

# CALIFORNIA Dairy Dispatch

RESEARCH, EDUCATION AND SERVICE TO SUPPORT THE DAIRY INDUSTRY

VOL. 13, NO. 2 • FALL 2003

## Marschall celebrates 40 years of education, service to the industry

**C**heese and dairy processors, researchers and suppliers gathered in Visalia to celebrate the 40<sup>th</sup> anniversary of the Marschall Cheese & Dairy Expo (formerly the Marschall Cheese Seminar). Co-sponsored by the California Dairy Research Foundation (CDRF) and Rhodia Inc., the educational event featured two days of seminars, workshops and networking.

The program, held Sept. 17-18 at the Visalia Convention Center, served as a forum for the industry to share information and technology important to success in the expanding marketplace.

“The Marschall Cheese & Dairy Expo is important to cheese and dairy processors as they look to grow because it’s a one-stop source for innovation, ideas and collaboration,” said Joseph A. O’Donnell, executive director of CDRF. “This sponsorship is part of our continued commitment to offering educational opportunities to the industry as a whole.”

Two pre-seminar activities—one social and one educational—were

held on the Tuesday prior to show kickoff. While golfers hit the links in nearby Kingsburg for the Fourth Open Scramble Golf Outing, representatives from companies such as Cheese & Protein International, DSM Food Specialties, Hilmar Cheese, Kraft Foods and Nestle took part in a day-long course on cheese making.

Led by Professor Phillip Tong of Cal Poly, San Luis Obispo, the course focused on the ingredients used for

(See **Marschall** on page 2)

**MARSCHALL**  
Cheese  
& Dairy  
Expo



## New milk products for new markets

By Joseph O’Donnell

**M**ost of us in the dairy industry know that Jersey milk is richer and higher in protein and fat as compared to Holstein milk, and milk from other breeds falls somewhere in between. We also know that milk composition can be modified through animal nutrition and genetic selection/breeding. Overall, though, the specific proteins and fats in all bovine milk

are similar, and each component is related to nutrition delivery.

With this in mind, what if a consumer had a health condition such as cancer, heart disease, allergy or immune disorder, or a nutritional need such as extra energy for athletic performance, or nutritional supplementation for weight loss or geriatric patients? A milk product designed to deliver one kind of protein or fat over another to

(See **New Markets** on page 6)

### INSIDE

3

#### STRAPPED IN BY STREPS

Environmental streps show resistance to antibiotics.

4

#### GOOD GI BACTERIA VS. THE BAD

NCSU study proves genetic advantage of “good” bacteria.

5

#### BENEFITS OF CALCIUM

Studies show calcium-rich diet may boost the immune system and help fight food toxins.

7

#### COS/DAIRY INDUSTRY PARTNERSHIP

College of the Sequoias offers dairy training certificate.

## Marschall *from front page*

supplementation of cheese milk, process and performance considerations in manufacturing cheese using these ingredients, and their quality attributes, as well as aspects of cheese manufacturing. Additional speakers included Mark Johnson of the Wisconsin Center for Dairy Research, Bob Fassbender of North American Milk Products, and Richard Wilson of Rhodia.

Official Marschall program activities commenced Wednesday, Sept. 17, with a morning of presentations by representatives from Dairy and Food Culture Technologies and Downes-O'Neill, along with a panel discussion on the need for calcium moderated by O'Donnell



### Board of Directors

**William Ahlem Jr.**

*Nat. Dairy Promotion & Research Board*

**Stan Andre**

*California Milk Advisory Board*

**Rachel Kaldor**

*Dairy Institute of California*

**Randy Mouw**

*California Milk Advisory Board*

**Mike Newell**

*Dairy Council of California*

**Rick Pacheco**

*California Creamery Operators Association*

**Tony Souza**

*California Milk Advisory Board*

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

© 2003 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@cdfsf.org](mailto:odonnell@cdfsf.org)

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

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

and featuring speakers from Rhodia Pharma Solutions and the Dairy Council of California.

Mary Ellen Sanders of Dairy and Food Culture Technologies, who also serves on the board of the International Scientific Association for Probiotics and Prebiotics (ISAPP), discussed new findings in the field of probiotics. According to Sanders, probiotic trends include moving product development beyond dairy, focusing on clinical targets such as allergies, dental and vaginal health, and post-surgery infection, as well as expanding probiotics applications for wellness through food and drugs.

