a small fraction of the trans fat in consumers' diets.³

Nutrition may not always be the primary driver for eating cheese, but this nutrient-dense dairy product does, in fact, deliver an impressive number of benefits.

Benefit #1 **Calcium**

The body needs calcium to build and maintain strong, healthy bones and reduce the risk of osteoporosis, and cheese is one of the richest sources of this mineral. Calcium is so important in the diet that the United States' 2005 Dietary Guidelines, the National Medical Association and the American Academy of Pediatrics all recommend consumption of at least three servings of low-fat or fat-free dairy foods, including cheese, per day. Recognizing the importance of dairy as a source of calcium, the American Menopause Society announced in 2006 that "the best source of calcium is food and the best food source is dairy products."⁴

Benefit #2 **Dental health**

Numerous laboratory animal, human and in vitro studies have shown that cheese may protect against dental caries (i.e. tooth decay), promote tooth remineralization and stimulate the flow of saliva, helping to clear food from the mouth and neutralize acids. As a result, the American Academy of Pediatric Dentistry has called cheese an "excellent snack."⁵ Furthermore, a recent study from the Journal of Periodontology

has suggested that regular consumption of dairy products, including cheese, helps promote gum health.⁶

Benefit #3 Cancer prevention

Conjugated linoleic acid (CLA) is a trans-fatty acid that has been shown to have powerful cancer prevention properties, prompting the National Academy of Sciences to state that “CLA is the only fatty acid shown unequivocally to inhibit carcinogenesis in experimental animals.” Dairy is an especially effective and potent vehicle for delivering CLA’s benefits. Dairy products, including cheese, provide about 70% of total dietary CLA, and studies have shown that the CLA in milk fat is among the most potent naturally occurring anti-carcinogens.⁷ Recent emerging research has focused on CLA’s ability to protect against breast cancer in women.⁸



Benefit #4 Heart health

The well-respected DASH (Dietary Approaches to Stop Hypertension) diet has shown that a diet rich in low-fat dairy, including cheese, and fruits and vegetables is more effective in reducing blood pressure than a diet rich in fruits and vegetables alone. As a result,

the DASH diet recommends consuming three servings of dairy foods every day. Other studies have confirmed that dairy products have beneficial effects on cardiovascular health. A 2006 Greek study found that consumption of dairy was associated with a significantly lower risk of acute coronary problems, while a 2007 study in the UK revealed that regular consumption of yogurt and cheese reduced the risk of metabolic syndrome by 56%.⁹



Benefit #5 Probiotics, omega-3s and antioxidants via fortification

While many nutrients occur naturally in cheese, others are added to further bolster its nutritional profile. American cheese processors have been especially innovative in fortifying their products to deliver new benefits. In 2007, Kraft Foods introduced *LiveActive* cheeses made with probiotics for digestive health. More recently, Dairy Farmers of America, Inc. (DFA) launched two new varieties of Borden Essentials™ cheese made with immune-boosting antioxidants. And to capitalize on the omega-3 trend, Sorrento just added omega-3-fortified cheeses to its Sorrento® +Plus string cheese line, while Cabot Creamery is preparing to launch a cheddar with omega-3 for brain and eye development.

These recent introductions underscore U.S. processors’ commitment to addressing nutrition concerns in a changing health and wellness environ-



ment. As researchers continue to uncover cheese’s nutritional potential, consumers may expect to find even more innovative U.S.-produced cheeses that fit their lifestyles.

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Formulating Beverages with Whey Protein Ingredients

By *K.J. Burrington,*
Wisconsin Center for Dairy Research

Beverage Trends

New beverage introductions in the U.S. have continued to increase in recent years with a total of 3,231 in 2007, the greatest number of new product introductions in any food category.¹ Some of the product areas with the highest growth were in the sports and meal replacement categories, which place a greater emphasis on nutrition.² More beverage companies are focusing their attention on adding nutrition to their new products. The introduction of product labeling, which highlights dietary guidelines or specific nutrient goals of a company-wide dietary program, means that these foods are typically lower in sugar, fat and calories. Often companies are looking to dairy ingredients to add nutritional value to their products and much of the interest is focused on protein. Beverage companies are turning more often to whey proteins for their unique functionality and excellent nutritional properties.

