

# CALIFORNIA Dairy Dispatch

RESEARCH, EDUCATION AND SERVICE TO SUPPORT THE DAIRY INDUSTRY

VOL. 10, NO. 4 • SPRING 2001

## UC Davis researchers from many fields add to knowledge about milk

By Patricia Bailey

UC Davis churned interest in milk decades before legions of white-mustached celebrities proclaimed it fashionable. Incensed that young farmers had to go out of state to learn dairy products judging, State Agricultural Society President Peter J. Shields paved the way for the 1906 founding in Davisville of the University Farm, where the scientific and technological aspects of agriculture could be combined. Although the campus has now grown far beyond its dairy roots, animal and food scientist, veterinarians, economists, engineers and nutritionists continue to examine the many facets of milk in hopes of improving the ways we produce, process and consume it.

Forget for a moment the mystique of wine, the machismo of beer and the youthful effervescence of soda pop. Instead, contemplate milk. From childhood we've glugged it down by the gallon and as adults admonished our kids to "Drink your milk; it'll make your bones strong and your teeth white."

But why? What is it about this murky white beverage that has positioned it over the ages as a staple



Food scientist Moshe Rosenberg (above) found that whey proteins from milk are ideal for microencapsulating food compounds, pharmaceuticals and agrochemicals.

food in the Western diet?

"I always say milk is a biological fluid selected by evolution to provide the best nutritional and immunological food source for the mammalian newborn," says UC Davis food scientist Moshe Rosenberg. "But we humans have decided over many thousands of years that we have other ideas."

Through the ages, people have obtained milk from a host of animals

(See "UC Davis" on page 2)

## Milk has unique capabilities without the aid of GMOs

By Joseph O'Donnell

Compared to all other foods, milk is the greatest raw material for product development. Just look at some of its advantages: milk contains the chemistry that allows fat to flow with water; milk can deliver easily oxidized components as well as oxidizing agents without damage to either one; milk is mild tasting; most of the milk protein destabilizes under acid for easy digestion; and other milk proteins deliver performance under acidic conditions.

And this is just a partial list.

Research has shown us how to exploit this chemistry—something we will continue to do. However, dairy food science does not work in a vacuum. New developments in genomics and proteomics are becoming more relevant to the dairy industry.

The concept that everything in milk is there to provide nourishment has been rapidly gaining acceptance. In fact, how could one deny it? Nature does not make

(See "Unique" on page 8)

### INSIDE

3

#### NEW DAIRIES

New facilities in Tulare and Davis extend educational opportunities for students.

4

#### JOHNE'S DISEASE

Protecting your herd from this difficult disease.

5

#### MARSHALL CHEESE SEMINAR

Rhodia's Marshall Cheese Seminar returns to Visalia in September.

7

#### CALENDAR OF

#### SHORT COURSES AND EVENTS

Advanced cheese short course May 21-24.

## UC Davis *from front page*

including goats, buffalo, sheep, yaks and of course the cow. These productive dairy animals have one important thing in common—the rumen, a compartmentalized stomach that efficiently ferments grass, grains and other fibrous foods into the biochemical components of milk.

Behind its bland facade, scientists have discovered more than 100,000 different types of molecules in milk. In addition to water and fats, these include proteins, sugar, minerals such as calcium, enzymes, gases and vitamins A, C, and D, to mention just a few.

The proteins account for milk's creamy white color. Centrifuge the fat molecules out and milk will still be white, but continue centrifuging until the casein proteins drop out and you'll be left with a clear liquid.



*Animal science professor Ed DePeters (above) is studying how changes in dairy cows' diets can improve the nutritional and processing qualities of milk.*

### **Making a good thing better**

Convinced of the benefits of milk, a number of UC Davis researchers are equally confident that they can improve on Nature's recipe.

UC Davis animal scientists Gary Anderson and Jim Murray are using genetic engineering techniques to change the protein content of milk. One of their primary interests involves introducing the gene for human lysozyme—one of those powerful antimicrobial proteins—into the genetic machinery of cows so that they too will produce lysozyme in their milk.

