CALIFORNIA Dairy Dispatch

RESEARCH, EDUCATION AND SERVICE TO SUPPORT THE DAIRY INDUSTRY VOL. 14, NO. 3 • WINTER 2005

Cow Study Proves Dairy Air Pollution Half the Previous Estimate

California dairy cows produce only half the amount of air pollution as had previously been believed and, perhaps more important, most of a dairy cow's contribution to smog comes not from her manure, but from her belching, says the UC Davis scientist conducting the first controlled study of its kind. Those unexpected findings may substantially change the thinking and the practices of California regulators and dairy operators trying to reduce air pollution.

"Our discovery means our whole approach to dairy waste management and air-emissions management might change," said Frank Mitloehner, the UC Davis air-quality specialist who is conducting the study. "We have to re-think that the only good solutions are engineering solutions, such as capping or aerating manure lagoons, and consider biological avenues such as animal feeding and management."

"For the first time we can tell dairy farmers the source of their air pollution," Mitloehner added. "For the most tightly regulated pollutant, the 700 ozone-forming gases collectively called volatile organic compounds, that source is not the cows' waste. It's the cows."

For three months, Mitloehner has studied dairy cows in controlled environmental chambers to collect precise measurements of the volatile organic gas emissions they produce. The information is urgently needed by the $4.6 billion, 1.5 million-cow California dairy industry—the largest in the world—as dairy producers try to comply with strict new pollution rules.

The study was prompted by concern over air quality in the San

(See **Pollution** *on page 2)*

Frank Mitloehner/UC Davis

In the UC Davis study, dairy cows were confined in small enclosures equipped to measure all the cows' production of gases and particulate matter.

Symposium Sparks Genomics Consortium

Researchers from 11 countries gathered recently in Napa, California, to discuss the future of genomic research into milk and its health benefits at the International Symposium on the Milk Genome and Human Health, sponsored by the California Dairy Research Foundation. An offshoot of a project currently underway at UC Davis and involving scientists from the United States, New Zealand, Australia, Ireland, Canada, Switzerland and the Netherlands is building databanks with the genes from milk. The symposium offered participants an opportunity to review the status of the project and to discuss development of an International Genomics Consortium with members from these and other countries.

Over two days, participants were treated to an overview of the

(See **Milk Genome** *on page 4)*

INSIDE

Pollution *from front page*

Joaquin Valley, which ranks as the worst in the country. The No. 1 source of ozone (smog) air pollution in the valley is exhaust emissions from trucks and cars. The No. 2 source is thought to be gases from cows on dairy farms.

Using state-of-the-art air-collection and analytical technology, and two environmental chambers in which to house the cows, Mitloehner precisely measured animal and waste production of volatile organic gases and other pollutants like ammonia and methane. He also videotaped the cows to correlate the timing of emissions with their activities, such as eating, ruminating and excreting.

His preliminary findings indicate that cows and their waste produce about 6.4 pounds of volatile organic compounds (VOCs) per year.

The only previous estimate of total VOCs—the estimate that California's rigid new air standard is based on—is derived from a scientific study conducted in 1938. That old estimate says that a cow produces 12.8 pounds of VOCs per year—twice the amount that Mitloehner found. Furthermore, Mitloehner found that about 2.5 pounds of the total 6.4 pounds, or only about 40 percent, comes from excreta.

Mitloehner is lead scientist on the $85,000 study, which was funded by the U.S. Environmental Protection Agency and the San Joaquin Valley Air Pollution Control District. His collaborators are 14 atmospheric scientists, engineers and physicists—six from UC Davis, three from Stanford University, two from UC Berkeley, and one each from Harvard University, Iowa State University and the U.S. Department of Agriculture.

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New Web Site Provides Reliable Information on Nutrition and Obesity Prevention

Multiple government agencies are responsible for creating a new nutrition Web site to help people find answers to nutrition- and food-related questions.

The site, www.nutrition.gov, is a comprehensive source of information on nutrition and dietary guidance.

