

# CALIFORNIA Dairy Dispatch

RESEARCH, EDUCATION AND SERVICE TO SUPPORT THE DAIRY INDUSTRY

VOL. 17, NO. 1 • SUMMER 2007

## On the road from analysis and discovery of milk bioactives to new products and health outcomes

By Samara Freeman, Ph.D., UC Davis researcher, symposium coordinator

The symposium on milk bioactives at the recent American Dairy Science Association (ADSA) meeting highlighted different approaches and types of research needed to capture the health value in dairy ingredients and products. Held in San Antonio, TX, the symposium was sponsored by CDRF, Agilent Technologies and Hilmar Ingredients. Participants included analytical chemists, physiologists, food scientists and clinicians.

Bioactive ingredients are structures in food that bring about specific physiological/metabolic effects beyond the traditional view of food as fuel sources. The impetus for focus on bioactives is the burden of chronic, metabolic diseases in the population coupled with rising health care costs. This opens the door to new strategies for preventing diseases and promoting health. Research is continuing to identify unique components in milk, define appropriate health targets and find diagnostics that make sense to deliver health benefits. Mammalian milks nourish and promote the

(see **Milk Bioactives** on page 2)



New technologies for previously difficult-to-measure, but important long-chain sugars in milk enable a detailed and comprehensive view of these potential health-promoting components in milk. Long-chain sugars are food for resident intestinal bacteria. This single credit card-like chip (photo inset) separates and measures all 190 different sugars found in breast milk in a single run.

## 4th International Milk Genomics & Human Health Symposium speaker program set

The speaker program for the 4th International Symposium on Milk Genomics & Human Health, to be held November 7-9 at the COPIA Center for Wine, Food & the Arts in Napa, California has been released.

This two-and-a-half-day event, organized by CDRF, gathers international experts in nutrition, genomics, bioinformatics and milk each year to examine the status of milk-specific genomic research.

The event kicks off with a welcome by CDRF Executive Director Joseph O'Donnell, followed by an introduction from Bruce German of UC Davis. Day one sessions will focus on presentations of recent research breakthroughs in the areas of evolutionary genetics; bioinformatics, tools

(see **Genomics** on page 5)

### INSIDE

3

**ADSA: 100 YEARS OF SERVICE**  
Leading association for dairy scientists marks 100th year

4

**ONE MAN'S TRASH...**  
Dairies contribute to renewable energy

6

**CDQAP HONORED**  
CDQAP nominated for environmental awards

8

**CALENDAR**  
IDFA dairy workshops Oct. 22-23

## Milk Bioactives *from page 1*

survival of the newborn infant and therefore, inherently contain bioactivities directed towards health. For human health, human breast milk offers a unique glimpse at how these milk components can guide development of the infant gut and immune system at a time when the infant is most vulnerable to infection and metabolic errors. This strategy enables efficiently linking specific milk components to specific health functions. Finding commercially viable bovine sources of bioactives and measuring changes in specific health targets in

different age groups and conditions are the next steps.

What bioactive components are in milk? What is the natural variation between breeds and different diets for different bioactives? Exciting technological breakthroughs in the areas of complex carbohydrate analysis provided an example of how we can begin to answer these questions. Complex carbohydrates namely the oligosaccharides (long-chain sugars) are one of the least understood components of milk. Prior to this research, it took years to analyze and document a few carbohydrate structures within milk and even longer to figure out how they were linked to proteins. With new technology, more than 190 different free structures have been identified in a single sample of human milk over the course of lactation. In human milk, free oligosaccharides are the 3<sup>rd</sup> most abundant component, yet they are not digestible by the infant; they instead direct the developing intestinal profile of bacteria, a critical part of a healthy intestine. Dairy now has targets for breeding cows that can produce a value-added milk containing health promoting, naturally formed oligosaccharides.

Conjugated linoleic acid (CLA), specifically rumenic acid can be analyzed in milk. CLA is a trans fat found in dairy, but it has a different structure than industrial trans fat, and has created significant interest for its anti-cancer and anti-heart disease effects. Medical studies investigating the effects of natural trans fats such as CLA versus those trans fats that are made in chemical plants show significant differences on heart disease. In a collaboration of dairy producers, processors and health researchers, a butter enriched with CLA was produced and used in clinical trials. However, translating these benefits to the consumer has been difficult because chronic diseases like cancer do not show up for years, so it is hard to determine the

success of the intervention. Showing prevention of a disease is very different from treating an existing disease. Proving prevention requires greater mechanistic understanding of how these different fat structures actually function in the body. Once we understand the mechanisms of action, we can build our story of health.

