

# CALIFORNIA Dairy Dispatch

RESEARCH, EDUCATION AND SERVICE TO SUPPORT THE DAIRY INDUSTRY

VOL. 15, NO. 4 • SPRING 2006

## Distinguished NCSU dairy expert Todd Klaenhammer presented with William C. Haines Dairy Science Award

In February, the California Dairy Research Foundation (CDRF) presented Southeast Dairy Foods Research Center Director and North Carolina State University Professor Todd Klaenhammer with the William C. Haines Dairy Science Award in recognition of his contribution to the field of dairy science. Dr. Klaenhammer received the award at the eighth annual Cal Poly Symposium on Advances in Dairy Product Technology in Shell Beach, Calif., where he gave a presentation on probiotics.

“It is a pleasure to present the William C. Haines award to Todd,” said Joseph O’Donnell, executive director of the CDRF. “He is a dedicated scientist who, throughout his career, has played many roles in the advancement of dairy science including teacher, researcher, lecturer and industry supporter. His devotion to the study of lactic acid bacteria and pioneering work with genomics will be the basis for many future dairy innovations.”

Dr. Klaenhammer is a William Neal Reynolds Distinguished Professor of Food Science, Microbiology

(see **Haines Award** on page 4)



CDRF Executive Director Joseph O’Donnell (left) presented NCSU Professor Todd Klaenhammer with the William C. Haines Dairy Science Award in February.

## Study finds whey protein improves body composition, reduces waist circumference

A new clinical trial abstract presented in April at the Experimental Biology meeting in San Francisco by researchers from the U.S. Department of Agriculture (USDA), found that individuals who consumed supplemental whey protein for six months weighed less and had less body fat compared to individuals who consumed a carbohydrate supplement. In addition, the whey protein group had a smaller waist circumference than both the soy and carbohydrate supplemented groups.

“The findings of this study add to our knowledge about the health

(see **Whey Protein** on page 4)

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International experts to meet in Brussels, Belgium, Sept. 19-21

# Tulare County dairyman converts methane waste to energy

By Shirley Kirkpatrick

Over the roar of four large Caterpillar engines purring in the background, Lindsay dairyman Rob Hilardes said his 20-year trek toward energy self-sufficiency is now paying off “big time.”

The engines are powered by methane gas collected from the waste lagoons of his nearby heifer cattle replacement operation. Each one generates 125 kilowatts of continuous electricity, more than enough to meet the needs of his modern 6,000-

cow dairy and his family’s farmstead cheese-making operation.

The methane digester system on the Hilardes Dairy helps offset electricity use under California’s recently extended dairy net metering law. The project was funded in part by California’s Dairy Power Production Program, administered for the California Energy Commission by Western United Resource Development Inc., an arm of Western United Dairymen.

Hilardes credits Roy Sharp, pioneer of methane conversion on his Tulare hog farm in the 1980s, as his inspiration. At that time, though, said Hilardes, “I only had the dairy heifer operation (Sierra Cattle Co.) and didn’t use that much power. It wouldn’t have been cost-effective.”

The impetus to further explore the waste-to-energy technology came for Hilardes in 2001 with the convergence of two events: the state’s energy crisis and the start of his application process for a special use permit to build the new dairy.

Because the permit process took so long, he began experimenting with the covered lagoon concept. He called on Sharp, who has sold his hog operation and now provides methane consultation services as Sharp Energy.

They, along with Electrical Power Systems of Fresno, began to work on the design as Hilardes’ permit application made its slow and expensive way through public hearings and Tulare County’s planning process. His was the first dairy application to proceed after an environmental group sued the county over air and water issues involving surrounding dairies. The team behind the Hilardes application provided a strong, defensible environmental impact report that withstood legal scrutiny.

“The benefit of planning a methane digester program at the outset for a completely new dairy is that we could bring all the electrical load to one spot,” said Hilardes. He said older dairies may have several power sources and meters serving a variety of functions, thus making it difficult to retrofit with the new technology.

