

## **Dairy Dispatch – Fall 2000**

### **Central Valley's Marschall Cheese Seminar Educational and Fun**

By Jennifer Giambroni

Cheesemakers and industry suppliers headed to the source this September, the dairy source that is, for the 37th annual Marschall Cheese Seminar. Co-sponsored by the California Dairy Research Foundation (CDRF) and Rhodia Inc., the two-day educational seminar was held in California's dairy rich Central Valley.

The seminar, held Sept. 13-14 at the Visalia Convention Center, brought together cheesemakers and cheese industry suppliers to share information and technology.

"Cheesemaking in the West is experiencing rapid growth, and nowhere is this more apparent than in California," said Dr. Joseph A. O'Donnell, executive director of CDRF. "The Marschall Cheese program provides a forum for cheesemakers and cheese industry suppliers to share information for future growth. We're committed to helping the cheese industry and, in turn, all dairy producers, by sponsoring such educational opportunities."

The day prior to event kick-off brought two new pre-seminar activities, one social and one educational. The first annual Open Scramble Golf Outing at Brighton Crest Golf Course in Friant, and a one-day workshop on cheese yield and composition control conducted by Dr. Phillip S. Tong (shown below left) of California Polytechnic State University at San Luis Obispo, both were held Sept. 12.

While more than 80 golfers hit the links, a group of education-minded cheese industry representatives from companies such as Antigo, Hilmar, Kraft and Land O' Lakes took part in a day-long session with Dr. Tong, Dr. Arthur Hill of the University of Guelph, Canada, and Dr. David McKenna of Foss North America. The course addressed why cheese yield and composition are important, retention of milk components during cheese manufacture, standardization of milk for cheese manufacture, manufacturing steps affecting yield and composition, and conducting yield and composition studies.

"We were pleased with both the turnout and involvement of the group," said Dr. Tong. "These kinds of workshops are as valuable for us as instructors, as they are for the people who attend."

Official seminar activities got underway Wednesday, September 13, with a morning of presentations by experts from organizations such as the University of Wisconsin, Cornell University, Sysco Foods and a panel discussion moderated by Dr. Gordon Brown of the International Dairy Foods Association (IDFA). Speakers covered a variety of topics from the advantages and pitfalls of making cheese from higher solids milk to foodservice guidelines for cheese suppliers and genetically modified organisms (GMO).

Dr. David Barbano of Cornell University talked about the practice of fortifying milk for cheesemaking with nonfat milk solids for increased production, improved consistency and cost savings, as well as addressing alternate fortification ingredient choices that may be available in the future. According to Dr. Barbano, the continued drive to control composition and reduce manufacturing costs will result in the development of cheese and whey manufacturing equipment to accommodate higher concentrations of casein plus fat.

Changes to international Codex (food code) standards and how they affect the United States' dairy industry were addressed by the University of Wisconsin's Dr. Rusty Bishop, who provided an overview of the Codex system and the steps taken to elaborate Codex standards for milk and milk products. Unfinished standards for cheese types and individual varieties were discussed as well as new items covered in the fourth session of the Codex committee on milk and milk products held last spring in New Zealand. While the United States has not changed its standards as a result of final action taken by Codex, Bishop indicated that the United States has a mechanism in place to review Codex standards and determine if a change in comparable U.S. standards is necessary.

Afternoon trade show activities opened with a "teaser" cheese reception that attracted traffic into the exhibit hall and also marked the debut of the inaugural cheddar cheese-grading contest in which cheesemakers tested their grading skills against a panel of experts. Seminar activities wrapped for the first day with the popular wine and cheese reception prepared by celebrated Chef Allen Hendricks, and featuring award-winning cheeses from around the world.

Day two's activities kicked off with a luncheon in which cheese-grading contest winners were announced and a special award was presented.