Whey Protein Ingredients

Selection of a whey protein ingredient for a beverage should take into consideration the desired composition and functionality of the finished product. The whey protein ingredients designed for protein fortification are whey protein concentrates (WPC) and whey protein isolate (WPI). WPCs are available with a protein level varying from 34% to less than 90%. When the protein level reaches 90%, the product is called WPI. WPC 80 typically contains 80% whey protein, 6% fat, 8% lactose, 4% ash and 4% moisture, while WPI contains 90% or more whey protein, 1% fat, 3% ash, 2% lactose and 4% moisture.

Protein-hydrolyzed versions of both these ingredients are available if more heat

stability is desired. Details of the level of hydrolysis and expected heat stability can be obtained from the individual suppliers. More information about whey protein ingredients can be found in the USDEC Reference Manual for U.S. Whey and Lactose Products which is available online at www.usdec.org/publications/manuals.cfm.

Explaining the Behavior of Whey Proteins

The unique functionality of whey proteins is linked to their chemical makeup and conformation. Whey proteins represent a combination of different proteins with unique functions. Whey proteins are very ordered and globular in structure with a high level of sulfur amino acids. Like other proteins, they are charged molecules and the overall net positive or negative charge changes with the pH of the solution. Most beverages are in the 3-7 pH range, so it is helpful to understand the behavior of whey proteins in this range. At pH 3-3.5, whey proteins have a very high net positive charge.³ This net positive charge creates an environment where there is strong repulsion between molecules of the protein. This repulsion translates into a decreased ability of the proteins to interact, even with heating. Whey proteins exhibit some of their best heat stability in this pH range because of the repulsive forces present. It also means that you can fortify a drink with the most protein possible in that pH range, greater than 2 g protein/30 ml liquid or 6.7% protein, and still obtain good heat stability. As pH increases above 3.5 whey proteins will start to decrease in their net positive charge until they reach the pH range of their isoelectric points (pH 5-5.5), at which point they will have a balance of positive and negative charges or a charge of 0. Like other proteins, the isoelectric point of whey proteins is the point of lowest heat sta-

bility because of the great potential for protein interaction due to attractive forces between molecules. Once the pH increases close to 7, whey protein molecules will be more negatively charged. However, they will not be at their highest net negative charge until they reach pH 10. It is also important to note that whey proteins have the unique ability to be soluble over the entire pH range, from pH 2 to pH 11.



Looking for Clarity

Some formulators will be interested in cloudy drinks, like smoothies, or in clear drinks, like flavored waters. Turbidity usually refers to the amount of cloudiness or clarity a drink has. Using a nephelometer is one way to measure turbidity – typically water is used as a standard and has a value of 0 nephelometric turbidity units (NTU). If a protein-enhanced flavored water is your target then a whey protein isolate (WPI) is the best ingredient. The addition of 2.5% WPI (5 g protein/235 ml serving) in the pH range of 3-3.5 will provide good clarity. According to work done at



Courtesy of Hech Company, USA

the Center for Dairy Research, U.S. WPIs tested had a clarity ranging from 42 to 254 NTU at pH 3.2. Fat is the main component of whey ingredients that contributes to cloudiness at low pH, so choosing an ingredient that is very low in fat is best for protein-enhanced water.

If clarity is not a goal and you wish to formulate a smoothie-type product then you will likely want to increase the pH range to 3.5-4.5. The decrease in net positive charge creates an environment where there are more attractive forces between the whey proteins and the beverage will appear cloudier. Meal replacement beverages are typically around pH 7. Whey proteins can still achieve good solubility and heat stability in these pH ranges but may require the help of added processing steps and ingredients.

Formulation Tips

Though it is relatively easy to formulate ready-to-drink beverages with whey protein ingredients, there are methods to optimize the performance of the protein. Some processes are discussed in the monograph U.S. Whey Proteins in Ready-to-Drink Beverages, USDEC 2006 (<http://www.usdec.org/files/Publications/BEVERAGESwebversion8-16-06.pdf>).