Another factor figuring into Hilardes’ decision was the state Legislature’s passage of SB 5X in the spring of 2001. It appropriated funds for the Dairy Power Production Program, which has approved more than a dozen waste-to-energy conversion projects, many of which have been completed.

Hilardes said his original plan called for two engines that would



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

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Courtesy of Western United Dairymen



*Lindsay dairyman Rob Hilardes has installed a methane digester system to produce electricity from dairy waste. Photo courtesy of Western United Dairywomen*

produce 250 kilowatts of energy. The grant paid half of the \$1 million cost. “When we installed the lagoon cover, we discovered it produced much more gas than anticipated. I added engines three and four on my own to produce 500 kilowatts, for a total cost of \$1.15 million.

“We’re connected through the Edison Co. (Southern California Edison). I use most of the power for the dairy and, if I can keep my demand down (charges for standby), I may be able to bank those fees as credits for use on my irrigation pumps,” said Hilardes.

Hilardes said he is using little or no power from the utility.

“Power production is pretty well in balance with demand, and very little extra gas is flared off from the engine room,” he said.

While costs vary between summer and winter rates, Hilardes said power charges for the dairy average about \$20,000 per month.

Key to methane production at the Hilardes Dairy are the lagoons serving his heifer ranch, more than a mile west of the dairy parlor. Manure from the alleys is flushed daily using recycled lagoon water. This generates 180,000 gallons of wastewater daily

that gravity flows into settling ponds (lagoons). Bacteria in the lagoons convert volatile solids in the manure into biogas.

The largest lagoon is 1,100 feet by 220 feet—five football fields—and is 18 feet deep. It is completely covered and sealed with high-density polyethylene (HDPE) material that is 60 mils thick and extremely durable. Life expectancy of the cover is at least 20 years.

A second lagoon is the same size, but is only 15 feet deep. It handles wastewater overflow and is partially covered with five floating plastic covers that collect a smaller amount of gas. Collection pipes and hoses lead from the lagoons to two pump houses where the gas is metered. Gas from the two lagoons is combined before it is sucked into a one-and-one-half mile underground pipeline that delivers it to the four Caterpillar G342 engines.

Methane from the ponds is not scrubbed or processed at all, Hilardes explained. But a couple of low spots, called water drops, were built into the line. These allow water and impurities to drop out as the lighter gas passes on down the line to be generated into electricity.

“Simplicity is the key to this system,” said Sharp. “It costs half as much to build and produces twice as much energy,” he said, comparing it to the plug digester and other dairy waste management systems.

“Grants to start these programs are all well and good,” Sharp added. “But they have to be viable, sustainable and must be able to operate on their own volition.”

Hilardes, Sharp and dairy sector leaders point out a major drawback to the biogas electrical systems, in general. This, they say, is the relationship to the electrical utility company. As it stands now, dairy producers are not allowed to sell back or receive credits for excess bio-power from livestock operations. They urge a legislative fix for the problem.

Beyond reducing the strain on the California power grid and need for electricity produced from fossil fuel power plants, other environmental benefits include:

- reduction of pathogens in the digested manure
- less odor and flies
- reduction of methane and other greenhouse gases in the atmosphere
- fewer weed seeds in the digested manure.

“If they can sell their excess power, it will surely encourage more dairies to convert waste to energy,” said Sharp. “If such pricing agreements could be affected, the Hilardes Dairy has the potential to pay off its costs in 31 months.”

This article first appeared in the April 26 issue of AgAlert, a weekly newspaper of the California Farm Bureau Federation. Shirley Kirkpatrick is a reporter in Exeter. She may be contacted at [joshkirk@lightspeed.net](mailto:joshkirk@lightspeed.net).

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## **(Whey Protein** *from page 1)*

benefits of whey protein,” said USDA researcher David Baer. “It’s noteworthy that people who consumed whey protein daily, without any additional exercise or caloric restriction, still had a smaller waist circumference at the end of the study compared to the other groups.”