"Health solutions begin with the availability of reliable nutrition and physical activity information the public can use to make good health choices and maintain a healthy weight," said Agriculture Secretary Ann Veneman. "Nutrition.gov is a Web-based resource that includes databases, recipes, interactive tools and specialized information for infants and children, adult women, and men and seniors."

Nutrition.gov supports the President's HealthierUS Initiative and expands on the nutrition information available on the healthierus.gov Web site, which also includes information on physical fitness, prevention and making healthy choices.

The nutrition.gov site is maintained by a team of registered dietitians and nutrition information specialists at the Food and Nutrition Information Center of USDA's National Agricultural Library (NAL). The team works in cooperation with scientists and professionals at USDA's Agricultural Research Service, USDA Food and Nutrition Service, the U.S. Department of Health and Human Services, and other Federal partners.

The Web site also links to information on the Food Guide Pyramid, the Dietary Guidelines for Americans, dietary supplements, fitness, and how to keep food safe.

Flavor Workshops Held at Two Central California Dairy Processors

When everything else is equal, flavor is the deciding factor between one food product or ingredient over another. In order to remain competitive in the global market as well as a viable contender for new markets and applications, U.S. dairy products must remain consistent.

Associate Professor MaryAnne Drake and her colleagues at North Carolina State University's Southeast Dairy Foods Research Center are responsible for developing the first defined and anchored sensory language or lexicon for Cheddar cheese in 2000. That led to a similar lexicon describing the flavors that may be present in milk powders and concentrates, and other dried dairy ingredients.

This research, sponsored by Dairy Management Inc. and the California Dairy Research Foundation, with funding from America's dairy farmers, has resulted in several flavor workshops held last fall at two large California dairy cooperatives—California Dairies Inc. (CDI), and Hilmar Cheese Company.

Last September, Drake conducted three full-day workshops at California Dairies Inc. in Visalia. Attendees learned about milk powder flavor, flavor formation, flavor variability and milk powder flavor in ingredient applications, and tasted about 50 milk powders. Drake conducted two workshops for CDI employees, and a third flavor workshop included representatives from Foster Farms, Land O Lakes, DairyAmerica, Cheese and Protein International and WestFarm Foods.

"I would like to say that all the support that California is giving to Dr. Drake's research program is a great investment because of the quality of her work and the information she is generating," said Ronald Thompson, vice president of regulatory and quality assurance at CDI.

In October, Drake returned to California to present two more flavor workshops—one on cheese flavor and the other on whey protein flavor—to about 45 Hilmar Cheese Company employees. During the whey protein workshop, Drake discussed current research on whey protein flavor, as well as evaluating the difference between the flavors of whey and soy proteins and whey/soy mixtures.

Phil Robnett, vice president of Hilmar Cheese Company, praised the workshops, explaining that "The education and understanding that comes from this level of knowledge helps us understand better what makes us who we are in the industry, as well as who we are to our customers."

Three on-site workshops are scheduled for 2005—one with a dairy cooperative and two with end-product user companies.

For more information on scheduling flavor workshops, please send an e-mail message to MaryAnne Drake at mdrake@unity.ncsu.edu.

Scientific Society Annual Meeting Focuses on Probiotics & Prebiotics

The International Scientific Association for Probiotics and Prebiotics (ISAPP) met in August 2004 to discuss the latest scientific developments in this rapidly growing field. This by-invitation meeting, surrounded by the grandeur of the Rocky Mountains in Copper Mountain, Colorado, convened 84 scientists from 13 countries. Presentations by Joel Weinstock (University of Iowa), Thadeus Stappenbeck (Washington University School of Medicine), Connie Weaver (Purdue University), Ian Rowland (Northern Ireland Centre for Food and Health), and Peter Lee (Stanford University) covered a range of topics, including the use of helminthes to modulate immune dysregulation, and probiotics bioengineered to improve resistance to HIV. Discussion subgroups were convened for a full day on the topics of engineered probiotics as therapeutics: formats and challenges; host commensal interactions—who talks to whom and how; Omics technologies—exploration of the interaction of pro and prebiotics with the host; hygiene and immune regulation; biomarkers for healthy people; prebiotic and probiotic applications to companion animals; development of a probiotic dossier using science-based criteria and physiological relevance of prebiotic activity.