A panel discussion on the need for calcium featured Jill Jobbins of Rhodia Pharma Solutions, and Lori Hoolihan of the Dairy Council of California. Jobbins provided an overview of Rhodia-sponsored bioperformance studies on calcium phosphates for bioavailability, bone development and the effects of calcium phosphate and calcium carbonate from commercially available dietary supplements on serum phosphate levels in older women. Hoolihan talked about the overall need for calcium, its role in chronic disease prevention, calcium DRIs and sources, as well as bioavailability from dairy and non-dairy sources.

Afternoon trade show activities opened with a "teaser" cheese reception in the exhibit hall, which marked the kickoff of the Cheddar cheese-grading contest in which participants tested their grading skills against a panel of experts. Wednesday seminar activities concluded with a cheese and wine reception featuring award-winning cheeses from around the world.

During Thursday's buffet breakfast, cheese-grading contest winners were announced. Karin Ford of the Economic Development Corporation of Tulare County was crowned "Champion Cheese Grader." Duane Murray of Farmdale Creamery in San Bernardino, Calif., and Randall Thunell of DSM Food Specialties in Millville, Utah, were first and second runners up, respectively. More than 30 people took part in the contest in which participants tried to match their scores for flavor, body/texture and color with those of experts Bob Aschebrock from ARA Cheese and Butter Grading, Mary Anne Drake of North Carolina State University, and James Chandler of Hilmar Cheese.

Thursday afternoon workshops included sessions on cheese and grade-A products, as well as a new series of topics for manager-level personnel.

Cheese sessions featured presentations by Mark Johnson, who discussed the use of concentrated milk in cheese making; Sylvan Moineau of Université Laval in Québec, who focused on phage-host interactions in lactic acid bacteria; and Jeff Broadbent of Utah State University, who covered cheese ripening and flavor development.

Henry Randolph, of Randolph Associates, opened the Grade-A session with a discussion about consistent quality/culture activities and maximizing yields. John Lucey of the University of Wisconsin-Madison presented a talk on yogurt texture improvements, and George Weber of Georgetown Technology Group discussed the use of antimicrobials in dairy applications.

*(See Marschall at right)*

# Strapped in by streps

*Environmental streps show resistance to antibiotics*

By Connie Kuber

**E**ven though producers have gotten better at controlling *Staph. aureus* and *Strep. ag.*, many California dairies are seeing an increase in bulk tank somatic cell counts and resistant clinical mastitis. The problem may be environmental streps in their many varied forms. In fact, of 90-some dairies sampled thus far, more than half had three or more environmental strep species that were resistant to one or more antibiotics. A few had as many as four to six resistant species.

Those results are according to University of California Veterinary Medicine Teaching and Research Center (VMTRC) scientists John Kirk, Jim Cullor and Edward Atwill.

The VMTRC study hopes to solve the treatment mystery for the various kinds of bacteria affecting the herds and

determine antibiotic sensitivity and resistance patterns. It also will survey the overall herd management of the dairies from which the milk samples came.

“We are trying to figure out what factors are present that might be making one herd more resistant or sensitive than others,” says Kirk. “We will look at bedding in the dry pens, calving barns and milking cow pens, as well as if antibiotics are being used as labeled or extra label.”



Photo courtesy of VMTRC.

The most common streps found were *Strep. uberis* and *Strep. dysgalactiae*. But the researchers tested and identified 14 other species. *Enterococcus* shows up most often. *Enterococcus faecalis* is very capable of transferring antibiotic resistance to other bacteria, say researchers.

The next step for the research team is to develop a questionnaire and visit approximately 50 dairies to see what, if any, management practices may result in lower “environmental strep” incidence. The final results of the study should be ready by fall or early winter. For now, Kirk offers the following advice:

1. The bacteria found in the study are often the same ones found in clinical cases. That suggests clinical cows could be contaminating milking units and possibly spreading bacteria to other cows. Keeping milking equipment clean and milking clinical cows last will help, says Kirk.
2. In the case of chronic herd problems, consider running tests (\$25/bacterium) to determine which environmental streps are involved, suggests Kirk.
3. Additional testing (\$25/sample) will determine antibiotic resistance. Although expensive, they will tell you which antibiotics will not work, thereby decreasing the chance of using wrong treatments.