The purpose of this study was to investigate the effects of whey protein, compared to both soy protein and carbohydrate, on body weight and composition. In the six-month study, researchers provided whey protein, soy protein or carbohydrate supplements to 90 free-living, overweight and obese (BMI > 28 and < 38) but otherwise healthy individuals. The study participants were randomly assigned to one of three treatment groups: 1) 60 grams/day of whey protein, 2) 60 grams/day of soy protein or 3) a control group receiving 60 grams/day of carbohydrate, and were instructed to incorporate the supplement they received as part of their normal diet. Body composition and weight were measured weekly. After six months, the researchers found that individuals who consumed whey protein weighed less, had less body fat and lost more inches around the waist compared to the carbohydrate group. The difference in body weight observed was associated with a decrease in body fat without a significant loss in

lean body mass. While the body weight was not different between the whey and soy groups, the whey group lost more inches around the waist than the group consuming soy protein.

“While research is still emerging on this topic, the results of this study support existing research suggesting that whey protein may improve body composition by preserving lean body mass and promoting fat loss,” said Joseph O’Donnell, executive director of the California Dairy Research Foundation (CDRF) and chairman of the U.S. Whey Protein Research Consortium. The consortium provided funding for the study.

Whey protein is a high-quality dairy protein derived from milk that contains all nine essential amino acids, the building blocks of healthy muscles, skin, nails and other body tissues. Whey is also a rich source of branched chain amino acids that help regulate muscle protein synthesis. Whey protein is found naturally in milk and is also available in various powdered forms. Many other foods and beverages sometimes include whey as an ingredient, such as nutrition and energy bars, smoothies, ready-to-drink beverages, dairy-based beverages, beverage meals, meal replacements and cereal.

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## **Haines Award** *from page 1*

and Genetics in the College of Agriculture and Life Sciences at North Carolina State University. He was inducted into the National Academy of Science in 2001 and is a founding member of the Lactic Acid Bacteria Genomics Consortium and a Fellow of the American Academy of Microbiology, American Dairy Science Association and Institute of Food Technologists. His current research goals include providing avenues for improvement and diversification of food bioprocessing and preservation systems through genetic investigation and modification of lactic acid bacteria.

“On behalf of my entire research group at North Carolina State University, it is a tremendous honor to be recognized with the 2006 William C. Haines Award,” said Klaenhammer. “Dr. Haines is one of the most knowledgeable and experienced dairy scientists in the U.S. He has had a tremendous impact on defining and advancing the national research agenda through his leadership at Dairy Management, Inc. In particular, his support for fundamental work on the genomics of lactic acid bacteria used in dairy fermentations has fueled our efforts to understand the interactions between fermented dairy products and the bacteria therein, which may positively impact our health.”

Established in 2004, the William C. Haines Dairy Science Award was created to recognize individuals who, through their accomplishments in research and development in the field of chemistry, biochemistry, microbiology, technology, nutrition, and/or engineering, have made a significant contribution to dairy science and the betterment of the dairy industry and consumers of dairy products.

The award, named for William C. Haines, former vice president of product innovation for Dairy Management Inc., includes an engraved plaque, \$1,000 in cash and travel expenses to an annual dairy industry event co-sponsored by the CDRF. A committee of dairy personnel representing producers, processors, manufacturers and researchers make the final award selection.

Nomination forms for the 2007 Haines Award are available online at [www.cdrf.org](http://www.cdrf.org) under “Awards & Giving.” The deadline to submit 2007 nomination forms and supporting materials is **Sept. 22, 2006.**

# Milk serves as an excellent model for future foods

By Joseph A. O'Donnell, Executive Director, CDRF

Everyone with a food to sell tries to tout some magical health benefit. These benefits have become points of distinction in a very competitive food marketplace. Consumers have so many choices that manufacturers need to have a “hook” to lure the consumer toward a purchase. Some of these reputed health benefits have data behind them, some don't. In many cases, if there is even a hint of some health benefit delivered by a component in a food item, the marketing department of that food item jumps on the bandwagon. While some laws exist regarding health statements, they are easily bypassed. In the end, the consumer often is left confused and misled.