Michael Shotts of Farmdale Creamery in San Bernardino, Calif., was crowned "Champion Cheese Grader." Pat Rankin of Southeastern Cheese in Uniontown, Ala., and Vern Kind of Land O' Lakes in Greenwood, Wis., were first and second runners up, respectively. Norm Wood, senior sales account representative for Rhodia Dairy Business, presented a very special attendance award during the luncheon to cheesemaker Joe Calabro of Calabro Cheese in East Haven, Conn. Calabro has attended all 37 Marschall Cheese Seminars, including the year the show went to Italy. According to Wood, Calabro's devotion to the show demonstrated the camaraderie of the industry.

Thursday afternoon workshops focused on practical applications and included for the first time grade-A products such as cottage cheese and yogurt. Presenters included Dr. Moshe Rosenberg of the University of California at Davis, Carol Chen of the University of Wisconsin, Earl Connolly of BroTech Inc., and Dr. Edmund Zottola of the University of Minnesota.

The "back-to-basics" workshops covered everything from basic American and Italian-style cheesemaking, cottage cheese and yogurt making, as well as sanitation and phage control, and hazard analysis critical control points.

More than 350 cheesemakers, suppliers and other industry representatives attended the Marschall Cheese Seminar. Plans are underway for the 2001 program. For more information, contact JoAnn Sterenberg at (574) 264-2557, or visit the Marschall Cheese Seminar Web site at [www.rhodiadairy.com](http://www.rhodiadairy.com).

### **Genetic Engineering and Cloning May Improve Milk, Livestock Production**

*Excerpted from an article that appeared in the July-August 2000 issue of California Agriculture  
By James D. Murray and Gary B. Anderson*

During the 15 years since the first transgenic farm animals were produced, the rationale for genetic engineering of livestock for agricultural purposes has been to produce animals with altered traits such as disease resistance, wool growth, body growth or milk composition. In most instances, the objective has been either to alter traits for improved production efficiency or to alter the properties of the animal product, such as wool or milk, and increase the range of manufacturing options.

Milk protein genes have been cloned from a variety of mammals. The promoter elements from certain milk-protein genes from one or more species have been used to facilitate expression of transgenes in the mammary glands of mice, sheep, goats, cattle, rabbits and pigs. Expression of these transgenes is developmentally correct, but their levels of expression can vary. Research on targeting transgene expression to the mammary gland of farm animals either has focused on studying the promoter function or on the production and recovery of biologically important, active proteins for use as pharmaceuticals.

Several private companies have produced transgenic cows, sheep, goats and pigs, targeting transgenic expression to the mammary gland with the aim of isolating high-value pharmaceutical proteins from milk. But the use of transgenesis for agricultural purposes, such as to alter the properties and composition of milk and change the functional properties of the milk protein system, is also possible by adding a new gene or altering an existing gene.

We have produced transgenic mice that express human lysozyme or a modified bovine casein (a protein used in cheese-making) in the milk. As a result, we have measured alterations in the physical and functional properties of the mouse's milk protein system, including decreased micelle size and increased gel strength. The production of human lysozyme in milk of transgenic mice also increased the antimicrobial properties of the milk, which in cows could reduce infections in the mammary gland and perhaps eliminate undesirable pathogens in the gut of humans who consume the milk.

### **Milk Improvements**

Variations in the composition and functionality associated with milk proteins, such as leading to more efficient cheese-making or new types of cheese, suggest that changes in these properties should be possible. Researchers have proposed specific alterations in the properties of milk that might be achieved by overexpressing, deleting or adding back a mutated form of most major milk protein genes. For example, adding extra copies of the casein gene to overexpress casein could increase the thermal stability of milk, reducing protein breakdown during manufacturing.

Ongoing research, supported in part by the California Dairy Research Foundation, is exploring potential uses of transgenic technology in the dairy industry. We expect genetically engineered dairy cows to become available within two decades, including animals that produce greater cheese yields and healthier milk for human consumption, as well as a wider range of milk products.