All of the methods are designed to maximize the heat stability and shelf stability of the proteins. One of the most critical steps is the pre-hydration of the protein. In most beverage plants, dried ingredients are typically added to water with high-speed mixers, such as a liquefier or tri-blender, to quickly dissolve the powders. Whey proteins will dissolve quickly but they will also foam readily with this high shear.⁴ It is important to also allow some time for the whey proteins to hydrate once they are dissolved. The warmer the water used, the faster the hydration time, so it is recommended that the temperature of the water be less than 54°C. Twenty minutes is adequate time for hydration of the protein prior to heat processing.⁵

Drinks in the acid pH range are processed using hot fill conditions, i.e. 91°C for 30 seconds. When formulating in the pH range of 3-3.5, good hydration will help ensure good heat stability and better clarity if using a whey protein isolate. At pH 3.5-4.5 good hydration will not be enough to ensure good heat stability and food additives will be needed. Whey proteins stability will benefit from the addition of a high methoxy pectin combined with homogenization prior to heat treatment. The homogenization step will ensure good interaction of the pectin and the whey protein.

If you are formulating a drink at neutral pH, additional protection will be needed for the whey proteins because Ultra High Temperature (UHT) or Retort heat treatment conditions will be used to ensure adequate food safety and shelf life. In these drinks, phosphate buffers and stabilizers, combined with homogenization

prior to heat treatment, are important. UHT and Retort drinks would also benefit from the use of hydrolyzed whey proteins for added heat stability. A chalky or grainy mouthfeel is common in protein drinks that are not formulated for good heat stability. Syneresis, or the formation of a water layer at the top of the drink, is another possible defect that usually is the result of too much foaming prior to heat processing.



Whey proteins can be formulated into a variety of beverages. Using these tips and working closely with your supplier will ensure the best performance in your application.

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Recipe for Mango-Flavored Green Tea with Whey Protein

Please visit http://www.innovatewithdairy.com/NR/rdonlyres/DCC16D4C-33C7-4821-A47C-29D94776F8B4/0/4211GreenTeaFormulation_Final_v4.pdf to view a printable copy of the recipe and nutrition facts.

Ingredient Usage Level (%)

Water	89.20
Sucrose	8.08
Whey Protein Isolate (WPI)	2.24
Phosphoric Acid	0.18
Natural Green Tea Flavor	0.16
Mango Flavor	0.07
Potassium Sorbate	0.04
Natural Green Tea Powder	0.03
TOTAL	100.00 %

Preparation:

1. Mix WPI and water (at ambient temperature) using a high-speed mixer. Allow to hydrate for 20 minutes with slow agitation.
2. Mix in tea powder, sucrose, potassium sorbate and flavors.
3. Use 85% phosphoric acid solution to adjust pH to 3.2.
4. Heat mixture to 79.4°C for 45 seconds.
5. Fill containers and cool to 4.4°C.

Benefits of Using Whey Protein Isolate in Beverages

- Increases the protein content of the beverage.
- Offers a product with excellent digestibility.
- Contains essential amino acids in the proportions that the body requires for good health.
- Helps build and maintain healthy muscle mass.
- Provides a clean, neutral flavor that works well in beverages.
- Minimizes sediment.
- Has high clarity at acid pH.
- Maintains solubility during processing.
- Offers good solubility and heat stability at acid pH.

Recipe for Protein-Enhanced Water with Natural Strawberry Flavor

Please visit http://www.innovatewithdairy.com/InnovateWithDairy/Articles/Formulation_proteinwater_06.htm to view a printable copy of the recipe and nutrition facts.



Ingredient Usage Level (%)

Water	97.30
Whey Protein Isolate (WPI)	2.26
Phosphoric Acid	0.20
Natural Strawberry Flavor	0.15
Potassium Sorbate	0.04
Sucralose Solution	0.04
FD&C Red 40 Solution	0.01
TOTAL	100.00 %

Preparation:

1. Mix WPI, strawberry flavor, sucralose, potassium sorbate, color solution and water (at ambient temperature) using a high-speed mixer. Allow to hydrate for 30 minutes.
2. Use 85% phosphoric acid solution to adjust pH to 3.4.
3. Heat mixture to 79.4°C for 45 seconds.
4. Fill containers and cool to 4.4°C.

The formulas on this page were developed at the Wisconsin Center for Dairy Research, University of Wisconsin-Madison. © Dairy Management Inc.™ Note: These formulas serve as a reference. Product developers are encouraged to modify the formulas to meet manufacturing and finished product specification needs.

Dairy Products for Infant Nutrition

Newborns and infants have unique and critical nutritional requirements. In order to meet those requirements the World Health Organization (WHO) exclusively recommends breast-feeding as the sole nutrition source for the first six months of life. Human milk is the perfect food for infants and it's a well-known and accepted fact that breast-feeding reduces infant mortality and has benefits extending far into adulthood. Breast-feeding is recommended for children up to 2 or more years of age with the addition of complimentary food sources after 6 months.