Ordinarily, you and your vet know which drug has been working, says Kirk. If that is no longer the case, then these tests provide a means to help fix the problem.

*This article first appeared in the March 2003 issue of Dairy Today.*

---

## Marschall *from page 2*

The afternoon’s manager-level program sessions included presentations from Linda Douglas of GTC Nutrition on the advantages of formulating dairy products with short-chain fructooligosaccharides (FOS), Mary Ellen Sanders on marketing challenges for probiotic dairy products, and Rhodia’s Kevin Gilles, who talked about health claims in foods.

Nearly 300 cheese and dairy processors, suppliers and other industry representatives registered for the Marschall Cheese & Dairy Expo.

Named for Adolph J. Marschall, founder of Marschall Labs and an industry pioneer who helped define and revolutionize the industry, the Marschall program is dedicated to innovation.

The program began 40 years ago as the Marschall Italian Cheese Seminar and evolved to include specialty cheese before opening to the entire cheese and dairy marketplace.

For more information, visit [www.marschallcheeseseminar.org](http://www.marschallcheeseseminar.org).

*ODD*

*ODD*

## Good GI tract bacteria have genetic advantage over bad bacteria

**F**ood microbiologists at North Carolina State University have discovered that, in the struggle for the undigested food inside your gastrointestinal tract, some “good” bacteria have a genetic advantage that allows them to capture and digest certain sugars for energy before “bad” bacteria can take a crack at eating those sugars.

The research is described in a paper published during the week of July 7 in the on-line edition of *Proceedings of the National Academy of Sciences*.

The good bacteria—*Lactobacillus acidophilus*, a member of the lactic acid bacteria—can be found in dairy products, such as milk, cheese and yogurt. They are used in food processing both as fermenting agents and as probiotics—

*Some “good” bacteria have a genetic advantage that allow them to capture and digest certain sugars for energy before “bad” bacteria can take a crack at eating those sugars.*

beneficial organisms that reside naturally in the small intestine where they are believed to contribute to general health and well-being. The organism is now used extensively in products worldwide, including many yogurts and “sweet acidophilus” milk.

The North Carolina State scientists discovered that turning on a group of genes, or operon, inside *L. acidophilus* allows this good bacterium to transport and internalize a complex sugar made up of repeating individual saccharides.



Todd Klaenhammer is director of the Southeast Dairy Foods Research Center at North Carolina State University.

The research team consisted of Dr. Todd Klaenhammer, professor of food science, microbiology and genetics, and director of the Southeast Dairy Foods Research Center at NCSU; Rodolphe Barrangou, a Ph.D. candidate in functional genomics; and Eric Altermann, post-doctoral researcher in food science.

Once inside the bacterium, the complex, called fructo-oligosaccharide, or FOS, is digested by cutting the individual fructose molecules off the end of the long oligosaccharride chain. These are then metabolized to provide energy to the organism. FOS is not digestible either by humans or by many other intestinal bacteria, some of which are unsavory and undesirable in large numbers. Therefore, feeding FOS can result in an increase in the number of desirable organisms already present in the human GI tract, or promote the growth of a probiotic culture being consumed from a product such as yogurt.

“FOS is a prebiotic, a special lunch that fuels the growth of beneficial probiotic bacteria in the GI tract,” says Klaenhammer, who is also the director of the Southeast Dairy Foods Research Center at North Carolina State University. “This research explains the connection between prebiotics like FOS and the increase of certain types of probiotic organisms in the GI tract.”

Because *L. acidophilus* uniquely transports and internalizes FOS before utilizing it, other competing bacteria cannot metabolize FOS, or its component sugars, giving the probiotic bacteria a potential advantage for survival and retention in the intestine.

“*L. acidophilus* has better potential to compete for FOS because it is transporting FOS into itself,” Barrangou, the paper’s lead author, says. “When we knocked out the genes in the operon, the bacteria could no longer utilize FOS.”

The majority of genomic investigations to date predict gene functions based on computer bioinformatic predictions. The involvement of the suspected genes for FOS utilization and metabolism were confirmed in this study by a functional genomic approach of disrupting the genes and correlating a loss of function—in this case, the inability to utilize FOS.