An important point made at the meeting was that we need to sort out the great complexity of milk fat rather than just look at it as a homogeneous lump. The negative stigma associated with saturated fats overshadows appreciation of benefits derived from consuming unique milk fat components. No other fat in the human diet has the complexity anywhere near what milk fat has. Complex fats are important in the body and having a dietary source of them could positively impact health. Milk fat globules can be loosely divided into small and large particles. The small particles are exciting because they are enriched for membrane and complex fats. These small particles are abundant in milk, and their function in the newborn infant could be instrumental in developing skin, brain and intestinal tissues. Likely these attributes will see similar roles as we age. The innovation here will come from finding novel mechanisms and assessment tools for looking at the effects of consuming small fat globules.

A clinical study on the impact of increasing whey protein in the diet on specific health conditions related



### Board of Directors

**Stan Andre**

*California Milk Advisory Board*

**Sharon Hale**

*California Creamery Operators Assoc.*

**Gregory Miller**

*Dairy Management, Inc.*

**Randy Mouw**

*California Milk Advisory Board*

**Mike Newell**

*Dairy Council of California*

**Tony Souza**

*California Milk Advisory Board*

**Ron Thompson**

*California Dairies, Inc.*

California Dairy Dispatch is a quarterly publication of the California Dairy Research Foundation.

© 2007 California Dairy Research Foundation

For more information, contact:

**Joseph O'Donnell, Executive Director**

California Dairy Research Foundation

502 Mace Blvd., Suite 12

Davis, CA 95618

Phone (530) 753-0681

Fax (530) 753-1453

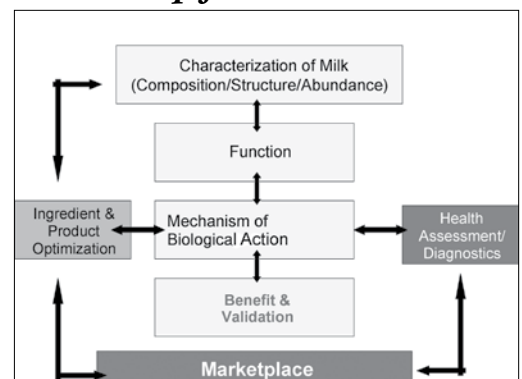
E-mail: [odonnell@cdf.org](mailto:odonnell@cdf.org)

Editor: **Corinne Esser**, CDRF, (530) 753-0681

Contributing Writer: **Jennifer Giambroni**

Produced by **EditPros**, Davis, CA (530) 759-2000

## A Roadmap for Milk Bioactives



**Milk Bioactives** *concludes on page 3*

# American Dairy Science Association: 100 Years of Service

One of the leading scientific associations for dairy scientists recently celebrated 100 years of service to the global dairy industry.

The American Dairy Science Association (ADSA) began in 1906 as the National Association of Dairy Instructors and Investigators with 19 charter members. After a brief stint as the Official Dairy Instructor's Association, it became the American Dairy Science Association in 1916. The ADSA currently has 4,122 members with international members accounting for 30 percent.

In its early years, the ADSA played an integral role in the development of dairy curricula in state universities, where little to no specific training existed for dairy products and dairy manufacturing. The Association also became involved in creating standards for dairy products as well as rules for judging, testing and identification of dairy cows. Annual meetings were held on college campuses where members could get a feel for the facilities in regions throughout the country—a practice continued until the late 1990s.

The *Journal of Dairy Science* (JDS) was introduced in May of 1917 as a vehicle publishing original research in dairy science. The inaugural issue

carried five manuscripts. The publication grew rapidly from bi-monthly to its currently monthly distribution.

Today the JDS stands as the peer review vehicle for definitive communication of dairy science research. For the past six years, the Institute for Scientific Information has ranked the Journal as one of the top three leading journals in the agriculture, dairy and



animal science category. In 2007, the JDS became one of three top-ranked journals of 44 in its category and is on track to publish 6,000 pages with papers from outside of North America, accounting for approximately 70 percent of submissions.

Beyond providing a forum for members to meet and share informa-

tion at regional and annual meetings, the association established the DISCOVER conference series in 1997 to expand educational programming in the area of food animal agriculture in a smaller, more interactive setting. DISCOVER sessions have covered topics such as microbial safety of foods of animal origin, transition cows, probiotics for food animals, antibiotics in animal agriculture, and protecting and managing animal genetic resources.