A goal of our research program is to improve the nutritional and antimicrobial properties of milk intended for human consumption. Our laboratory at UC Davis has already shown that human lysozyme, when expressed as a transgene in mice, maintains antimicrobial activity, some of which is enhanced when lysozyme is secreted by the mammary gland versus simply adding lysozyme to milk.

Experiments are currently underway to add other naturally occurring human milk proteins-also having antimicrobial properties-and genes to alter the fatty-acid composition of milk in favor of a more heart-healthy mix.

Dairy cows carrying these types of transgenes could become available by 2025. Using transgenic cows could result in the gradual separation of the genetic backgrounds of herds being used for fluid milk production from those used for producing milk for cheese manufacturing. For example, the antimicrobial properties of lysozyme-containing milk for drinking could interfere with the microbes used in cheese and yogurt production. Greater specialization among dairy herds could result, with some herds earning premiums for producing specific types of milk for particular niche markets.

### **Industry Acceptance**

The acceptance of genetically engineered animals by industry, as with the use of cloning to reproduce exceptional females, will depend on economic incentives. The cost of purchasing genetically engineered stock must prove beneficial to producers over a reasonable period of time through increased efficiencies or income, or they will not use these technologies.

In cases for which the transgene results in new products, such as antimicrobial milk or moth-resistant wool, the producer would probably need to obtain a premium price to convert to the production flock or herd to the new genotype. As with antimicrobial milk, the introduction of some new genotypes may lead to segmenting the industry and creating special uses for different populations of animals so that new "breeds" are established. In the end, if scientists have done a good job in selecting traits to be manipulated, the acceptance of genetically modified animals by industry will come down to whether or not consumers are prepared to buy the resulting products.

### **Future in Focus**

We are optimistic about the future of transgenic animals in agriculture. We predict that by midcentury most agricultural animals will be genetically engineered to be more efficient and

healthier than current stock, producing healthy products for human consumption in an environmentally friendly system.

As we move into the 21st century, we must engage in two dialogues: one with the agricultural animal industry to determine the most important areas to target for manipulation and another with the public so that consumers fully understand the nature of the genetic changes being introduced.

*James D. Murray is professor, Department of Animal Science, College of Agricultural and Environmental Sciences, and Department of Population Health and Reproduction, School of Veterinary Medicine, UC Davis. Gary B. Anderson is professor and chair of the UC Davis Department of Animal Science.*

### **Frequently Asked Questions About Edible Films and Coatings**

Whey protein films formed as coatings on foods continue to attract considerable attention from the food industry. The data developed is necessary to show that whey protein coatings are superior to existing popular commercial coatings. Adoption of whey protein as a coating material by the food industry will result in large, value-added utilization of whey protein. Research conducted by John M. Krochta, Peter J. Shields Chair in Dairy Food Science at UC Davis, continues to lay the groundwork for utilization of whey protein as films and coatings by the food industry to protect foods from moisture, oxygen, oil and aroma migration, provide food integrity and improve appearance. Below are some frequently asked questions with a response by Dr. Krochta.

#### **1) What are the current trends in edible films?**

Materials that are getting a lot of attention include cellulose derivatives, chitosan, alginate, carrageenan, soy protein, wheat gluten, corn zein and, of course, milk proteins. Some of these materials have been around for a while and have been promoted as edible coatings and films, but data has been lacking on their moisture, oxygen, aroma and oil barrier properties, as well as their mechanical properties.

Polysaccharides and protein edible coatings and films have proven to be excellent oxygen, aroma and oil barriers; however, none of these materials serve as effective moisture barriers. Research at UC Davis is underway involving the combination of polysaccharides and proteins with various hydrophobic lipid materials (e.g., edible waxes, fatty acids, triglycerides including milkfat fractions) to achieve good moisture-barrier coatings and films with acceptable mechanical integrity.

Present commercial edible coatings are non-aqueous solvent-based (mainly ethanol solvent). These include shellac and corn zein. The food industry would like to replace these solvent-based coatings with water-based coatings to ensure worker safety and reduce risk of environmental problems.