Klaenhammer says probiotic bacteria may help maintain normal and healthy microflora, or bacterial life, in humans; modulate the immune system; and possibly protect us from infection by intestinal pathogens. He says the number of bacterial cells found

(See **Good bacteria** at right)

# Calcium-rich diet may lead to resistance against infection

**A** glass of milk could not only protect our bones, but also help fight food intoxication, suggest Dutch scientists. The news ushers in the potential for a new wave of functional dairy products in the future.

Research from the Wageningen Centre for Food Sciences (WCFS), carried out at NIZO food research in The Netherlands, had already found that rats on a calcium-rich diet had a better resistance to infection with *Salmonella* and *E.coli*. In this latest study, scientists were challenged to prove that the positive effects found in rat experiments would be mirrored in humans.

They set up a so-called double-blind placebo-controlled intervention study on healthy males. One half of the group received normal dairy products with a naturally high calcium level and the other received special (placebo) dairy products with low calcium levels.

The volunteers were allowed to maintain their normal eating habits but consumption of other dairy



Photo courtesy of CMAB

products was not allowed. After an adaptation period of a week, both groups were infected with a weakened strain of *E.coli*—the common cause of “traveler’s” diarrhea.

According to the scientists, the results were convincing. Men who had eaten the calcium-rich dairy

product diet suffered significantly less compared to the group on the special low-calcium dairy products diet.

The researchers suggest that the positive effect of calcium is most likely due to the boosting power that calcium has on protective intestinal flora, in particular the lactobacilli.

In the past few years, dairy has emerged as one of the most dynamic sectors of the functional food market in Europe, accounting for around 30 percent of all functional products. Another key trend today is the consumer demand for all that is natural.

This latest study shows the potential for functional dairy products with an inherent positive property—calcium—that boosts the system to help fight food toxins.

*This article appeared in the Sept. 1 e-mail newsletter, FoodNavigator.com, maintained by Novis, a European online publisher of global industry and science news for the food and beverage industries.*

*edd*

---

## Good bacteria *from page 4*

on our bodies actually outnumber the human cells in our body tenfold, so having a healthy microflora is quite important for good health and resistance to disease.

Barrangou and Klaenhammer say that sequencing of the *L. acidophilus* genome was the key to discovering its relationship with FOS.

“We knew a great deal about *L. acidophilus*, but now that we have the genome sequence, we can look at its contents and predict what the organism can or cannot do,”

Barrangou says. The research group is now studying other genes believed to be important to surviving gastric passage, attaching to the intestinal mucosa, and producing antimicrobial compounds that may promote the competitive ability of probiotic cultures.

“We’re seeking a mechanistic basis of probiotic functionality through genetics,” Klaenhammer says. “That means understanding exactly how the good guys do good things for human health and well-being, and discovering ways to do it better.”

The research is funded by Rhodia Inc., Dairy Management Inc., the Southeast Dairy Foods Research Center, the North Carolina Dairy Foundation and the Environmental Biotechnology Institute.

Dr. Todd Klaenhammer may be reached by calling (919) 515-2972, or by sending an e-mail message to [klaenhammer@ncsu.edu](mailto:klaenhammer@ncsu.edu); Rodolphe Barrangou is at (919) 539-1313 or [rbarraa@unity.ncsu.edu](mailto:rbarraa@unity.ncsu.edu).

*edd*

## New markets *from front page*

supplement health and lifestyle deficiencies would have great appeal. The ability to significantly alter milk composition to satisfy specific consumer needs has the potential to greatly expand the market for fluid milk and dairy ingredients.



Photo courtesy of Penn State Dairy & Animal Science.

Now for the good news—it's happening. Discovery of the human genome gave scientists a greater understanding of how dietary components, especially those in milk, influence our physiology. In addition, the machinery used to sequence the human genome has been applied to bovine genomes. Put these together and you have a consumer who knows what is needed to achieve certain physiological goals and milk producers who can create products targeting these goals. It all sounds pretty futuristic, but it's happening at an accelerated pace.

Critical to all of this is the ability of scientists and dairy companies to communicate to consumers and manufacturers the huge volumes of data associated with this kind of research. The key is the Internet. Software designed to facilitate the dissemination of research involving the role of milk components in reaching human physiological goals is nearly completed and installed in the laboratory of Bruce German,

professor of food science and technology at the University of California, Davis. Several overseas research organizations and companies are lining up to take part in this unique project. These participants will lead the way in producing a line of dairy products not even conceivable today.