The ADSA is dedicated to developing the dairy scientists of tomorrow and has a thriving Student Affiliate Division (SAD) with 744 members in 12 chapters across the country at colleges and universities offering dairy science courses. In addition to regional meetings, the SAD meets annually and conducts activities in conjunction with the ADSA annual meeting.

In 2006, the ADSA celebrated its centennial, culminating with a celebration at its joint annual meeting in Minneapolis featuring displays from ADSA members, a historic coffee table book and commemorative DVD. According to member Joseph O'Donnell, ADSA past president (2005) and executive director of the CDRE, the association is well positioned for its next 100 years.

"The ADSA has consistently been at the forefront of dairy leadership and discovery, demonstrating an ongoing commitment to providing cutting-edge programs and services for its members," said O'Donnell. "Like most of my peers, ADSA membership is a resource I continually tap and is responsible for many of the professional and personal relationships I value today."

For more information about the ADSA, visit [www.adsa.org](http://www.adsa.org).

---

## Milk Bioactives *from page 2*

to obesity and metabolic syndrome in women showed that a 5 to 10 percent decrease in weight can significantly improve fertility. Weight and fat mass loss was greater with increased protein compared to carbohydrates. As part of the study, women were tested immediately after a meal to show how their body responded to that meal. The immediate effects of food present an opportunity to develop health diagnostics that bring established bioactive ingredients to practice. Further

studies could determine any unique bioactives in whey protein that contribute to the observed weight loss to differentiate it as a bioactive food. As milk is better characterized at the molecular and structural level, benefits to the consumer will be more easily identified. To be successful, these bioactive projects need the food science, nutrition and medical fields to come together to discuss these ingredients from their multiple perspectives.

*CDD*

*CDD*

# One man's trash is another's profit center

By Joseph O'Donnell, CDRF Executive Director

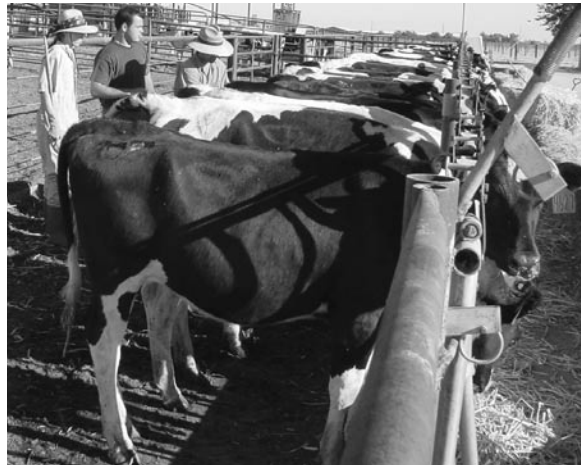
California is more than the land of sunshine and happy cows. Over the last 30 years, it has become the number one milk producer in the U.S. (responsible for 21 percent of the supply) and one of the top milk-producing regions in the world. While the secret to this success has many facets, one of the overriding elements is the low cost of milk production.

California leads the country in many things—some good, some bad and some just plain goofy. Two claims to fame include being the state with the largest population and our status as the number one agricultural producer. Can these two coexist? The fact is, California is a desirable place to live and the population won't be reducing any time soon. All of these residents want clean air, clear water and clean food. Overall, in fact, this interest in *Clean and Green* is at an all-time high and shows no sign of abating, regardless of the region. In California, we just got a head start on everyone else. Currently we have the toughest air and water regulations in the country. While that is positive for the environment, it can and will have a serious effect on California's traditionally low cost of production. Accommodating environmental regulations takes money, lots of it. Most of that money will be spent managing one of the byproducts of our dairy success—manure.

How have others dealt with this situation? Years ago, the cheese industry faced a similar problem when new regulations were put in place for the disposal of whey. As they say, necessity is the mother of invention. Cheesemakers looked at it as a business opportunity. They put whey

under the microscope of scientific study to better understand what it was and, more importantly, what it was good for. The functional properties and nutritional value of whey as a food ingredient, which came from this research, created the market. Now, instead of being a disposal expense, whey is a profit center.

Whey can serve as a model for the milk producer. Manure must be handled to minimize its impact on air or water quality. This could present an enormous cost, which will trickle down to the cost of milk production. With each increase in production costs, our competitive edge slips. The



way out is to design a business plan using manure as the raw material for a profitable business. To do so we need to better understand the properties of manure so we can identify targets for commercial venture. Some of this has already been done; for example, the commercial value of the components fermented to make methane.