Today approximately 39% of the world's infants are breast-fed up until the age of 4 months.¹ A smaller proportion continues up to 6 months of age; however, the situation varies greatly from country to country. Educational campaigns have been put in place to raise awareness to the importance of breast-feeding, and recent data from the United States Center of Disease Control and Prevention indicates that these programs are working in the U.S. They recently reported that approximately 77% of new mothers are breast-feeding their infants, at least for a brief period of time. This is the highest rate ever reported.

When Infant Formula is Beneficial

Unfortunately, breast-feeding is not always possible. These include situations where the health of the mother is poor, she is taking medication that would be harmful to the infant, there is an inadequate supply of maternal milk, or unsupportive social or economic conditions exist. When breast-feeding is not possible the WHO advocates the use of high quality and nutritionally balanced infant formula to ensure that the infant receives adequate nutrition. Infant formulas are available in many countries in powder and concentrated liquid, both of which require the availability of clean, safe water for consumption. This is espe-



cially critical for premature, immunocompromised and low-birth-weight infants. Ready-to-drink formulas are also available; however, they are higher in cost and are most beneficial when convenience is important or when clean water is not available.

Composition of Infant Formula

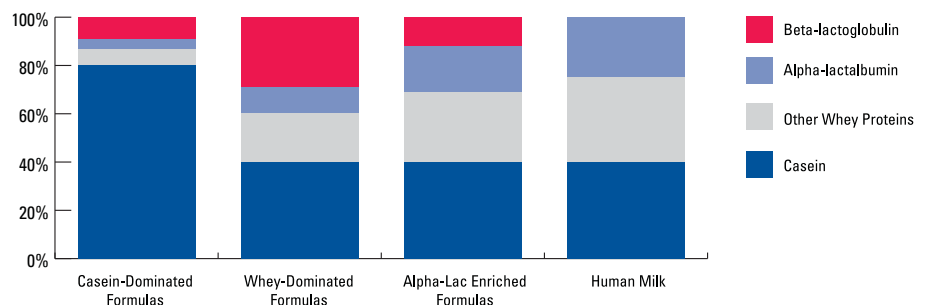
While greater knowledge about human milk has helped scientists improve infant formula, it has become increasingly apparent that infant formula can never duplicate human milk. Human milk contains living cells, hormones, active enzymes, immunoglobulins and compounds with unique structures that cannot be replicated or are cost prohibitive to include in infant formula.

The goal of infant formula manufacturers is not to duplicate human milk but to match its performance so that formula-fed infants develop as well as those who are breast-fed. Performance is measured by the infant's growth, absorption of nutrients, gastrointestinal tolerance and reactions in blood.

With the proper nutrition, infants are able to achieve their genetic potential for growth and development. The importance of proper infant formula development is underscored by the fact that it is the infant's sole source of nutrition for the first 4-6 months of age.

In the U.S. there are strict regulations for the composition, production and marketing of infant formula as regulated by the U.S. Food and Drug Administration (FDA) and as mandated by the Federal Drug and Cosmetic Act, including the Infant Formula Act of 1980 and its amendment in 1986. Since the passage of the Infant Formula Act, there have been many changes in infant formula products and new processing and packaging methods have been developed. Consequently, with the assistance of internationally recognized experts in the field of pediatric health and nutrition, the Life Science and Research Organization (LSRO) and the Food and Nutrition Board (FNB) of the Institute of Medicine, as contracted by the FDA, have compiled a concise and comprehensive list of recommendations for maximum and minimum levels of

Proportions of Proteins in Human Milk vs. Infant Formulas⁶



nutrients to be contained in infant formulas for both term and preterm infants, as well as the requirements for evaluating the safety of ingredients new to infant formula. These recommendations serve as the benchmark for infant formula development worldwide.

There are strict requirements for finished product testing, for good manufacturing procedures, quality control procedures, records, reports and product recall. A greater understanding of infant nutritional needs for healthy growth and development has been, and continues to be, a key element for development of science-based regulations in the U.S. and abroad. Moving into the next century, challenges for infant formula regulation will continue to evolve with increasingly complex new ingredients and advances in technology.