Lysozyme-fortified cows' milk likely would reduce udder infections in dairy cows and intestinal ailments in humans who drink milk, the researchers believe. The gene transfer procedure has been successful in mice and now Murray and Anderson hope to repeat it in goats and eventually cows. But the promising research moves painfully slow in cows, which have much longer gestation periods than mice and give birth to just one or two offspring at a time rather than a litter.

Down the hall from Anderson and Murray, other animal scientists are also tinkering with the composition of cows' milk. Ed DePeters, an authority on dairy cow nutrition, is trying to make those changes in milk by altering the cows' diet. To understand how a cow changes hay, grains and other feeds into milk, you first have to look at the rumen, that garbage-can sized four-compartment stomach.

"The rumen is a huge anaerobic fermentation vat filled with millions of bacteria," DePeters says. "We always say that we're feeding the cows, but in reality we're feeding the 'bugs'—the microbes. It's a symbiotic relationship between the microbes and the cow," he explains. "The animal maintains a level of acidity in the rumen that is good for digestion and provides a warm environment that's just right for the growth of the microbes. In return, the microbes provide nutrients for the cow."

Right now, DePeters and his colleagues are particularly interested in a small group of fatty acids known as CLAs or Conjugated Linoleic Acids, shown in laboratory mice to have anti-cancer properties. CLA levels are quite low in ruminants but DePeters is certain they can be boosted significantly simply by feeding the cows more unsaturated fats, usually in the form of vegetable oils.

DePeters and animal scientist Juan Medrano, are also working on selecting and breeding dairy cattle with higher levels of casein proteins in order to increase the amount of cheese that can be made from a given volume of milk. And they're trying to increase the levels of unsaturated fats in milk.

"The cow's rumen naturally tends to add hydrogen molecules onto unsaturated fatty acids and turn them into saturated fatty acids," explains DePeters.

Medrano has identified significant differences among various dairy breeds including Holstein, Jersey and



**Board of Directors**

**Jeff Poston, Chairman**  
*California Milk Advisory Board*

**Stan Andre**  
*California Milk Advisory Board*

**Peggy Biltz**  
*Dairy Council of California*

**Rachel Kaldor**  
*Dairy Institute of California*

**Randy Mouw**  
*California Milk Advisory Board*

**William Ahlem Jr.**  
*Nat. Dairy Promotion & Research Board*

**Rich Ghilarducci**  
*California Creamery Operators Association*

California Dairy Dispatch is a quarterly publication of the California Dairy Research Foundation.  
© 2001 California Dairy Research Foundation

For more information, contact:

**Joseph O'Donnell, Executive Director**  
California Dairy Research Foundation  
502 Mace Blvd., Suite 12  
Davis, CA 95616  
Phone (530) 753-0681  
Fax (530) 753-1453  
E-mail: [odonnell@cdf.org](mailto:odonnell@cdf.org)

Editor: Corinne Esser, CDRF, (530) 753-0681  
Produced by **EditPros**, Davis, CA (530) 759-2000

Brown Swiss in levels of the enzyme that converts saturated fats into unsaturated fats. He also has found that these different enzyme levels are genetically linked and is in the process of identifying genetic markers for these traits.

“We don’t want to make dramatic changes,” he says. “We’re simply interested in increasing the proportion of unsaturated fatty acids because it would be healthier for people who consume dairy products and might allow us to produce butter that is soft and spreadable right out of the refrigerator.”

### The bottom line

For researchers, the sky does seem to be the limit but dairy producers and processors face very down-to-earth problems such as mastitis infections in cows, environmental issues related to waste management, food safety challenges and an ever changing economic environment. If university research doesn’t provide practical solutions to those problems, it won’t go far beyond the pages of the scientific journals.

UC Davis agricultural engineer Michael Delwiche is doing just that as he designs “bio-sensors”—delicate instruments that can measure hormone levels that indicate where a cow is in the reproductive cycle. Some biosensors might detect elevated levels of urea, suggesting an imbalance in the cow’s feed and a potential waste-management problem. Eventually such sensors should also be able to pick up signs of elevated immunological activity in the cow, alerting dairy farmers to the onset of mastitis before the infection even produces symptoms.

