

The Pros of Probiotics

CDRF a leader in recognizing the potential benefits of probiotics

By Mary Ellen Sanders

The belief that consuming live, active cultures in fermented dairy foods have a positive health benefit has been around for more than 100 years. These foods are integral to many traditional diets worldwide. What's new in 2007? Diligent scientific investigation has combined with innovative product development and marketing to bring new life to this old concept. A range of new products with an assortment of probiotic cultures that have been studied and shown to have beneficial effects on human health are on the market. The California Dairy Research Foundation (CDRF) has been a leader for more than a decade in recognizing the potential benefits of probiotics, both to the consumer and consequently, to the dairy industry.

Probiotics have arrived in (dairy) foods!

To say that 2007 is the year of probiotics is an understatement. In the dairy category, new products abound, including Dannon's Activia®

(see **Probiotics** on page 2)



Ireland's Paul Ross presented with William C. Haines Dairy Science Award

The California Dairy Research Foundation (CDRF) presented Dr. Paul Ross (above, right) head of Ireland's Teagasc Moorepark Biotechnology Centre, with the William C. Haines Dairy Science Award in recognition of his contribution to the field of dairy science. CDRF Executive Director Joseph O'Donnell presented the award to Ross at the 9th Cal Poly Dairy Ingredients Symposium in San Francisco, where Ross gave a presentation on mining biodiversity for fermented dairy products such as yogurt and cheese.

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

INSIDE

4

MILK GENOMICS

Fourth symposium set for Nov. 7-9 in Napa

5-6

PROBIOTICS NEWS

Cheese cubes, cottage cheese among many products with probiotics

7

REDUCING EMISSIONS

Dairies using trucks that run on fuel from cows

8

CALENDAR

9th Dairy Science and Technology Basics for the Cheesemaker, Sept. 11-14

Probiotics from page 1

yogurt featuring *Bifidobacterium animalis* DN173010, DanActive® fermented milk with *Lactobacillus casei* DN114001, and Danimals® yogurt drink with *Lactobacillus rhamnosus* GG. All three of these products contain the yogurt starter cultures *Lactobacillus bulgaricus* and *Streptococcus thermophilus*. All yogurts produced by Stonyfield Farms contain yogurt cultures plus four strains of added probiotic bacteria, including *Lactobacillus reuteri*, the subject of several recent studies documenting its contribution to protecting healthy

adults and kids from illness. Nestlé has launched an extension to its Good Start® infant formula line with Good Start® Natural Cultures, containing *Bifidobacterium lactis* BB12 with data showing immune benefits. Some additional products with live cultures added for their beneficial health effects are frozen yogurt (TCBY), cheese (Kraft LiveActive Cheddar Cheese) and kefir (Lifeway).

However, dairy no longer “owns” the probiotic concept for foods. In the past year, a number of other foods containing live cultures have hit the market, including granola and candy bars (Attune), cereal (Kashi), and cookies (Mrs. Freshley’s).

Dairy+probiotics=a good match

Dairy products offer a great residence for probiotics. Fermented dairy products have always been a source of live and active cultures. Some of these same fermentation microbes are the ones that have been studied as candidate probiotics for their health benefits. (Other bacteria used as probiotics, namely strains of the group *Bifidobacterium*, are not traditionally associated with fermented dairy products.) The lactobacilli typically can survive well in these dairy products which are kept refrigerated and generally have short shelf lives, although the acidic nature of some of these products can challenge survival. In addition, fermented dairy products are one of the few food categories that consumers associate with live active cultures. In the mind of consumers, often “bacteria are bad” but “cultures are good.”

Although dairy products traditionally deliver probiotics, other food groups are competing with dairy products for this honor. To stay competitive, the dairy industry must:

- Use the term “probiotic” only when the product meets the minimum criteria for probiotic, i.e., that the microbe is alive at

adequate levels in the product and has been shown to confer a health benefit to humans.

- Create products that deliver an efficacious level of probiotic through the end of shelf life.
- Provide validated products that meet consumer needs for taste, convenience and price.
- Continue to fund research to better understand the role of dairy products in delivering health benefits mediated by probiotics.

CDRF early involvement

The CDRF has led the way in promoting a science-based understanding of probiotics and dairy products through research and communication efforts. CDRF understood that with better data on the benefits of probiotics bacteria that dairy products were the ideal carrier for providing these benefits to the consumer.

Some highlights of CDRF-sponsored activities include:

- In 1992, the CDRF commissioned the preparation of a white paper to review the scientific status of research supporting health benefits that could be attributed to probiotics. This paper

(**Probiotics** continues at right)



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For more information, contact:

Joseph O'Donnell, Executive Director

California Dairy Research Foundation

502 Mace Blvd., Suite 12

Davis, CA 95618

Phone (530) 753-0681

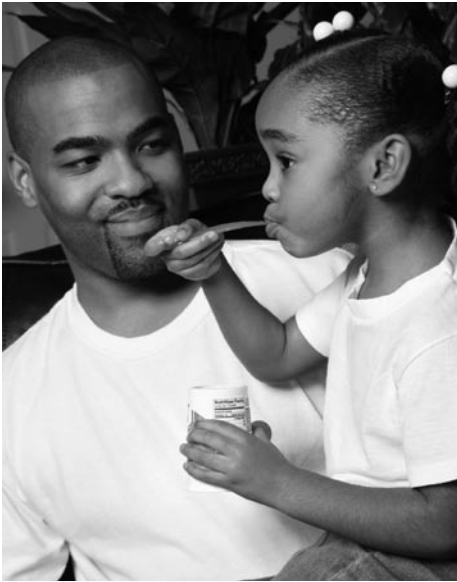
Fax (530) 753-1453

E-mail: odonnell@cdf.org

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

Contributing Writer: **Jennifer Giambroni**

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



was published the following year (Sanders 1993a).