The Codex Standard for Infant Formula was developed and adopted by the joint FAO/WHO Codex Alimentarius Commission to establish standards for infant formula around the world. The document is regularly updated, the last revision having been done in 2007. In order to meet the established guidelines, infant formula must contain the appropriate levels of protein, carbohydrate, fats, vitamins and minerals to sustain a healthy rate of growth and development without placing unnecessary stress on the infant.

Infant formulas have been available since the latter half of the 19th century. Over time significant product development and research has been done to improve their quality to better replicate the analytical profile of human milk. This is only possible to a certain point however, as human milk contains components that cannot be matched due to lack of availability, high cost, processing incompatibility, or other reasons. Another factor is the difference in the protein composition of cow's milk vs. human milk, which evolves over time. The original composition of human milk starts out being more than 80% whey protein and later changes to a whey:casein protein ratio of 60:40. In comparison, cow's milk



has a whey:casein protein ratio of 20:80. In the past, the protein composition of infant formula was approximately 80% casein and 20% whey protein. However, as researchers better understood the differences between human and cow's milk, infant formula manufacturers started adding whey protein to their formulations. By the mid-1990s the majority of all milk-based formulas, at least in the U.S., contained whey protein and today the protein source in many infant formulas varies between 60% and 100% whey protein.²

The primary protein sources used in infant formula today are a combination of whey protein concentrate (WPC) and skimmed milk powder (SMP). Formulas based on soy protein are also available; however, dairy ingredients are the preferred choice. The SMP helps provide a natural flavor to the formula while WPC aids in emulsification, adds stability and imparts a smooth mouthfeel. In addition to being a source of easily digestible protein, these ingredients also contain natural calcium which is required by infants for healthy bone development.

The protein composition of infant formula is critical as differences in the type and amount of protein directly affect amino acid intake during feeding. The amino acids in human milk play an important role in early growth and development, and infant formulas need to contain the minimum amount of each one. To reach these levels infant formu-

las often contain more protein than human milk. Several studies have been done to compare the effects of the higher protein intake on infants. The researchers concluded that whey-dominant infant formulas with up to 1.8 g protein/100 kcal were safe and comparable to conventional formulas in terms of growth and development during the first 4 months of life.³ The formulas were well tolerated by the infant and the effect on their gut bacteria was similar to that of the breast-fed infants.⁴

Role of Lactose

Lactose, a carbohydrate found in milk and milk products, is another dairy ingredient commonly used in infant formulas. Human breast milk contains approximately 7% lactose (67 g/L, about 10 g/100 kcal). With the exception of soy-based and lactose free infant formulas, most commercial formulas manufactured in the U.S. contain lactose as a sole source of carbohydrate at a level of 72 to 74 g/L (10.7 to 10.9 g/100 kcal). In preterm formulas, lactose and glucose polymers each constitute approximately 50% of the carbohydrate content.

In the digestive tract, lactose is broken down into the simple sugars glucose and galactose by lactase (β -galactosidase). Glucose is important as a source of energy and it is essential for an infant's growth and development, while galactose plays a role in brain and nervous tissue development. Lactose powder aids in the absorption of minerals, including calcium, and also supports the growth of beneficial bacteria in the digestive system.⁵ The enhanced calcium absorption by lactose is dependent on the adequate intestinal hydrolysis of lactose. During times of illness, for instance in the case of infectious diarrhea, infants may be unable to tolerate lactose in the diet. A myriad of Lactose-free infant formulas are available on the market. The protein sources for the lactose-free formulations may include milk protein isolate, free L-amino acids, casein hydrolysates with L-cystine, L-tyrosine and L-tryptophan or soy protein isolates with L-methionine.



The carbohydrate source is typically corn maltodextrin, corn syrup solids and/or sucrose.

Alpha-Lactalbumin Enriched Formulas

Developments in manufacturing and filtration technology have increased the availability of concentrated whey protein fractions such as alpha-lactalbumin (α -lac), which is a calcium-binding protein. Human milk contains over 4 times the amount of α -lac present in cow's milk. Increasing α -lac level in infant formula while simultaneously reducing the level of beta-lactoglobulin (not present in human milk) provides a lower protein formula with the necessary balance of essential amino acids required by infants. Some of the potential benefits associated with this formula include improved sleep patterns, better mineral absorption, stimulation of the immune system and better formula tolerance.⁶ The ingredient cost of α -lac is higher than WPC and its use in infant formula is more limited.