In the environmental arena, Cooperative Extension animal scientist Deanne Meyer is spearheading the Environmental Stewardship Program, a statewide educational project aimed at helping dairy and other livestock producers develop plans for managing waste on their farms and ranches. She’s helping them understand the myriad state and federal

waste-management regulations and identify markets for their animal wastes, which can be sold as fertilizer.

Likewise, UC Davis agricultural economist Bees Butler provides educational outreach programs to help dairy farmers better understand the markets in which they are operating and to adjust to the gradual withdrawal of federal price supports for milk.

“The biggest issue facing the dairy industry is how it reacts to the risk environment created by the loss of price supports,” says Butler, confident that the dairy industry will weather the changes and emerge stronger and more efficient as a result.

It’s been 95 years since UC Davis was established with the intent of

weaving science and technology into innovative solutions for California agriculture. Today the state is the nation’s largest milk producer and, despite the growing popularity of non-dairy beverages, the average Californian each year is still drinking more than 22 gallons of milk and gobbling down 12 to 15 pounds of cheese. UC Davis veterinarians and animal scientists, engineers and economists, nutritionists and food scientists would like to think that they and their predecessors have played some small part in that success story of milk.

*A longer version of this story first appeared in the Spring 2001 issue of UC Davis Magazine..*

*ODD*

## New dairies to serve students and industry

*By Patricia Bailey*

**T**his is the kitchen, said UC Davis veterinary professor Jim Cullor as he wheeled his pickup truck through canyons of hay bales and past mountains of cottonseed, almond hulls and corn silage. It is the feed storage area of Rancho Teresita, a typical dairy in the heart of California’s San Joaquin Valley—a dairy that daily milks 4,000 Holstein cows and hopes soon to boost that to 5,000 cows. It’s the kind of dairy that originally brought the UC Davis Veterinary Medical Teaching and Research Center and Cullor, its director, to Tulare. At the center veterinary students and residents, most of them specializing in food-animal medicine, can study herd health, food safety and environmental issues in the context of commercial dairying.

When the center was established in 1983, Tulare County boasted the state’s largest swine population, was not far from the mammoth Harris Ranch beef feed

lot and was the center of the California dairy industry. Today, it is home to some 340,000 dairy cows and is the largest milk-producing county in the nation.

“Here we’re in the heart of agriculture,” said Cullor. “The theme down here is managing dairy-animal health and well-being, public health and the financial bottom line.”

Although 200 miles south of UC Davis and its School of Veterinary Medicine, the Tulare center’s diagnostic laboratory is fully equipped to conduct necropsies—animal autopsies that identify the cause of death and help track disease outbreaks. Its milk technology laboratory analyzes 60,000 to 70,000 milk samples annually for quality and signs of bacterial infections. And its milking parlor enables the center to milk up to 100 cows for specific research projects.

The center is a full-service clinical and research facility but it’s about to get bigger. Collaborating

*(See “New Dairies” on page 6)*

## Protecting your herd from Johne's disease

By John H. Kirk, DVM, MPVM

**D**espite the enormous destructive potential of Johne's disease, only half the dairy producers in the United States are familiar with the malady, according to a recent survey conducted by the National Animal Health Monitoring Service (NAHMS). Unfortunately, many more dairy operators will likely become much more intimately familiar with this difficult disease.

The National Johne's Working Group is now attempting to organize working groups in each state. An advisory group has been formed in California under the leadership of the California Department of Food and Agriculture. The advisory group will oversee the formation of a voluntary, market-driven plan to reduce the prevalence of Johne's disease in California through education, improved diagnostics and increased research intended to assist producers with infected herds.

Why all the fuss about Johne's Disease in California? Isn't Johne's supposed to be a problem limited to dairies in the East? The NAHMS survey disturbingly found that infected herds are just as prevalent in California as elsewhere in the United States. The survey revealed that 40 percent of the animals in herds larger than 300 cows have Johne's. That statistic strikes home in California, in which the 1998 average totaled 620 cows per herd.

Due to the high cull rates in most California dairies, livestock do not often reach the final progressive stage of this disease, characterized by chronic diarrhea and dramatic weight loss despite a normal appetite, with no response to treatment. Still, the pathologists in the California Animal Health and Food Safety Laboratory System do diagnose a few cases of clinical Johne's each year.