"This meeting was an incredible networking opportunity for key academic and industry scientists," explained Mary Ellen Sanders, current president of ISAPP.

In addition to the academic participants, about 25 industry scientists participated in the meeting. Twenty companies committed to science-driven probiotic and prebiotic product development contributed financially and scientifically to the meeting.

The complete scientific program for the 2004 meeting can be found at http://www.mesanders.com/Presentations.htm.

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Milk Genome *from front page*

Milk Genome Project that is being undertaken by UC Davis Professor Bruce German. Presentations were given on topics such as the biology of lactation, bioactive molecules in milk, the genetics of bovine milk composition, the use of tools like microarrays to examine gene expression in bovine mammary tissue and principles for the design and analysis of experiments using gene expression arrays and other high-throughput assay methods. Further sessions covered what proteomics tell scientists about milk lipid secretion, tapping into the bovine genome sequence for future research and using genomics, metabolomics and proteomics to study lactation as well as updates on the research from Australia, New Zealand and the Netherlands. The final presentation focused on the use of knowledge management tools—created in the UC Davis project—to share milk genomics information.

In addition to German, speakers included Bo Lönnerdal, Juan Medrano, David Rocke and Matt Lange of UC Davis, Floyd Schanbacher of Ohio State University, Mark McGuire of the University of Idaho, Jim McManaman and Peggy Neville of the University of Colorado Health Services Center, Tim Smith of the USDA/ARS U.S. Meat Animal Research Center in Nebraska, Paul Donnelly of the Cooperative Research Centre for Innovative Dairy Products in Australia, Steve Davis of ViaLactia and Johan Van Arendonk of Wageningen University in Holland.

According to German, genomics offers the greatest opportunity for biological discovery, particularly in establishing the genetic nature of structure functional relationships in organisms and their products. He does, however, recognize the challenges to bringing this knowledge to practical application.

Milk evolved with the selective Darwinian pressure to nourish healthy growing mammals. Scientists are probing the milk genome to understand nutrition and health.

"We have a unique opportunity to set the stage and create the platform for this research, and to do so in a very cost-effective manner."

"First of all, databases are expensive to build and maintain. Add to that the fact that most of the sequence information in intact genomes is unknown and that genomes are being annotated for biological functions—not nutritional actions—and you can see what we're up against," he explains. "What is most necessary for milk research as a discrete field to move forward in the most efficient manner is the creation of an international consortium of active scientists for pre- and post-competitive support of research and development."

German and others who participated in this first symposium are actively soliciting membership in the International Milk Genomics Consortium to continue the development of the databanks and knowledge management tools. He is positive about the effects a consortium of this type can have on the future of milk genomics research. "We have a unique opportunity to set the stage and create the platform for this research, and to do so in a very cost-effective manner."

The consortium's goals include leveraging existing resources for the assembly of genetic instructions for milk molecules, linking the scientific community for a better understanding of the biological values of milk, creating tools for an interactive, Web data exchange, coordination of pre-competitive research to develop baseline data, and providing a foundation for the development of exclusive/competitive research.

A second International Symposium on the Milk Genome and Human Health is scheduled for Nov. 10-11 at COPIA: The American Center for Wine, Food and the Arts in Napa, California. For more information, contact coordinator Jennifer Giambroni at (415) 254-4549 or jgiambroni@sbcglobal.net.

Information about the International Milk Genomics Consortium can be obtained by contacting Dr. Bruce German, UC Davis, (530) 752-1486, jbgerman@ucdavis.edu.

CSU Ag Research Initiative Extends Dairy Funding at Cal Poly SLO

California is home to a unique agriculture research funding program that has, over the past five years, contributed greatly to the quantity and quality of dairy research coming from state universities like California State Polytechnic University, San Luis Obispo (Cal Poly SLO).