Crops capture the energy of sunlight. When cows consume crops, much of this energy is transferred to the milk and meat. Energy not captured by the cow goes out with the manure. This energy is now being tapped through fermentation to generate methane (natural gas). Methane

finds a market either directly into the pipeline or to a diesel generator that can put the electrical energy back into the dairy or to the grid. The now-composted manure can in turn be sold into other money-making markets. This translates to real dollars. And the best thing is, it's *renewable*. The timing has never been more critical.

This is far from a pipe dream. With the proper business plan, the processing of manure can become a profit center for dairy producers. As technology improves, systems will become available for all sizes of dairy operations and they won't always need to use a digester. With manure generating profits rather than incurring expenses, the cost of production can remain reasonable and California producers will remain competitive. The research is under way throughout the country. As far away as New York, Clarkson University received a large project from the state to look at biogas from dairy waste products. The University of California, Davis, also has a research group looking for solutions. Consistent with that are restructuring efforts of our energy suppliers to accommodate this new resource.

The answer lies in looking at manure as an opportunity rather than a challenge. Given the keen nationwide interest in environmental stewardship and the urgent need to decrease our dependence on foreign energy sources, the time is ripe (pardon the pun) for a manure management business plan that will keep the cost of production for all dairy producers as low and competitive as possible.

*This article appeared first in the Feb. 2007 issue of Western DairyBusiness.*

*OOD*

---

## Genomics *from page 1*

and applications; the bovine genome; and genetic diversity in milk and lactation. Day two will focus on the activities of milk and genomics centers from around the world with the goal to increase coordination among researchers. Topics include the targets of milk bioactives; mammary epithelia and milk production; the milk fat globule proteome; and bacteria—the other consumers of milk.

The symposium will wrap up Friday morning with highlights from researchers throughout the world followed by an in-depth discussion of the International Milk Genomics Consortium, including knowledge management tools developed for the consortium led by the IMGC Web portal group.

Symposium registration is \$450 through Sept. 6, 2007, and \$500 thereafter and includes all program materials and daytime meals, as well as a Wednesday evening reception. Members of the International Milk Genomics Consortium can register at the rate of \$400 through Sept. 6, 2007, and \$450 thereafter. Student rates also are available. For registration information, visit [www.milkgenomics.org](http://www.milkgenomics.org) or register at [www.acteva.com/go/cdrf](http://www.acteva.com/go/cdrf).

In addition to the CDRF, sponsors include the International Dairy Federation, U.S. Dairy Export Council as well as IMGC sponsoring members CDRF, CNIEL, DairyAustralia, Dairy Farmers of Canada, Dutch Dairy Association, Mead Johnson Nutritionals and Teagasc.



### *Tentative Schedule*

***Bovine QTL Viewer: A Web-accessible Database of Bovine Trait Loci***, David Adelson, University of Adelaide, Australia

***Bacterial Imprinting of the Immune System***, Anne Donnet-Hughes, Nestlé Research Center, Switzerland

***Intestinal Barrier Function and Immune Gene Expression***, Sharon Donovan, University of Illinois

***Ancestral Mammalian Genome***, Jenny Graves, The Australia National University

***The IMGC Web Portal: Tutorial***, Matthew Lange, IMGC Web Portal Group, UC Davis

***The IMGC Web Portal: Content & Applications***, Danielle Lemay, IMGC Web Portal Group, UC Davis

***Milk for Protection***, Patrice Martin, Institut National de la Recherche Agronomique, France

***The Genomics of Milk Lipid Synthesis***, Peggy Neville, University of Colorado Health Sciences Center

***Isotopomer Flux Analysis of Bifidobacterium ssp Carbohydrate Metabolism***, Neil J. Price, USDA-Agricultural Research Service

***Intestinal Transporters and Gut Function***, Helen Raybould, UC Davis

***The Milk Fat Globule Proteome***, Timothy Reinhardt, USDA-Agriculture Research Service

***The Bovine Genome Status and Annotation Progress & the Role of Chromatin Conformation in Regulation of Milk Protein Gene Expression***, Monique Rijnkels, Baylor College of Medicine, TX

***Dutch Milk Genomics Initiative Reveals Large Genetic Variation in Milk-fat Composition***, Anke Schennink, Wageningen University, The Netherlands

***An Integrative Genomics Program to Explore Lactating Systems to Improve Herd Genetics & Develop Dairy Products***, Peter Williamson, The University of Sydney, Australia

## The CDQAP nominated for prestigious environmental awards

**T**he California Dairy Quality Assurance Program—a public/private partnership that supports programs in environmental stewardship, animal health and welfare, and food safety—was recently honored with nominations for three prestigious environmental awards.