In reality, health claims for foods are a dicey subject. Is there a way to scientifically identify specific health parameters influenced by food, the mechanisms by which this occurs and the circumstances whereby this effect can be optimized? So much of what is hyped today is based on serendipity rather than a plan of nature. These reported health benefits are blurred further by not knowing the bonafide health effect. Is it just a response to a chemical produced by a vegetable trying to defend itself from being eaten? Is caffeine really a health benefit, or an obnoxious toxin? Are the estrogen-like compounds in soy really there to reduce heart disease or to make the consumer impotent, thus killing off a species preying on the soy plant? Who knows? The point is, we need a model system for sorting it all out.

In steps my favorite food hero—milk. Milk was optimally designed to optimize an infant's ability to thrive. That double optima is intended. Nature doesn't waste materials. Not only is the amino acid profile of milk's proteins optimized for growth and development (by comparison, amino acids in soy protein cause a rise in insulin secretion), the proteins themselves are pleiotrophic, meaning they conduct multiple tasks as they go through digestion. None of this happens by chance; rather, it all is powered by Darwinian pressure to maximize survival. The system that exists is the one that survived. It is the most efficient and effective.

I refer to milk as a model because it has achieved what food developers strive for—the ability to deliver complete nutrition in a tasty package. Looking at the human genome and specifically milk production elements, we can learn what turns on the synthesis of various components of milk and what effect those components have on the recipient.

That will lead us to the mechanism of action. Once we understand the mechanism by which milk components deliver health benefits, we can search other foods for similar activity. Milk will be the standard by which foods will be designed from a variety of raw ingredients. Nature has worked out the most effective system—all we need to do is figure it out. After that, product developers will have a field day. Once product developers and nutritionists understand how nature delivers health benefits in the most efficient way possible, alternatives can be devised.



I'm not here to preach to the choir about the merits of dairy products, but to take a view of milk from the perspective of a scientist trying to understand how best to deliver health benefits to consumers through product formulation and still make it taste good. Milk already has achieved that goal. It took millions of years of evolution to get there, but it works. Other foods can be made to work in the same way, especially if one takes the open view of combining multiple sources of raw materials.

Obviously, humans don't live by dairy products alone. But the secrets of nature to be learned from milk can open up new, exciting avenues to product developers drawing on all the food resources available to us and trying to deliver health benefits to consumers in a constantly changing marketplace.

*This article first appeared in the March 2005 edition of Cheese Market News*

*JOD*

## Laurie Jacobson receives 2006 food and environmental sciences staff award

**C**ongratulations to Laurie Jacobson, who received the 2006 “Rain for Rent” staff award from Cal Poly San Luis Obispo’s College of Agriculture. A 1994 graduate of Cal Poly’s Food Science and Nutrition Department, Laurie has served the Dairy Products Technology Center (DPTC) continuously for the past 10 years as its outreach specialist. In this capacity, Laurie provides leadership for the DPTC industry educational short courses and symposia.



“In large part, the continued success, tremendous industry support, and growing reputation of the DPTC is in part due to the single efforts of Laurie Jacobson, her commitment to Cal Poly and to excellence in her job performance” wrote DPTC Director Phil Tong in his nomination of Laurie for this award. The DPTC and the thousands of industry attendees to our programs will be happy to learn Laurie has been recognized formally for her work. In addition to this work, Laurie performs other communication duties for the benefit of the students, staff, faculty and industry involved in dairy foods and related fields.

## Probiotic dairy could help block HIV

Scientists have devised a way of using “live” bacteria in yogurt to deliver medicine that can prevent HIV infection, potentially opening up a new avenue for probiotic dairy development.

Researchers from the United States and Europe say they managed to genetically modify the *Lactococcus lactis* bacteria so that it produces cyanovirin—a drug that has

blocked HIV infection during tests on monkeys and is set for human trials next year. *L. lactis* produces lactic acid and is used widely to make cheese and yogurt.