Despite the lack of clinical cases in older cows, infected cows without obvious clinical signs of disease are surely present in our herds and are also known to produce less milk and be at a higher risk of early culling. So while the terminal phase of the disease is uncommon in California, Johne's disease extracts an undefined hidden economic toll on California herds.

Johne's disease is challenging for both dairy operators and their veterinarians for several reasons. First, it is a slowly degenerative disease that does not yield visible symptoms—diarrhea and weight loss—until its terminal phase, just before death. Infections most often take place in the young heifer replacement calf shortly after birth.

Visible signs do not appear for three to five years following the initial infection. During this time, the Johne's bacteria invade the cells lining the small intestine. In response to this invasion, the cells mount an immune response to attack the bacteria. As a result, the lining cells of the intestine become thickened and no longer capable of efficient absorption of essential nutrients from the gut into the body. Therefore, an infected animal may have a good appetite but can't absorb the nutrients in the feed it is consuming. The severity of the nutritional absorption deficiency worsens over several years.

A second big challenge involves diagnostics. Laboratory technicians can culture the bacteria and perform blood tests for titers indicating exposure to the bacteria, as they can do for most bacterial diseases. The appropriate sample for culture is feces or manure. As the disease progresses, the amount of Johne's bacteria shed in the feces increases, and therefore the chances of finding the Johne's bacteria in the feces increases. However, the analytical process is slow; the culture

requires up to 15 weeks to mature before the results are available.

Under the typical California management systems, dairy operators bring heifer replacements into the herd when they are 2 years old. Many of these calves had lived at some point on a calf ranch. If any are infected, the bacteria amounts in their feces may be below levels detectable by culture. However, detection by culture becomes much easier as the clinical signs of diarrhea begin to appear.

Another diagnostic option is a blood test, commonly the ELISA. Analysis by blood test is much quicker than by fecal culture. Although results are available in two to three days, the blood test has some limitations. Due to the location of the bacteria within the gut lining cells, no immune response to the infection can be detected until about the time that the first clinical signs of the disease appear. Consequently, the test is not really practical for dairy operators who wish to screen incoming heifer replacements for Johne's. However, the blood tests can be used to quickly determine if older cows with diarrhea and weight loss have Johne's disease.

Even though Johne's disease is difficult to control, dairy operators can minimize risks by applying strategies that are effective in controlling other bacterial and viral diseases. But be sure to keep the limitations of each diagnostic test in mind, and remain vigilant at all times.

To learn more about Johne's Disease in California, visit [www.vmtc.ucdavis.edu/dfs/dfs.html](http://www.vmtc.ucdavis.edu/dfs/dfs.html), and select the link "Current Topics."

*John H. Kirk is an extension veterinarian with the University of California, Davis, stationed in Tulare.*

*edd*

## Marschall Cheese Seminar returns to California's Central Valley

For the third year in a row, Rhodia's Marschall Cheese Seminar, co-sponsored by the California Dairy Research Foundation (CDRF), will return to California. This year's seminar marks the 38th anniversary of the event, which had taken place in Wisconsin until 1999.

The seminar, titled "Tools of the Trade," will be held at the Visalia Convention Center Sept. 12-13, bringing together cheesemakers, cheese industry suppliers and dairy researchers from throughout the world to share information and technology to stimulate growth in the domestic cheese market.



The dairy-rich Central Valley was chosen as the site for this popular seminar because of its proximity to many local dairy operations and cheesemaking facilities.

"California and the Marschall Cheese Seminar are a perfect fit. Not only is California a thriving area for cheese production, it's also a source of fluid milk for many out-of-state cheesemaking operations," said Joseph O'Donnell, executive director of CDRF. "We're glad to have a role in bringing this opportunity to cheesemakers here and throughout the United States."

Pre-seminar highlights include a Sept. 11 short course and open scramble golf outing. The main program begins Sept. 12 with a morning

of industry seminars followed by a mini-cheese reception to kick off exhibit hours, an afternoon of trade show exhibits, and a wine and cheese reception showcasing award-winning cheeses from throughout the world. Activities wrap up on Sept. 13 with morning exhibit hours, a keynote speaker luncheon and afternoon workshops.