### *Governor's Environmental & Economic Leadership Award (GEELA)*

Recognizing individuals, organizations and businesses that have demonstrated exceptional leadership and made notable contributions to conserving California's environmental resources, the Governor's Environmental & Economic Leadership Awards are the state's highest environmental honor. The San Joaquin Valley Air Pollution Control District nominated the CDQAP for this award in recognition for its ongoing air pollution outreach. Award winners will be announced in October 2007.

### *Roy Family Award for Environmental Partnership*

Presented every two years by Harvard's John F. Kennedy School of Government, the Roy Family Award recognizes public-private partnerships that significantly enhance environmental quality and/or protect unique natural resources. The CDQAP was one of six finalists in a field of 20 candidates from throughout the world. The final award was presented to the Hybrid Systems for Rural Electrification in Africa (HSREA).

### *US EPA Region 9 Environmental Award*

This program recognizes groups and individuals outside of the EPA that are working to protect public health and the environment. The San Joaquin Valley Air Pollution Control District submitted the nomination for the CDQAP's air quality outreach efforts in 2006. This is a second nomination for the CDQAP, which received this award in 2004.

This year marks the CDQAP's 10<sup>th</sup> anniversary. Since its inception, the program has demonstrated how compliance through education can work for both producers and regulatory agencies. The U.S. EPA's Region 9 has called the CDQAP "a model for significantly advancing our ability to improve water and air quality by simply changing the way we connect and work with farmers." For additional information, call 1-866-66CDQAP or visit [www.cdqa.org](http://www.cdqa.org).



*edd*

## Wilson appointed interim director of UC Davis Veterinary Medical Teaching Hospital

The UC Davis School of Veterinary Medicine has appointed W. David Wilson as interim director of the William R. Pritchard Veterinary Medical Teaching Hospital effective July 1. He took over the helm from Bradford P. Smith, who served as director for 13 years before his retirement from academia.

Wilson, a professor in the Department of Medicine and Epidemiology, has served as the associate director of the hospital's Large Animal Clinic for the past seven years. His research interests focus on antimicrobial treatment of infection, formulation of appropriate vaccination programs for foals, the influence of pregnancy on vaccine responses, equine infectious diseases and preventive medicine. He teaches courses in pulmonary medicine, general equine medicine and infectious diseases.



*W. David Wilson*

*edd*

## Sensory properties of meal replacement bars & beverages made from whey & soy proteins

Recent research on the sensory qualities of whey and soy protein, published by J.L. Childs, M.D. Yates and M.A. Drake in the *Journal of Food Science*, found that consumers prefer whey or whey/soy protein to soy protein in meal replacement bars.

In the study, commercial peanut butter-flavored meal replacement bars and vanilla meal replacement shakes were evaluated by an experienced, trained descriptive panel. Prototypes of bars and beverages were developed with three levels of whey and soy protein, and were also subsequently evaluated.

Prototype bars made with soy protein were characterized by nutty flavor, while the texture was characterized by tooth-pack and denseness. Whey protein contributed to sweet aromatic and vanillin flavors in prototype beverages while soy protein contributed cereal/grainy flavors.

Consumer acceptance scores were higher for prototype bars and beverages containing whey protein or a mixture of whey/soy protein than for products made with soy protein alone.

*edd*

## With calcium, food trumps pills

Most women know that calcium is critical in preventing osteoporosis, the disease of progressive bone loss and fractures that affects millions of Americans.

But which source is better—calcium-rich foods or supplements? A preliminary study by researchers at Washington University School of Medicine suggests dietary calcium may be better at protecting bone health.

Though not definitive, the study found that women who get most of their daily calcium from food have healthier bones and higher bone density than women whose calcium comes mainly from supplemental tablets.

That was true even though the supplement-takers had higher average levels of calcium.

Calcium from dietary sources is generally better absorbed than that from supplements, which could help explain the difference, said the study's lead author, Reina Armamento-Villareal.

Those getting calcium from foods also had more estrogen in their bodies; the hormone is needed to maintain bone mineral density. Researchers can't yet explain the food-estrogen connection.