Hydrolyzed Whey Protein Formulas

Hydrolyzed whey proteins are produced using a strictly controlled manufacturing

process during which the protein chains are broken down into smaller sections called "peptides". Infant formulas made with hydrolyzed whey proteins have been shown through clinical testing to reduce the incidence of food allergies in affected infants by approximately 50%.⁷ Hydrolyzed whey protein formulas were found to also have a significant cost, taste and odor advantage over the earlier casein containing formulations. The addition of hydrolyzed whey protein to infant formulas has also been shown to help reduce the incidence of crying in colicky infants but the research in this area is still limited.⁸

Preterm Infant Formulas

In comparison to full-term infants, infants born prematurely often require additional nutrients, including protein, vitamins and minerals (i.e. calcium and phosphorus), to achieve optimal growth and development. Human milk is often supplemented with nutrient dense formulas called "human milk fortifiers" in order to meet the nutritional needs of the preterm infant. Human milk fortifiers and stand-alone formulas for preterm infants typically contain 20-24 g protein/L. The majority of these formulas are whey-predominant with a whey to casein ratio of 60:40. The composition of the formulas will vary as some are designed for in-hospital use while others are tailored more for post-discharge feeding.

Formulas for Older Infants and Children

After the age of 6 months daily protein requirements increase and supplemental food products are often added to the diet. Follow-on infant formulas have been specially formulated to meet the nutritional needs of infants 6 months and older. From this point through early childhood it is recommended that every 100 g of food contain 15 g of high quality protein to support growth. Food products and beverages containing whey protein and skimmed milk (powder) are a rich source of high quality protein and essential amino acids. Both

of these are preferred ingredients in formulas developed for infants 6 months and older and in beverages designed for toddlers. The introduction of whole cow's milk is not recommended until after the age of 12 months and only whole milk should be consumed until the age of at least 2-3 years.⁹

Future Developments

Despite the progress achieved, additional work is needed to increase the proportion of breast-fed infants and the duration of breast-feeding. Efforts are on-going to improve the composition of infant formulas and areas of current interest include:

- Addition of prebiotics to help stimulate the growth of desirable bacteria, such as *bifidobacteria*.
- Probiotic supplemented formulas to help reduce the incidence and severity of diarrhea.
- Addition of lactoferrin to treat iron deficiency.

Research continues in the above areas to better understand and validate the benefits associated with short- and long-term use and to address any potential safety concerns. For additional information please refer to the USDEC monograph titled U.S. Whey Products and Child Nutrition at <http://www.usdec.org/files/Publications/ACFA74.pdf>.

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Downes-O'Neill, LLC

Downes-O'Neill, LLC is a leading dairy market brokerage group and risk management consulting firm. Chicago, Illinois-based Downes-O'Neill reports that it trades more in CME Group dairy contracts annually than any other brokerage firm.

Downes-O'Neill was established in 1996 at the start of CME Group dairy trading. "We've been active in dairy commodities for exporters and importers since the earliest time it was possible. The firm was instrumental in creating these markets from scratch," says Robert Chesler, account executive. *(For more about the CME Group, see the related article on p.4 in this issue)*

The firm combines brokerage services for CME futures, options and forward contracting with client services, such as analysis. The large volume of Downes-O'Neill deals, combined with close client relationships, strengthens the firm's advisory role to dairy buyers, Chesler says.

The goal is to help international buyers manage U.S. dairy product price fluctuation, Chesler says. The financial transaction in the futures market can help to lock in a price for deliverable physical products, while Downes-O'Neill consulting services help time market buys to maximize profit margins, he adds.

Chesler notes CME's dairy commodity markets allow international buyers to establish future costs, even without a guaranteed price from the U.S. dairy product supplier. "When buyers are considering the merits of the countries to source dairy product such as nonfat dried milk, the ability to get a fixed price for dairy futures is a key factor driving U.S. dairy exports," Chesler says.

The firm helps U.S. dairy export buyers reduce the risk of price fluctuations by securing a price on cheese or other dairy products that day. "If buyers can't

get a fixed price, they don't know how much it's going to cost. Downes-O'Neill secures today's market price for later purchases," Chesler explains.

For instance, a buyer in Mexico may plan a substantial U.S. cheese volume purchase in September. But the U.S. dairy supplier may not be able to quote advance pricing due to market fluctuations. The buyer can purchase a futures contract at \$1.90 per lb. When September arrives, the price of the actual product has risen to \$2 per lb. The buyer from Mexico pays \$2 per lb. to purchase the cheese from the U.S. supplier. Then, because the futures contract has also risen in value, the buyer sells the \$1.90 per lb. future at the \$2 rate, a 10 cent gain per lb.