The California State University Agricultural Research Initiative (CSU/ARI) was created to provide new avenues of opportunity for the CSU to leverage existing CSU faculty and staff talent and attract matching funds for applied agricultural and natural resources research. Since its inception, the program has generated primary funding for 98 faculty research projects worth over $7.6 million at Cal Poly SLO alone. These projects, encompassing agribusiness, horticulture, crop sciences, agricultural engineering, irrigation, earth and soil sciences, food science and nutrition, and natural resources management, include 16 dairy-related projects that were awarded a combined total of $2.0 million in ARI funds.

Established in 1999, the CSU/ARI is a multi-campus collaborative research partnership involving four state universities—California State University (CSU), Fresno; California State Polytechnic University, Pomona (Cal Poly Pomona); CSU Chico; and Cal Poly SLO—as well as California's agriculture and natural resources industries and allied business communities. Co-funding is an important element of the program, which requires dollar-for-dollar matching funds from non-CSU sources, such as the California Dairy Research Foundation, Dairy Management Inc., the USDA and companies like Kraft, Hilmar Cheese and other interested businesses.

The program has enabled dairy researchers at Cal Poly SLO to reinforce research dollars contributed by dairy processors and producers by pairing them with ARI funding. The initiative also offers potential opportunities for researchers in CSU colleges of agriculture to collaborate with University of California investigators and to complement the basic and applied research undertaken by UC.

Four Cal Poly students and Professor Rafael Jiménez-Flores (striped shirt) are being helped by ARI funds. Students, from left, are Salvador Uzon, Michael Johansen, Dee Bachiero and Angie Benavides. To their right is the prototype Laser Tweezers.

Dairy research co-funded through ARI at Cal Poly SLO over the years includes projects on the contribution of dairy foods to nutrient intakes and health in the United States, as well as new product development. Cal Poly SLO Professor Nana Farkye created a line of smoked cheeses, and is currently working on a project to develop a processed Queso Fresco. Professor Phillip Tong is investigating the use of dairy ingredients in extended shelf-life dairy-based foods. Professor Rafael Jiménez-Flores has worked on the early detection of spores and spore formers in commercial dairy powders, as well as on buttermilk with ARI funding. He also developed a program for microbial quality improvement of milk powder produced in California. ARI funding also has supported growing research on probiotics conducted by Jiménez-Flores and his colleague, Adjunct Professor Mary Ellen Sanders.

Jiménez-Flores claims ARI funding has given him an opportunity to extend his research while at the same time increasing his ability to attract matching funds. "The program promotes projects that have a direct effect on the agriculture industry—through new products or processes," he says. "This practical approach is very attractive to other funding organizations and also to private industry because it addresses a need."

He is currently working under a $490,000 ARI grant to use laser tweezers to study milk component interactions. He hopes to advance the commercialization of dairy ingredients with increased concentrations of the milk fat globule membrane.

ARI funding also is helping to train the dairy researchers of tomorrow. According to Cal Poly's ARI Grants Analyst Sue Tonik, "Our dairy science graduates have worked on projects that would not have been possible without ARI support. In fact, we currently have 17 graduate students with concentrations in dairy science whose research was primarily supported through the ARI program."

These graduates make highly desirable job candidates and are often, according to Tonik, "almost recruited out of the lab before they can finish writing their theses." At this time, all of the graduates who were supported by ARI funding are employed.

(See **ARI** *on page 7)*

News and Notes

Cal Poly's Tong appointed to International Dairy Federation's Standing Committee

In November, Cal Poly dairy science Professor Phil Tong was appointed to the International Dairy Federation's Standing Committee on Dairy Science and Technology. The group monitors the latest developments in technology on behalf of the world's dairy sector.

"Because of the growing globalization of the dairy sector, it's important to be actively involved in IDF," Tong said. "Participation provides key linkages to help insure that U.S. dairy products stay competitive around the world by staying at the forefront of science and technology."