The research is preliminary and offers "a springboard to do something more, a hypothesis to test," said Armamento-Villareal, a bone specialist and assistant professor in the School of Medicine's division of bone and mineral diseases. It was published in the May 2007 issue of the *American Journal of Clinical Nutrition*.

*Excerpted from a story by Cheryl Wittenauer, The Associated Press, June 28, 2007*

*CDD*

## Nestlé launches probiotic infant formula in the United States

Infant formula is getting increasingly more functional with Nestlé's recent announcement that it is launching formula with probiotic *Bifidobacterium lactis*, BIFIDUS BL, for the United States.

The Swiss food giant claims Good Start Natural Cultures is the first U.S. infant formula to contain probiotics for immune system support. The company says the *Bifidobacterium lactis* in its formula helps children improve the balance of microflora in their gastrointestinal tract, thereby supporting a healthy immune system.

Nestlé says bifidobacterias are naturally found in the digestive tracts of breastfed infants. In formula-fed infants the presence of probiotic "friendly bacteria" is significantly lower than in breastfed infants.



"The inclusion of probiotics clearly goes a step further than providing basic nutrients for growth and development by adding a functional component which addresses an important objective of nutrition: supporting and modulating an infant's immune system," said José Saavedra, medical and scientific director with Nestlé Nutrition.

"The inclusion of probiotics in infant formula is a major step toward providing infants a small part of the immune-related benefits that only breastfeeding can provide," said Saavedra.

Nestlé has already been selling *B. lactis* formulas in 30 different countries for more than 15 years, while the U.S. Food and Drug Administration (FDA) only now authorized the use of *B. lactis* in Good Start Natural Cultures.

"It's an exciting time for probiotics in the U.S. with the introduction of food products similar to those that have been available for years in Europe and Asia containing strains with documented health benefits," said Mary Ellen Sanders, executive director of the International Scientific Association for Probiotics and Prebiotics.

*This article, by Clarisse Douaud, appeared in IDFA Smart Brief on May 7, 2007.*

*CDD*

## Nominations sought for 2008 Innovative Dairy Farmer of the Year

Nominations are now being accepted for the title of Innovative Dairy Farmer of the Year, an annual award co-sponsored by IDFA and *Dairy Today* magazine. The winner will be honored at the 2008 Dairy Forum, Jan. 20-23, 2008, at the La Quinta Resort and Club in La Quinta, Calif. Applications should be typed and must be postmarked to the International Dairy Foods Association (IDFA) by Friday, Oct. 5, 2007. To download a pdf of the nomination form, go to: [http://www.idfa.org/news/2008\\_innovativefarmer\\_form.pdf](http://www.idfa.org/news/2008_innovativefarmer_form.pdf)

*CDD*

---

## Address Service Requested

---

# *Calendar* of **EVENTS**

**Sept. 21, 2007** is the deadline to submit nominations for the **2008 William C. Haines Dairy Science Award**. Visit [www.cdrf.org](http://www.cdrf.org), under "Awards & Giving," to download the 2008 award nomination form.

### **October 16-17, 2007**

**11th Annual Dairy Cleaning and Sanitation Short Course.** Designed to provide basics of plant and equipment cleaning and sanitation, as well as personal hygiene, and introduction to HACCP. Location: Cal Poly Dairy Products Technology Center, San Luis Obispo, CA. For more information please contact Laurie Jacobson at (805) 756-6097 or by e-mail: [ljacobso@calpoly.edu](mailto:ljacobso@calpoly.edu).

### **October 22-23, 2007**

**IDFA dairy workshops.** IDFA is offering three workshops immediately before Worldwide Food Expo this

October, bolstering the overall show programming and the importance for dairy operations and executive staff to attend Expo. On Oct. 22 and 23, IDFA will hold its in-depth HACCP Certification Workshop for dairy professionals. On Oct. 23, IDFA will hold two additional workshops—the "IDFA Labeling Workshop: Trends in Dairy Claims" and the "Dairy Industry Orientation Workshop." Attendees to any of the pre-Expo workshops will receive free registration to Worldwide Food Expo. To register for the workshops, [www.idfa.org/meetings/index.cfm](http://www.idfa.org/meetings/index.cfm).

### **October 24-27, 2007**

**IDFA Worldwide Food Expo 2007.** Chicago, IL.

### **November 7-9, 2007**

**4th International Symposium: Milk Genomics & Human Health.** Location: Napa, California. For more information, contact Jennifer Giambroni, symposium coordinator, at [info@imgconsortium.org](mailto:info@imgconsortium.org).