## **2) What kinds of films are being used on foods in the marketplace?**

- \* Collagen casings and wraps are used for sausages and hams, respectively, but the production method is awkward and expensive. We are currently looking into ways to produce such casings in a more efficient manner from whey protein.
- \* Gelatin capsules are used for various pharmaceuticals (e.g., soft capsules for vitamin E and hard capsules for various cold-relief drugs).
- \* Corn zein is used to coat candies and pharmaceuticals, providing some moisture and oxygen protection and a glossy surface.
- \* Hydroxypropylmethyl cellulose is used to coat pharmaceuticals, again providing some moisture and oxygen protection and a glossy surface, as well as masking bitter flavor in some cases.
- \* Shellac is used to coat candies, pharmaceuticals and fresh fruits and vegetables. It provides some moisture and oxygen barrier and a glossy surface.
- \* Various edible waxes (e.g., beeswax, carnauba wax, candellia wax) are used to coat candies, pharmaceuticals and fresh fruits and vegetables. These waxes provide a moisture and oxygen barrier and a glossy surface.

## **3) What is the industry like now? Is it expanding coating uses?**

Currently, food companies are looking at using edible coatings when they can add value to a product, increase shelf-life and/or reduce packaging costs. Food companies are becoming more aware of the potential of edible coatings and are actively pursuing information on possible uses in old and new products. Applications of interest to the food industry about which we are aware include

- a) Coating of oxygen-sensitive foods, such as nuts, to extend shelf-life and reduce packaging.
- b) Coating of nuts to prevent oil migration into surrounding food components (e.g., prevention of nut oil migration into chocolate).
- c) Coating of chocolate products to reduce pieces sticking together and to the hands, provide gloss and when needed provide an oxygen barrier.
- d) Coating of fragile foods, such as freeze-dried foods, to improve integrity and reduce loss due to damage.
- e) Coating of fresh whole and pre-cut fruits and vegetables to extend shelf-life by reducing moisture loss, respiration and color change.
- f) Coating of nuts, cookies or candies in ice cream to provide a moisture barrier and ensure crispness.
- g) Coatings as seasoning adhesives in low-fat and non-fat snack foods.
- h) Coatings on frozen foods to prevent oxidation, as well as prevent moisture, aroma or color migration.

## **4) What different applications are currently in the marketplace using edible films made from whey?**

I'm not aware of any current applications of whey-based coatings or films in the marketplace. This does not mean they do not exist. Food companies are quite secretive and protective of their food product development concepts. However, I know that many segments of the food industry are extremely interested in new coating materials and coating technologies. The main challenge I see is providing convincing information to the food companies that whey protein films and coatings have superior properties and that they can be formed on the food product of their interest. We are providing convincing data on the superior properties of whey protein films and coatings.

### **5) How does whey protein compare to other coating materials?**

Below is a list of advantages of whey protein for use as edible films and coatings:

- a) Whey protein is water soluble but can produce either a water-soluble coating or a water-resistant coating.
- b) Whey protein films and coatings are transparent, glossy and bland in aroma and flavor.
- c) The term whey protein on an ingredient label is less threatening sounding to consumers than, for instance, hydroxypropylmethyl cellulose.
- d) Data available thus far shows whey protein film to be a superior oxygen and aroma barrier.

Currently there exists a tremendous lack of understanding and information in the area of edible coatings for foods. The food industry is eager for new information, and ingredients suppliers and contract coaters want to meet the needs of the industry, but basic information on film-coating formation, properties, methods of application to food surfaces and demonstrated effectiveness are lacking. We are attempting to fill these voids. For more information, contact John M. Krochta at (530) 752-2164 or [jmkrochta@ucdavis.edu](mailto:jmkrochta@ucdavis.edu).