Tong, who serves as director of the Dairy Ingredients Applications Program at Cal Poly San Luis Obispo, hopes to gain a broader international perspective and establish stronger working relationships that can lead to scientific and technological exchange benefitting the United States and the dairy sector worldwide.

Milk peptide recognized for BP-lowering effect

A milk peptide developed by Dutch dairy ingredients firm DMV International reduced blood pressure in people with hypertension, according to a small study published last November.

The casein peptide, called C12, reduced systolic pressure in the 10 participants by an average of 9 points, while diastolic pressure fell an average of 6 points, write the researchers in the November issue of the *American Journal of Hypertension* (17(11 Pt 1):1056-8),

Findings from the small study are set to be confirmed in a larger trial on 50 people being carried out by the same team over an eight-week period.

The DMV peptide is already used in supplements, including a product developed by the TwinLab brand, while Japanese food firm Kanebo has created a little bottle drink containing the active ingredient.

Foods that can help control blood pressure present a significant opportunity for industry. About two thirds of strokes and half the incidence of heart disease are attributable to raised blood pressure, according to the World Health Organization.

The above article was excerpted from the Dec. 3, 2004, issue of FoodNavigator.com.

Probiotic dairy products lack scientific support

The US probiotic industry needs to finance further research in order to win over consumer confidence by providing scientific proof of its health benefits, according to research published by the International Food Information Service.

Probiotics is a growth industry in the United States, said the report, but the industry "must develop a proactive policy in order to bolster consumer confidence in commercial probiotic products."

The study added that this is essential given recent publications suggesting that commercial probiotic products do not comply with label claims, though agrees that this is not the case for the whole industry.

While U.S. consumers have a plethora of probiotic products from which to choose, "consumers have little rational basis for their choice of product," stated researchers.

"Useful information would include third-party verification of stated levels and types of viable probiotics until the end of the product shelf life," they added.

Accurate labeling of the content of a probiotic product is, obviously, essential.

An example of the possible confusion regarding labeling of probiotic products, said the researchers can be seen in yogurt, which is the main probiotic food in the United States. It is estimated that about 80 percent of the approximately $3 billion of yogurt sold in the U.S. each year contains additional bacteria for health benefits.

"Yogurt labels disclose the presence of these adjunct microbes, but there is essentially no information on the health benefits, levels, strains or, in the case of Bifidobacterium, even species contained in such products," said the researchers.

Probiotics is one of the fastest growing functional food markets worldwide. The U.S. probiotics market is forecast to more than triple in value from $143.9 million currently to $394 million in 2010, according to recent statistics from Frost & Sullivan.

This article was excerpted from the Nov. 10, 2004, issue of DairyReporter.com.

School Vending Machine Program Gives Milk Sales a Boost

Nutritious milk is becoming more "in" at schools throughout the West as vending machine programs catch on with students and parents alike.

Dairy producer promotion organizations across the West are reporting great success with school milk vending machine programs. In addition, dairy checkoff dollars are the prime reason McDonald's is promoting milk with meals.

Milk consumption is up as various combinations of rebate programs, state, federal and private funding is used to place single-serve milk vending machines in elementary, junior high and high schools, as well as colleges. Flavored milk is the biggest seller, with chocolate listed as the number one choice in all areas.

A California pilot program has been a roaring success with more than 80,000 single-serving plastic bottles of plain and flavored milk sold since the beginning of the 2003-2004 school year. The collaborative effort involved Western United Dairymen as well as the California Milk Advisory Board, Hilmar Cheese, Producers Dairy and Foster Farms.

Courtesy of Dairy Management, Inc.

The funding came from the state's Buy California grant program to loan milk vending machines to FFA chapters in 17 high schools. Project manager Christine DeMont said the chapters had to apply for the program and present a business plan for the machine. Profits from the machines go back to the FFA programs, and the chapters can apply to keep the machine for the next school year. This year, 17 chapters were presented with vending machines. DeMont said school food services personnel had been reluctant to approve vending machine placement, fearing loss of cafeteria milk sales.

"What they found was they were selling more milk as students have the opportunity to try it and are drinking more. These machines are having an impact on student nutrition," she added.