Increased Presence, Capabilities

Key management has more than 50 years of combined industry experience, including dairy trading as well as broader agricultural and commodities markets. Downes-O'Neill brokers are registered with the Commodity Futures Trading Commission (CFTC) and are members of the National Futures Association (NFA).

"We help customers manage price risk through comprehensive hedging strategies and information," Chesler says. Downes-O'Neill provides clients with services as well as dairy market trends analysis through sister company, e-Dairy Inc.

Downes-O'Neill has new capabilities including over-the-counter swaps through its new parent company FCStone Group, Inc. (NASDAQ: FCSX). Downes-O'Neill became a part of FCStone's worldwide commodity risk management business in January 2008. FCStone companies serve more than 7,500 customers with consulting and transaction services in all major commodity areas.



Already common in energy and grains markets, over-the-counter swaps are gaining ground as a dairy risk management tool thanks to added flexibility, Chesler says. Because futures contracts have set specifications, such as 200,000 lb. (91 MT) contracts for a 24-month trade, a U.S. dairy export buyer can't hedge a 300,000 lb. (136 MT) cheese buy. With over-the-counter swaps, clients can buy the exact amount required.

Along with new trading capabilities through FCStone, Downes-O'Neill continues to expand the content of its client industry publications, including:

- *The e-Dairy Weekly Insider* – Comprehensive technical analysis, a fundamental report and interviews with dairy industry leaders.
- *The Bailey Report* – A dairy market publication that focuses on dairy export, import and international supply-and-demand factors, as well as in-depth analyses. Published monthly.
- *Washington Update* – Access to Jim Webster's commentary on legislative issues that impact the dairy industry.

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Humboldt Creamery

Humboldt Creamery, Fortuna, California, is the processing arm of the Humboldt Creamery Cooperative. It was founded in 1929 to market the milk from 152 dairy farming families and today is the oldest continuing dairy farm co-op in the state of California.

Humboldt Creamery reported more than \$100 million in sales of conventional and organic dairy products for 2007. The cooperative began exporting its ice cream, frozen novelties, milk powder and dairy products more than 10 years ago, and continues to expand its international marketing reach.

Humboldt Creamery's west coast location offers readily accessible shipping capabilities to its export customers. The co-op currently exports powdered milk products to Mexico, The Netherlands, Bangladesh, Egypt, Syria, Panama and Vietnam, as well as to West African countries. Its ice cream and frozen novelty products are currently exported to Mexico and Chile and are poised to expand to the European Union this year.

"We have the capability to ship our products to any country in the world and are actively seeking new markets," says Jeffrey Sussman, Humboldt Creamery's sales and marketing manager.

Production Capabilities

Humboldt Creamery's operations process more than 88 million liters (200 million pounds) of member milk annually. All milk is pledged rBST-free, and roughly half of the co-op's 50-plus dairy farm owner-members supply organic milk certified by the U.S. Department of Agriculture (USDA). Member farms continue the historic practice of pasture-grazing dairy herds year round in the moderate climate of the California Northern Coast.

"Our dairy families take pride in their approach to compassionate care for animals and we have been approved by the American Humane Association for our farming practices," says Sussman, noting the co-op's Free Farmed certification.

Milk is manufactured into ice cream, milk powder and a variety of fluid milk products at Humboldt Creamery facilities in Fortuna and Los Angeles, California. Each operation produces both conventional and certified organic dairy products; all products are certified kosher. Humboldt Creamery has an in-house product development lab and enforces strict manufacturing procedures.

The Fortuna facility manufactures more than 4,500 MT (10 million gallons) of ice cream annually. It produces a full range of frozen dessert product and package types, ranging from pint to 3-gallon containers. The Los Angeles plant manufactures more than 100 million individual frozen dessert novelties each year. As Humboldt's frozen dessert exports grow, the co-op will add metric to all standard U.S.-size ice cream and novelty packaging.

The cooperative's Fortuna plant additionally produces nearly 10,000 MT (22 million pounds) of conventional and certified organic milk powders annually. Powders are packaged for export in 25 kg bags and larger tote sizes.