Consider all of the people in the world with varying personal genetics, climates, cultures and lifestyles who would benefit from foods containing dairy components targeting their needs.

Milk from the United States would be different from the milk of New Zealand, Australia or Europe. Competition will heat up as companies target specific markets. Artisan products will always be manufactured in the traditional way using traditional milk. But if you can produce milk that yields more cheese per pound, fluid milk products that control body weight or a yogurt that keeps the gut healthy no matter where someone travels, you will make money—a lot of it. This may sound a little outrageous, but we don't need exotic genes to make it happen. It can be done with genetics already present in the bovine.

This technology is on the fast track. Products formulated with dairy components designed to deliver against specific marketing objectives are right around the corner. This is not limited to nutrition and health benefits—efficiency of manufacturing commodity products also will be a driving factor. The question is, who will be the leader in bringing this technology to market? Likely we will see strong competition, especially from overseas.

To quote Bruce German, "We consume dairy products because we can." Milk is a highly nutritious food. As science reveals more details about the role of milk components and health, technology will allow dairy products to deliver these benefits to a much larger consumer base with a world of needs.

*This article first appeared in the January 2003 issue of Cheese Market News®.*

*ODD*

## NEWS & NOTES

### Researchers focus on specialty cheese consumers

**C**hristine M. Bruhn co-authored a research article titled "Sampling and farm stories prompt consumers to buy specialty cheeses," which appeared in the July–September 2003 issue of *California Agriculture*, Vol. 57, No. 3.

Bruhn, director of the Center for Consumer Research at UC Davis, and co-author Barbara A. Reed, county director and dairy farm advisor, UC cooperative Extension for Glenn County, discovered that "specialty cheese consumers have a strong preference for sampling cheese before making a purchase. Consumers also rely heavily on staff recommendations to select cheese. They appreciate unlimited sampling in an unhurried, low-pressure environment. Specialty cheese consumers consider themselves 'food experimenters'; they value narrative descriptions about where and how the cheese was made and are not price sensitive in this area of their food purchases."

*For more information, contact Christine Bruhn at [cmbruhn@ucdavis.edu](mailto:cmbruhn@ucdavis.edu).*

*ODD*

## College of the Sequoias offers hands-on dairy processing

**S**an Joaquin Valley's College of the Sequoias (COS) is the new home of the California Dairy Products Training Institute (CDPTI), a partnership between the California dairy industry and education at the community college level. The program was made possible through a grant from the Chancellor's Office of the California Community Colleges.

Classes began about three years ago in a rented cheese factory in Tulare, but the Institute's new 5,000-square-foot building at the COS Agricultural Complex on Linwood Avenue in Visalia is nearing completion as equipment is put into place.

"The building is completed, our pasteurizer is being installed, and we're now in the process of installing other equipment," says Russ Poe, project director for CDPTI, college professor, and owner of Sequoia Valley Products LLC.

Poe, a fourth-generation dairy producer who has built factories



worldwide, leases the Institute's facility by day for Sequoia Valley Products' yogurt-making operation, and makes it available for hands-on teaching at night. Poe predicts he'll be able to produce about 12,000 pounds of yogurt a day in the College of the Sequoias processing plant and train hundreds of students at night.

The curriculum for CDPTI was developed in tandem with industry leaders. Courses are taught by professionals in the industry, including plant supervisors and managers, human resource directors, private business owners, state inspectors and retired industry experts.

The Institute's practical skills training curriculum "Concepts in

Dairy Processing" currently offers 12 one-unit modules, one three-unit computer class and two units of work experience. The modules include:

- ♦ Fluid Stream
- ♦ GMPs and Sanitation
- ♦ Industrial Safety
- ♦ Sensory Evaluation and Grading
- ♦ HACCP and Food Safety
- ♦ Human Resources
- ♦ Process Equipment and Engineering
- ♦ Laboratory Skills
- ♦ Dairy Products and Marketing
- ♦ Transportation
- ♦ Cheese and Whey Processing
- ♦ Warehousing (Dry and Refrigeration)

*For more information about the California Dairy Products Training Institute, visit [www.cos-ag.com](http://www.cos-ag.com), call Russ Poe at (559) 799-3917, or send an e-mail message to [poe1224233@cs.com](mailto:poe1224233@cs.com).*

*ODD*

## Dairy products friend, not foe, for teenage girls

**A**dolescent girls who consume a moderate amount of dairy products are not likely to have a higher body mass index or experience an increase in percentage of body fat, concludes a new study published in the September 2003 issue of the *International Journal of Obesity*.