Dairy Management Inc., which is responsible for increasing dairy product demand both domestically and internationally reported the same scenario after their pilot test.

"We found that the vending machines were great complements to the school milk program," said DMI's David Pelzer. DMI's test in food services also led to the McDonald's milk promotion.

This article is excerpted from an article written by Cecilia Parsons that first ran in the June 2004 issue of Western DairyBusiness.

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ARI *continued from page 5*

ARI is administered by the California Agricultural Technology Institute (CATI), a non-profit educational institution based at CSU Fresno. It was created in 1984 by a mandate of the state Legislature to develop and evaluate new and promising technologies that could have the potential for improving the economic performance of California agriculture. At Cal Poly SLO, the ARI coordinator is Mark Shelton, associate dean in the College of Agriculture.

Originally established with a $5 million annual budget, the ARI program has been subject, like all state programs, to budget cuts. In 2002, then-Governor Davis reduced ARI's annual budget to $4 million with $1.24 million to be dispersed among the four CSU agricultural colleges for competitive research projects; another $800,000 pooled for competitive research projects at the system-wide level; $1.53 million for individual campus "capacity-building" funds; and $424,000 for central and campus.

For information about ARI, contact:

- **Cal Poly ARI** on the Web at http://ari.calpoly.edu, or by phone at (805) 756-7241
- **CSU Agricultural Research Institute** on the Web at http://ari.calstate.edu/
- **California Agricultural Technology Institute** on the Web at http://cati.csufresno.edu/, or by phone at (559) 278-2361

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Calendar of EVENTS

March 22-25, 2005
Sixteenth Annual Cheese Short Course I. This course will teach participants the basic scientific information and practical skills needed to understand and manufacture cheese. Location: Cal Poly Dairy Products Technology Center, San Luis Obispo. For more information, call Laurie Jacobson at (805) 756-6097 or send an e-mail message to ljacobso@calpoly.edu.

April 10-13, 2005
10th ADSA Discover Conference. Improving Health Through Dairy Foods: New Technologies, New Research, New Directions. Location: Stone Mountain, GA. For more information, visit www.adsa.org/discover on the Web.

August 14-17, 2005
International Association for Food Protection (IAFP) 92nd Annual Meeting. Location: Baltimore, MD. For information, visit www.foodprotection.org.

September 17-22, 2005
IDF World Dairy Summit. Location: Vancouver, Canada. For information, visit www.fil-idf.org/content/default.asp on the Web.

September 27-30, 2005
Sixth Annual Dairy Science and Technology Basics for the Artisan/Farmstead Cheesemaker. You will learn the basics of quality cheese manufacturing with emphasis on artisan/farmstead cheese for a small-scale cheesemaking business. Location: Cal Poly Dairy Products Technology Center, San Luis Obispo. For more information, call Laurie Jacobson at (805) 756-6097 or send an e-mail message to ljacobso@calpoly.edu.

October 18-19, 2005
Ninth Annual Dairy Cleaning and Sanitation Short Course. This two-day course is designed to provide the basics of plant and equipment cleaning and sanitation, personal hygiene, and introduction to HACCP. Location: Cal Poly Dairy Products Technology Center, San Luis Obispo. For more information, call Laurie Jacobson at (805) 756-6097 or send an e-mail message to ljacobso@calpoly.edu.

November 7-10, 2005
Sixth Annual Frozen Dairy Desserts Manufacturing Short Course. This course emphasizes ingredients function and usage, mix formulation, equipment and processes in frozen dessert manufacture. Location: Cal Poly Dairy Products Technology Center, San Luis Obispo. For more information, call Laurie Jacobson at (805) 756-6097 or send an e-mail message to ljacobso@calpoly.edu.

November 10-11, 2005
Second International Symposium on the Milk Genome and Human Health. Location: COPIA—The American Center for Wine, Food and the Arts in Napa, Calif. For more information, call Jennifer Giambroni at (415) 254-4549 or send an e-mail message to jgiambroni@sbcglobal.net.