Whole Milk Powders are available in organic, instant and standard varieties. Manufactured by spray drying, these powders have undergone a controlled low heat treatment. Each has a consistent and uniform composition and a pleasing flavor when reconstituted. Applications include confectionery products, bakery products, reconstitution, nutrient supplements and dry blends.



Nonfat Dry Milk Powders are available in a wide range of varieties:

- Fortified with vitamins A & D
- rBST Free
- Organic
- Instantized to offer high dispersibility and reliquification properties.

Applications include various drink mixes, dry blends, nutrient supplements and any uses where instant density characteristics improve product acceptance.

Contact Information

Website: www.humboldtdairy.com

Export Product Website Pages:

<http://www.humboldtdairy.com/icecream.html>

<http://www.humboldtdairy.com/milkpowderdatasheets.html>

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Rice Dairy

Brokerage firm Rice Dairy specializes in dairy commodities purchases and market guidance. The Chicago, Illinois-based firm's services are designed to limit price volatility risks for domestic and international U.S. dairy buyers.

Rice Dairy was established in 2002 by Brian Rice, an experienced dairy commodities trader at the CME Group. *(For more about the CME Group, see the related article on p. 4 in this issue.)*

"Price volatility is found in all commodities, and in dairy commodities it is here to stay. The dairy market is coming to terms with the price risk in the U.S. and the world market at large," says Rice. "The dairy buyers who learn to manage price risk efficiently are at a distinct advantage."

Rice Dairy handled more than 20% of all CME dairy trades in the 52 weeks ending March 31, 2008, according to the company. The volume of dairy futures and options trades represented 1.25 million MT.

With four CME brokers, Rice Dairy reports that it offers the most extensive trading staff of any CME dairy specialty firm. The CME presence provides Rice Dairy with unique market insights and instant turnaround on orders, Rice says.

Buyers of U.S. dairy products can utilize Rice Dairy to purchase CME dairy futures, options, spot and forward markets. The firm's services are designed to help dairy buyers in the "institutional management of price risk," Rice says, citing the grains commodities market as an example. The 150-plus-year history of grains trading has created a buying pool that considers market purchases a core business competency.

"It is a mindset the dairy buyers should strive for. Hedging is the opposite of gambling. By going into the market and

hedging, dairy buyers actively lower the business risk. If they are not hedging, dairy buyers are making a choice to not actively manage their price risk," Rice says.

For instance, a foodservice provider in Japan regularly purchases 1 million pounds (454 MT) of U.S. cheese per month. The amount needed is fixed, but volatile pricing is a variable that can infringe on profitability. To create a long-range price, the buyer can utilize the CME as a dairy risk management tool. "If they buy a million pounds' worth of cheese options in June, they've locked the price in," Rice explains. If the cheese price goes up, the buyer will pay more, but the profit in the futures market will be equal to the price difference. Likewise, if the price drops, the buyer pays the lower price for the physical product, which evens out the loss on the sales of futures.

Execution & Education

The firm taps a wealth of expertise for client services, outreach and education. Brian Rice and Pete Turk, fellow Rice Dairy principals, have each been involved in the CME dairy futures market since its 1996 launch. The two principals have a combined 35 years of futures industry experience and a combined 30 years of National Futures Association registration. Other key staffers share long-term backgrounds in dairy futures as well as in the overall dairy industry.

Rice Dairy publishes research projects, daily and weekly reports, periodic price forecasts and pre-USDA (U.S. Department of Agriculture) report estimates, as well as audio commentary on the markets. "Rice Dairy's mission is to arm our clients with the right tools and information for participation in a very competitive marketplace," Brian Rice says. "We're very much in the education business. Our research products offer an



informed perspective on market conditions. We travel the world to talk to people about how our markets work, explain our role in the marketplace, and offer specifics on how the market may work for each particular buyer."

Rice Dairy publications include:

- The Rice Dairy Report
- Daily Spot Report
- Market Blog (straight from the CME Dairy Trading Pit)
- Jerry Dryer's "Dairy & Food Market Analyst"
- Jerry Dryer's "Long-Range Price Forecast"
- Pre-USDA Report Forecasts
 - Milk Production
 - Dairy Products Report
 - Cold Storage

"Growing international dairy demand combined with the U.S. dairy industry's steady milk supply and stringent quality/sanitary standards will continue to increase demand for market risk management tools," Rice says. "When you come to the U.S. to source a dairy product, you automatically have an advantage, because you have the ability to manage your price risk at the largest derivatives exchange in the world in an open and transparent manner."

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