"Marschall has a great history of providing educational opportunities for cheesemakers, and Rhodia is proud to continue this tradition" said Brian Sinkoff, North American dairy business director for Rhodia. "With the inclusion of Grade-A product workshops introduced last year, the seminar will be a great resource for other dairy manufacturers as well."

The California Dairy Research Foundation is a non-profit corporation that manages the research investments of the California dairy industry in basic and applied dairy product research, nutrition, dairy herd health, and food safety.

Rhodia's dairy business, headquartered in Madison, Wis., is a leading supplier of cultures, media, coagulants, lipases, hydrocolloids, bioprotectants, annatto colors and cheese flavor acceleration systems.

For more information on this year's Marschall Cheese Seminar, please call Jo Ann Sterenberg at (219) 264-2557 or visit the Marschall Cheese Seminar Web site at [www.marschallcheeseseminar.org](http://www.marschallcheeseseminar.org) for continuing updates.

*edd*

### Food labeling resource guide available

A new guide that provides information on federal labeling requirements for dairy products, published by the Dairy Council of Wisconsin, is now available nationally to dairy producers and processors. *Food Labeling Resource Guide* (2nd edition, 2000) also offers suggestions about ways to use the food label as a marketing communications vehicle to inform consumers about product benefits. Available in a loose-leaf, three-ring binder format, the *Guide* consists of 14 chapters that include

- ▶ a concise discussion of the general labeling requirements;
- ▶ information on various product claims that can be used as selling points for qualifying products, and ideas on how these claims can be used to highlight product benefits as part of an overall marketing plan;
- ▶ key information on federal and

industry definitions, requirements and/or guidelines for individual claims;

- ▶ a practical how-to chapter integrating key points that are essential in designing a label that complies with federal requirements; and
- ▶ a list of resources that can help dairy manufacturers and marketers keep informed about labeling issues and requirements.

Offered nationally for the first time, the *Food Labeling Resource Guide* is available at \$950 per copy, including shipping and handling. Because food labeling requirements continue to evolve, future updates will be issued as appropriate. The *Guide* contains a registration form for purchasers who wish to receive the updates. For ordering information, call Dairy Council of Wisconsin at (800) 325-9121.

*edd*

## New Dairies *from page 3*

with Tulare Joint Union High School District and the College of the Sequoias in nearby Visalia, the veterinary school will soon break ground for the \$3 million California Dairy Technology Center. The innovative new facility will provide educational programs in dairy production and animal health and management for more than 200 high school and 150 community college students each year.

The Dairy Technology Center will be built on the Veterinary Medical Teaching and Research Center's 400-acre site, just north of the existing buildings. The new dairy will accommodate a 1,000-cow milking herd, be equipped with a state-of-the-art waste management system and raise all of its own feed. The facility also will include classrooms, a laboratory, an animal show area, milk house, milking parlor, barns and hospital facility.

Experience at the Dairy Technology Center will not only give high school and community college students a taste of dairy science, but will actually provide them with the skills necessary for various jobs in the dairy industry, ranging from herd managers to commodity purchasers to breeders.

Meanwhile, back at UC Davis, plans also are underway for a new campus dairy. Built in 1958, the dairy provides undergraduate and graduate training, primarily for animal science and veterinary students. But with a milking capacity of only 100 cows, the dairy now is quite small by California standards and its equipment woefully outdated.

Plans for a fundraising campaign to replace the dairy are now being drawn up, according to Gary Anderson, chair of the animal science department, which runs the dairy. Anderson envisions the new dairy will have a 300-cow milking capacity that can be expanded to 400 cows

and cost about \$10 million to build.

"In addition to being larger than the current facility, the new dairy will be designed to be more like modern California dairies," said Anderson. "It will have a modern waste-management system and the equipment necessary to separate the milk from research animals from the milk that is being sent off for processing."

He notes that the new campus dairy and the California Dairy Technology Center will complement each other, with the campus facility focusing on research involving individual cows or small groups of cows, while the Tulare facility tackles large-scale

studies of herd health and management. And while the campus provides hands-on dairy experience for undergraduate and veterinary students whose other studies require that they remain on campus, the new California Dairy Technology Center will extend educational opportunities to high school and community college students as well as to advanced veterinary students and residents.