## **NAMES IN THE NEWS**

### **Cano Occupys Chair for Environmental Studies**

A portion of a \$5.6 million gift to the College of Science and Mathematics' Environmental Biotechnology Institute (EBI) at Cal Poly San Luis Obispo, from the Unocal Corp. has endowed the Unocal Chair for Environmental Studies, which microbiology professor Raul Cano will occupy. Cano has served as director of EBI since its launch in late 1996 assisted by a \$1.3 million grant from Unocal. A pioneer in the study of ancient bacteria, Cano is a specialist in paleobiology and molecular evolution. In 1995 he discovered that bacteria dating to the Dinosaur Age can be revived and reproduced. That breakthrough finding revealed a new range of possibilities in medicine, industrial processes and other areas. Cano's research in food microbiology includes a current study of *Listeria*, a pathogen primarily affecting children, which is found in dairy products and other foods.

### **UC Davis' DePeters Receives Teaching Award**

Edward DePeters was presented with the 2000 Purina Mills Inc. Teaching Award during the American Dairy Science Association (ADSA)/American Society of Animal Science (ASAS) 2000 Joint Meeting in Baltimore in July. A professor in the UC Davis Department of Animal Science, DePeters received the award in recognition of his ability to effectively motivate and educate his students. He teaches three lecture and laboratory courses and directs student research projects that stress problem solving and independent thinking. He is known as a teacher who is scientifically rigorous and challenging. He is always willing to provide students with the help and direction they need to assist them in mastering their knowledge of the subject matter of his courses. In addition to his teaching abilities, DePeters is an effective advisor. In 1994, the College of Agricultural and Environmental Sciences awarded him with the Outstanding Advising Award.

The American Dairy Science Association (ADSA), formed in 1911, is an international organization of educators, scientists and industrialists who are committed to advancing the dairy industry. Members are keenly aware of the vital role that dairy sciences play in fulfilling the economic, nutritive and health requirements of the world's population.

### **IAFIS Foundation/ADSA Fellowship Awarded to Cal Poly's Aaron Harris**

The IAFIS Foundation and the American Dairy Science Association (ADSA) awarded a biennial Graduate Research Fellowship to Aaron L. Harris at the ADSA Annual Meeting in Baltimore in July. The \$10,000 graduate Fellowship assists in the training of personnel for leadership in dairy science and dairy foods processing. Additionally, \$1,000 is awarded to the recipient's research program.

Harris earned his B.S. from Wheaton College and is currently a graduate student at Cal Poly San Luis Obispo, seeking both an M.S. degree with a specialization in Dairy Products and an M.B.A. He is conducting research under the direction of Dr. Phillip Tong on characterization of the composition of milk received in California dairy product manufacturing plants. Before entering Cal Poly, Harris worked for Land O'Lakes in the area of milk fat composition. He was a member of a three-person Cal Poly product development team that won the Dairy Management Inc. (DMI) Discoveries in Dairy Ingredients Contest for "most creative use of a dairy ingredient."

### **Cal Poly Dairy Graduate Student Receives Top Honor**

Maurice E. Pitesky, a Cal Poly San Luis Obispo graduate student in dairy science, was awarded the prize of "Cal Poly Outstanding Graduate Student Thesis" for his master's thesis titled "Microbial Ecology of Milk Powder Production Using Terminal Restriction Fragment Patterns and the Development of a Rapid PCR Assay for the Detection of Mesophilic Bacillus Endospores in Milk Powder."

### **November 14-16**

Pacific Regional Milk Seminar. Annual meeting hosted by the U.S. Food and Drug Administration. Topics include farm and plant issues with a focus on regulatory concerns. All regulatory and dairy industry personnel are welcome to attend. Location: Peppermill Hotel, 2707 S. Virginia Street, Reno. Cost: \$35. For registration information contact Randy Elsberry, Regional Milk Specialist, U.S. Food & Drug Administration, 2202 Monterey St., Suite 104E, Fresno, CA 93707.