"Teenage girls can maintain a healthy weight and include dairy products," said Aviva Must, associate professor of community health at Tufts University and one of the study's authors. "Dispelling that myth is important because the potential health benefits of the natural calcium in dairy products, particularly its role

in building bone mass, are so significant in adolescent girls. The window for maximizing bone mass occurs only in adolescence and doesn't occur again."

Dairy foods are the primary source of calcium for children and adolescents. In the US the daily recommended intake for calcium in girls aged 12-18 years is 1,300 mg—the equivalent of four servings of milk, cheese or yogurt daily.

"Many young women cut out dairy for fear of fat. This study shows that they can keep milk, cheese and yogurt in their diets and maintain a healthy weight," said Deanna Rose,

registered dietitian, National Dairy Council. "Dairy foods are the best natural sources of calcium and provide a unique nutrient combination of nine essential nutrients. Parents and health professionals should encourage teens to enjoy 3-4 servings of dairy a day, which is as easy as having a slice of cheese, a glass of chocolate milk and a container of yogurt."

*This article is excerpted from the Aug. 27 e-mail newsletter, FoodNavigator.com, maintained by Novis, a European on-line publisher of global industry and science news for the food and beverage industries.*

*ODD*

**Address Service Requested**

*Calendar of* **EVENTS**

**Rescheduled for Spring 2004**

**Cal Poly/UC Davis 10th Annual Milk Processing Technology Short Course.** Course emphasizes principles and technology for the processing of milk for fluid and manufactured dairy foods. Location: Cal Poly Dairy Products Technology Center, San Luis Obispo, CA. For more information, contact Laurie Jacobson at (805) 756-6097 or by e-mail: [ljacobso@calpoly.edu](mailto:ljacobso@calpoly.edu).

**November 18-20, 2003**

**Annual Regional Milk Seminar: Pacific & Southwest Regions.** This three-day seminar, sponsored by the U.S. Food & Drug Administration and the Pacific Region Seminar Committee, will be held at the Silver Legacy Hotel in Reno, NV. For room reservations, call (800) 687-8733. For more information, call John Bruhn at (530) 754-6455, or e-mail [jcb Bruhn@ucdavis.edu](mailto:jcb Bruhn@ucdavis.edu).

**January 27-30, 2004**

**Frozen Dairy Desserts Manufacturing Short Course.** This four-day course will emphasize ingredients function and usage, mix formulation, equipment and processes in frozen dessert manufacture. Hands-on sessions for products quality evaluation and product manufacture included. Location: Cal Poly Dairy Products Technology Center, San Luis Obispo, CA

**February 23-26, 2004**

**2004 Dairy Industry Conference.** Location: Montebello Country Club/Hilton Garden Inn, 801 North Via San Clemente, Montebello, Calif. Sponsored by the California Dairy Industries Association and California Association of Dairy and Milk Sanitarians. For reservations, call (323) 724-5900.

**March 1-2, 2004**

**6th Dairy Ingredients Symposium.** This two-day symposium covers the latest trends in the marketing, science, manufacturing technology and application of dairy ingredients, including whey-derived and milk-derived concentrates and powders. Location: The Cliffs at Shell Beach, Shell Beach, CA. For more information, call Laurie Jacobson at (805) 756-6097, e-mail [ljacobso@calpoly.edu](mailto:ljacobso@calpoly.edu).

**March 23-26, 2004**

**Cal Poly/UC Davis 16th Annual Cheese Short Course I.** Participants will obtain the basic scientific information and practical skills needed to manufacture cheese. (includes 1 day of hands-on cheese making). Location: Cal Poly Dairy Products Technology Center, San Luis Obispo, CA

**May 9-12, 2004**

**Fourth International Symposium on Recombined Milk and Milk Products.** Location: Cancun, Mexico, Moon Palace Resort. For more details, call USDEC at (703) 528-3049.