"By establishing these new facilities in Tulare and on campus, UC Davis is making sure that we're prepared to meet the changing needs of the California dairy industry," Anderson said.

*edd*



Photos: Sam Woo, UC Davis Medicworks



Thirty-six years ago, Don Lord, then assistant to the regional production manager of Foremost Dairies, was given the job of closing one of the company's plants and told to throw away everything that was left. In one of the cabinets he found six old milk bottles. To Lord, those bottles weren't trash but the beginnings of a hobby and a mission: "to put together the best milk bottle collection in the country." Now retired and believing it's time to share them with others, Lord has donated the cream of his collection to UC Davis: 192 bottles worth more than \$100,000. John Bruhn, director of Dairy Research and Information Center at UC Davis and longtime friend of Lord's, plans to display portions of the collection at locations around campus. Valuable to individuals interested in the history of milk bottles and the dairy industry, the bottles will offer today's students—most of whom have known milk in only waxed paper cartons and plastic jugs—a glimpse of a bygone era.



—Teri Bachman,  
editor, UC Davis Magazine



# Calendar of **EVENTS**

## **May 5-10**

**28th National Conference on Interstate Milk Shipments.** Location: Wichita Marriott, Wichita, Kansas. For more information, call Leon Townsend at (502) 695-0253, e-mail leontown@dcr.net; or visit <http://www.ncims.org>; or call John C. Bruhn at (530) 752-2192; fax (530) 752-4759; or email at [jcbruhn@ucdavis.edu](mailto:jcbruhn@ucdavis.edu).

## **May 15-18**

**Better Process Control School (Spanish language version).** Operators of thermal processing systems and container closure inspectors must be under the supervision of a person who has been certified as having satisfactorily completed an approved course of inspection. The Better Process Control School at UC Davis fulfills the training requirements (upon completion of exams) for operating supervisors of commercial food canning operations. The four-day intensive course is taught in Spanish. For more information or to enroll, call toll free (800) 752-0881. Cost \$545 (includes instruction, text and four lunches).

## **May 21-24**

**Cheese Short Course II.** Location: Cal State University, San Luis Obispo, CA. Cost: \$375 if postmarked by May 4th; afterward, the cost is \$425. If you are a CREF member, cost is \$275. This four-day intensive follow-up course to the Cal Poly/UC Davis Cheese Short Course 1 is designed to provide more comprehensive knowledge of the science and technology of cheese. Experts from academia and industry will serve as the course instructors. Cheese sampling and mini-labs will provide more practical experience. For registration information, contact Laurie Jacobson at (805) 756-6097; Fax: (805) 756-2998; e-mail: [ljacobso@calpoly.edu](mailto:ljacobso@calpoly.edu). For program information, call Dr. Philip S. Tong at (805) 756-6102 or e-mail [ptong@calpoly.edu](mailto:ptong@calpoly.edu).

## **June 23-27**

**Institute of Food Technologists Annual Meeting and Food Expo.** Location: New Orleans, LA. Keynote speaker is Elizabeth Dole. For more information, call the Institute of Food Technologists at (312) 782-8424; fax (312) 782-0045; e-mail [info@ift.org](mailto:info@ift.org); or visit [www.ift.org](http://www.ift.org) on the Web.

## **July 6-13**

**International Workshop and Mini-Symposium on Rapid Methods and Automation in Microbiology XXI.** Location: Kansas State University, Manhattan, Kansas. For information on scientific content, please call Daniel Y.C. Fung, director of the workshop, at (785) 532-5654, or e-mail [dfung@oznet.ksu.edu](mailto:dfung@oznet.ksu.edu). For registration information, please visit <http://www.dce.ksu.edu/dce/cl/microbiology/index.html> on the Web.

## **Aug. 20-24**

**Special Problems in Milk Protection Course.** Location: Sacramento, CA. For more information, call Richard Eubanks at (301) 594-0959, or e-mail him at [reubanks@ora.fda.gov](mailto:reubanks@ora.fda.gov).