### **November 29-30**

Cal Poly/UC Davis Milk Processing Short Course. This two-day event teaches principles and technology for processing of milk for fluid and manufactured dairy foods. Location: Visalia Holiday Inn at Plaza Park. For program information, contact John Bruhn at (530) 752-2192, or e-mail [jcb Bruhn@ucdavis.edu](mailto:jcb Bruhn@ucdavis.edu). Registration information can be obtained by calling Amy Barden at (530) 752-2774 or by e-mailing [ambarden@ucdavis.edu](mailto:ambarden@ucdavis.edu). Cost: \$275

### **January 30-February 2, 2001**

Cal Poly/UC Davis Cheese Short Course II. This course discusses factors influencing development of quality attributes of cheese and their measurement and applies advanced techniques in the manufacture of cheese. Completion or familiarity with material covered in Cal Poly/UC Davis Cheese Short Course I or equivalent recommended. Location: Cal Poly Dairy Products Technology Center, San Luis Obispo, CA. Cost \$375

### **February 21-22, 2001**

Spring Dairy Industry Conference. Mark your calendar! More information to come. This conference is sponsored by the California Dairy Industries Association, California Association for Dairy and Milk Sanitarians, the Dairy Research and Information Center, UC Davis, and the

Milk and Dairy Foods Control Branch, CDFA. The program includes the CDIA Milk and Ice Cream Judging Contest, now in its 68th year, as well as tabletop industry exhibits. For information on the program, contact John Bruhn at [jcb Bruhn@ucdavis.edu](mailto:jcb Bruhn@ucdavis.edu). For registration information, contact Shirley Rexroat at [cdialdy@aol.com](mailto:cdialdy@aol.com).

**February 27-28, 2001**

Concentrated and Dried Dairy Ingredients Symposium. This two-day symposium provides an overview and update on the latest trends in the marketing, science, manufacturing technology and application of value-added dairy ingredients. Location: The Cliff's at Shell Beach, Shell Beach, CA. Cost \$295

**March 20-23, 2001**

Cal Poly/UC Davis 13th Annual Cheese Short Course I. This four-day course (including a day of hands-on cheesemaking) will to teach each participant the basic scientific information and practical skills needed to understand and manufacture cheese. Location: Cal Poly Dairy Products Technology Center, San Luis Obispo, CA. Cost: \$450

**March 29-31, 2001**

Introduction to Statistical

Methods for Sensory Evaluations of Foods. This two-day course introduces statistical analysis to the beginning sensory scientist with little or no statistical background. It is also an excellent update on applying statistical procedures for the experienced professional. Instructor: Dr. Michael O'Mahony, professor of food science and technology at UC Davis. For registration and information, contact UC Davis University Extension at (800) 752-0881. Cost: \$850

**April 2-4, 2001**

Sensory Evaluation: Overview and Update. This three-day course is designed for both the beginner and the more experienced professional who want an overview of sensory evaluation and wish to understand the reasons why tests can be set up in some ways and not in others. From this base, the professional can modify and custom-design techniques specific to the product being tested. Instructor: Dr. Michael O'Mahony, professor of food science and technology at UC Davis. For registration and information, contact UC Davis University Extension at (800) 752-0881. Cost: \$950

**May 1-4, 2001**

Dairy Science and Technology Basics for the Farmstead Cheesemaker. This four-day course (including a day of hands-on cheesemaking) is similar to Cheese Short Course I, but emphasis is placed on farmstead cheese production. In addition to information covered in Cheese I, this course includes designing a business plan, marketing, sales, distribution, cutting, packaging and labeling. Location: Cal Poly Dairy Products Technology Center, San Luis Obispo, CA. Cost: \$595

For more information on Cal Poly events please contact Laurie Jacobson at (805) 756-6097 or visit the Web site at [www.calpoly.edu/~dptc/shortcou.htm](http://www.calpoly.edu/~dptc/shortcou.htm). For information on UC Davis events, call John Bruhn at (530) 752-2192 or e-mail [jcb Bruhn@ucdavis.edu](mailto:jcb Bruhn@ucdavis.edu), or visit his Web site at <http://drinc.ucdavis.edu>.