Bharat Ramratnam, one of the researchers and an HIV expert at Brown Medical School, said it is possible that probiotic food products could be made containing cyanovirin. However, the team only focused on how to block the sexual transmission of HIV, which means that the live bacteria would have to be capable of moving from the gut down to the vagina.

*L. lactis* is already found naturally in both the human gut and vaginal wall, suggesting that any strain introduced would have a good chance of survival. However, Ramratnam said the team must be sure that cyanovirin is safe. “No one has ever applied this to animals for months at a time,” he said, adding the testing may not be complete for two or three years. Initial tests have shown that cyanovirin blocks a receptor the HIV uses to infect cells by binding itself to sugar molecules attached to the HIV virus.

Even if things do not work out as planned, however, Ramratnam said the team has shown that *L. lactis* “can be used as a vehicle for drug delivery.”

*This article by Chris Mercer is excerpted from the December 8 issue of DairyReporter.com.*

## Probiotics may help solve gut problems

*By Stephen Daniells*

Chronic stress is implicated in the development of irritable bowel syndrome and in the worsening of symptoms of inflammatory bowel disease, such as Crohn’s disease, which affects more than half a million people in the United States.

The new research, published on-line in the journal *Gut* (10.1136/gut.2005.089739), measured the effects of a commercial probiotic powder on intestinal health of male rats subjected to a daily dose of stress.

Brown Norway rats were fed either a normal diet or a normal diet supplemented with a probiotic mixture. The probiotic powder contained *Lactobacillus rhamnosus*, strain R0011 and *Lactobacillus helveticus*, strain R0052 (Lacidofil) and was provided by the Montreal-based Institut Rosell-Lallemand.

The two groups were further divided so that half of the probiotic and half of the normal diet groups were subjected to water avoidance stress (WAS), which involved placing the rat on a small platform surrounded by water,

## (News and Notes *from page 6*)

for one hour a day for 10 consecutive days. The other half of each group was subjected to a sham stress for the same time period. The stress sessions were designed to mimic psychological stress to produce the type of effects that would be seen in the human gut.

At the end of the stress period the intestinal tissues of the animals were examined. The researchers, from Canada and Sweden, found that the presence of harmful bacteria was significantly greater in the WAS rats.

The density of harmful bacteria was measured to be 28.3 and 34.7 bacteria per square millimeter in the ileum and colon of the WAS group, respectively. Rats exposed to chronic stress and supplemented with probiotics had only about 20 percent of these bacterial populations, leading the scientists to conclude that the probiotics were preventing the adherence of harmful bacteria to the cells lining the gut wall.

“Probiotics transiently colonize the gut and competitively exclude pathogenic bacteria from binding,” said lead author Mehri Zareie from the University of Toronto.

The researchers also found that supplementation with the probiotic mixture reduced migration of bacteria into the lymph system, and thus prevented an immune response from the hosts.

More in-depth studies into the mechanisms of action will allow a better understanding of how probiotics target specific organs in different disease states,” concluded the researchers.

*This article appeared in NutraIngredients-usa.com on April 25, 2006.*

## Dairy air quality specialist wins award

Frank Mitloehner, an air quality specialist in the UC Davis Department of Animal Science, received the 2006 Academic Federation Award for Excellence in Research for meritorious achievements. Mitloehner, who studies air quality in and around livestock production facilities, won the award for research productivity in the areas of publications, grants and graduate student mentorship. The award recipient is determined annually by the Academic Federation Committee on Research at the University of California, Davis. A public ceremony was held on May 24 on the UC Davis campus at which Mitloehner spoke and received a \$500 stipend.



*Frank Mitloehner*

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## Symposium on Milk Genomics & Human Health to be held in Brussels

**I**nternational experts in nutrition, genomics, bioinformatics and milk will gather in Brussels, Belgium, this September to discuss the status of milk-specific genomic research at the third International Symposium on Milk Genomics and Human Health.