## **Sept. 18-19**

**Cal Poly/UC Davis 6th Annual Milk Processing Technology Short Course.** Location: Cal Poly Dairy Products Technology Center, San Luis Obispo. Cost: \$295. This course teaches the principles and technology for processing milk for fluid and manufactured dairy foods. For more information, call Laurie Jacobson at (805) 756-6097.

## **Sept. 11-13**

**Marschall Cheese Seminar.** Location: Visalia Convention Center. Pre-seminar events, including golf outing and short course, begin on Sept. 11. The main program is Sept. 12-13 (see article on page 5). For more information, call Jo Ann Sterenberg at (219) 264-2557, or visit [www.marschallcheeseseminar.org](http://www.marschallcheeseseminar.org) on the Web.

## **Oct. 2-3**

**4th Annual Dairy Cleaning and Sanitation Short Course.** Location: Cal Poly Dairy Products Technology Center, San Luis Obispo, CA. Cost: \$275. This is a two-day course designed to provide the basics of plant and equipment cleaning and sanitation, as well as personal hygiene. For more information, call Laurie Jacobson at (805) 756-6097.

## **Nov. 6-9**

**Cal Poly Frozen Dairy Desserts Manufacturing Short Course.** Location: Cal Poly Products Technology Center, San Luis Obispo, CA. Cost: \$350. This course, including hands-on ice cream manufacture and product evaluation, is designed to emphasize mix formulation, equipment, and processes for the production of frozen dairy desserts. For more information, call Laurie Jacobson at (805) 756-6097.

## Change Service Requested

### Unique *from front page*

things for no reason, and what is the reason for milk to exist at all but to nourish? Armed with this understanding, the international dairy research community is generating data that supports the role of milk as a provider of many “bioactive” compounds important for good health. Once this knowledge is available, anyone—anywhere in the dairy world—will be able to promote these health benefits since milk composition varies relatively little from place to place. This will give the dairy industry an advantage that will humble the competition from the non-dairy world. So, how is the non-dairy competition going to respond?

The food world is buzzing with the genetically modified organism (GMO) technology. Many of our commodity plant foods use this technology routinely. Setting aside the social controversy, we wonder if plant geneticists can use GMO technology to incorporate the bioactive components of milk into their product. Doing so will be difficult if for no other reason than that these components usually need to work in concert with the rest of the system—i.e., milk. The interactions among components are just as important as the components themselves.

Genetic engineering, the controversial part of GMO, is not available commercially within the dairy industry. The unavailability is due to the complexity of the milk production system as well as consumer resistance to the technology. Also, often overlooked is the simple fact that the cow does not need to steal genes from other organisms in order to improve milk. Nature has constructed milk as a nourishing material in ways we are just beginning to understand. All the genes needed to support this concept already exist in cows.

Work will proceed on understanding these genes that make up the genome of the bovine—the genetic basis for why milk is the way it is. After all the genes are mapped and tabulated, the genetic selection (natural breeding) process will become greatly accelerated and efficient. When that occurs, cows will be bred to produce milk of varying composition for various markets. Those who command an understanding of the genetics of the cow and the metabolism of the milk components will capture markets not available to dairy processors lacking these technologies. That will occur without GMS or genetic engineering.

Market diversification of milk products in the future will depend on production of tailored milks married to separation or other process

technologies collectively designed to capture large and small markets. I am not just talking about pharmaceuticals here. I am talking about attributes of bioactive compounds that exist in milk today but are poorly understood. I am talking about bottled milk that will prevent colon cancer; products containing milkfat modified to reduce blood cholesterol or prevent cancer; dairy products that increase the nutritional value of other foods in a balanced diet by enhancing the absorption of nutrients carried in these foods; cheese that prevents tooth decay; dairy ingredients that contribute to food safety; dairy beverages that reduce hypertension or enhance muscle mass or promote immune function to resist disease—you get the idea. This is on top of what we already know about the calcium, protein, vitamins, and bioactive compounds in milk. Milk and health will be tightly linked—imagine that! Once we understand the science as well as the genetic basis behind the links, we will find ourselves in a very different world with far more competition in the food marketplace—more competition both inside and outside the dairy industry.

*This article first appeared in the August 2000 issue of Cheese Market News, for which Joseph O'Donnell is a guest columnist.*

*edd*