The event, to be held September 19-21, 2006, at the Brussels Hilton, is being organized by the California Dairy Research Foundation (CDRF) and the International Dairy Federation (IDF).

The symposium will feature three sessions over the two-and-a-half day period, focusing on topics such as the regulation of lactation genes, milk peptides sequence and targets, and updates from the International Milk Genomics Consortium. Special sessions for consortium members also will be held during the event.

The inaugural Milk Genomics Symposium in 2004 attracted researchers from 11 countries to discuss the future of genomic research into milk and its health benefits and led to the development of an International Milk Genomics Consortium. The consortium's goals include leveraging existing resources for the assembly of genet-

ic 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. Information about the Milk Genomics Consortium can be obtained by e-mail, [info@imgconsortium.org](mailto:info@imgconsortium.org). A second symposium was held in November 2005.

Symposium registration is \$425 through July 12, 2006, and \$475 thereafter. The registration fee includes all program materials and daytime meals as well as a Tuesday evening reception. Members of the International Milk Genomics Consortium can register at the rate of \$400 through July 12, 2006, and \$450 thereafter. Student rates also are available.

For registration information, visit <http://milkgenomics.fil-idf-pr.com> or register online at [www.acteva.com/go/cdrf](http://www.acteva.com/go/cdrf).

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## Address Service Requested

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# *Calendar* of **EVENTS**

### June 24–28

**Institute of Food Technologists Annual Meeting**, Orlando, FL. For more information visit [www.am-fe.ift.org/cms/](http://www.am-fe.ift.org/cms/).

### June 26–27

**California Creamery Operators Annual Meeting**, Lake Tahoe, NV. For more info, call (530) 662-1228

### July 9–13

**ADSA-ASAS Joint Annual Meeting**, Minneapolis, MN. For more information visit <http://adsa.asas.org/meetings/2006/>.

### August 7–9

**International Conference on the Future of Agriculture: Science, Stewardship, and Sustainability**, Hyatt Regency in downtown Sacramento. The conference is sponsored by the U.S. EPA ORD Hazardous Substance Technical Liaisons Program, the National Institute of Environmental Health Sciences, the Midwest Hazardous Substance Research Center—Kansas State University, and California EPA. For more information, contact Ellen Stauffer at [ellen@ksu.edu](mailto:ellen@ksu.edu), or call (785) 532-2562, 8 a.m.–5 p.m. (CST).

### August 13–16

**International Association for Food Protection**, Calgary, Canada. For more information, visit [www.foodprotection.org/meetingsEducation/2006ammain.asp](http://www.foodprotection.org/meetingsEducation/2006ammain.asp).

### September 19–21

**Third Annual International Milk Genomics Symposium**, Brussels, Belgium. Sponsored by CDRF and IDF, the symposium will discuss ongoing and future collaborative milk genomics research and provide database mining tools and highlights from International Milk Genomics Consortium participants. For more information, call Jennifer Giambroni at (415) 254-4549 or e-mail [jgiambroni@sbcglobal.net](mailto:jgiambroni@sbcglobal.net)

### September 26–29

**8th Dairy Science and Technology Basics for the Farmstead/Artisan Cheesemaker**. Basics of quality cheese manufacture with emphasis on artisan/farmstead cheese manufacture. Location: Cal Poly Dairy Products Technology Center, San Luis Obispo, CA. For information, call Laurie Jacobson at (805) 756-6097, or visit [www.calpoly.edu/~dptc](http://www.calpoly.edu/~dptc).

### October 16–17

**Developing Probiotics as Foods and Drugs—Scientific and Regulatory Challenges**. An overview of the historical and current human use of probiotics, as well as advances in clinical studies and potentially new probiotic applications. Location: Marriott Conference Center, University of Maryland College Park Campus, Adelphi, MD. For information, call Amanda Carmody at (215) 442-6176, or e-mail [Amanda.Carmody@diahome.org](mailto:Amanda.Carmody@diahome.org). Visit [www.diahome.org](http://www.diahome.org) for a schedule of events.