- Building on the conclusions of this review, the CDRF convened a consensus panel with experts from the United States, Europe and Japan to determine what types of health claims could be substantiated by current science. The results of this panel were published in 1993 (Sanders 1993b).
- In 1996, the CDRF supported research at Cal Poly, San Luis Obispo that contributed to the understanding of strain-specific attributes of different strains of probiotics used in commercial products (Yeung et al., 2002 & 2004).
- In 1997, CDRF funded research at UC Davis by Dr. Linda Harris who studied ways to enhance the survival of Bifidobacteria in dairy foods.
- In 1998, CDRF supported Dr. Sanders on research studying the evaluation of factors influencing cell count of probiotic bacteria.
- In 2001, the CDRF, in collaboration with probiotics expert Mary Ellen Sanders, launched the first science-based Web site devoted to understanding probiotics. This site, www.usprobiotics.org, has grown from 9,963 page views in its first year to 320,533 page views in 2006

alone and is referenced in media articles and consistently receives accolades from users on its delivery of unbiased information for consumers, industry and health professionals.

- Since 2002, the CDRF has supported outside experts in the field to provide resources for media interviews. Close to 100 interviews on the topic of probiotics have been conducted with popular press or trade publications.
- In 2002, the CDRF recognized the need for a professional scientific society to promote communication and the advancement of science of probiotics and prebiotics and provided funds to establish the International Scientific Association for Probiotics and Prebiotics (ISAPP). *See box below.*

- Currently, CDRF is working with Dairy Management Inc. to establish a national probiotics and bioactives program using research from dairy research centers throughout the United States. Results from these projects will be reported in future issues of the *Dairy Dispatch*.

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What is ISAPP?

- ISAPP is an international non-profit collaboration of scientists dedicated to advancing the science of probiotics and prebiotics.
- **What does ISAPP hope to accomplish?** To engender and disseminate information on high quality, multidisciplinary, scientific investigation in the fields of probiotics and prebiotics, and to advance the development of scientifically substantiated, health-promoting probiotic and prebiotic products worldwide.
- **How has ISAPP forwarded its goals?** Through scientific meetings, publications and establishing a network of involved scientists interested in advancing the science of probiotics and prebiotics. ISAPP has convened three by-invitation meetings where scientists from around the world met to discuss pressing scientific issues in the field. ISAPP also has published several papers in peer-reviewed journals summarizing the results of the meetings.
- **How is ISAPP supported?** By contributions from science-driven companies focused on probiotics and prebiotics.
- **When is the next meeting?** ISAPP will convene its first open-invitation meeting in London UK, June 27-28, 2007 featuring scientific presentations, poster sessions, student awards and a collegial atmosphere to mingle with other professionals in the field.
- For further information, visit www.isapp.net on the Web.



4th Annual Symposium on milk genomics & human health scheduled

International experts in nutrition, genomics, bioinformatics and milk research will gather in Napa, California, Nov. 7-9, for the 4th International Symposium on Milk Genomics and Human Health.

Organized by the California Dairy Research Foundation (CDRF), the three-day event will be held at COPIA: The Center for Wine, Food & the Arts, under the theme of "Milk: from Genes to mRNA to Proteins." Sessions will focus on the proteomics of milk, regulation of milk protein expression, post-translation modification of milk proteins, proteomics of milk peptides and glycopeptides and bioactives of milk proteins as well as updates from the International Milk Genomics Consortium (IMGC). Speaker proposals will be accepted through April 30, see www.milkgenomics.org for details. A complete speaker program will be announced in June.

Symposium registration is \$450 through Sept. 6, and \$500 there-

after, and includes all program materials and daytime meals as well as a Wednesday evening reception. Members of the International Milk Genomics Consortium can register at the rate of \$400 through Sept. 6, and \$450 thereafter. Student rates also are available. For registration information, visit www.milkgenomics.org, or register online at www.acteva.com/go/cdrf.



Since 2004, the event has attracted researchers from 24 countries to discuss current and future genomic research of mammalian milk and its related health benefits. The symposium has led to the development of

the IMGC, a partnership of companies and academic organizations whose goals are to leverage existing resources for the assembly of genetic instructions for milk molecules, and link the scientific community for better understanding of the biological values of milk. In addition, IMGC created tools for an interactive Web data exchange, coordinates pre-competitive research to develop baseline data, and provides a foundation for the development of exclusive and competitive research. For more information about the IMGC, visit www.imgconsortium.org, or send an e-mail inquiry to info@imgconsortium.org.

Event sponsors include the International Dairy Federation, U.S. Dairy Export Council, as well as IMGC sponsoring members CDRF, CNIEL, DairyAustralia, Dairy Farmers of Canada, Dutch Dairy Association, Mead Johnson Nutritionals and Teagasc Biotechnology Food Research Centre.

CDR

Haines Award *from page 1*

"Paul's work in microbiology, especially in exploring lactic acid bacteria and probiotics and their antimicrobial peptides, will influence the future quality of dairy products," said O'Donnell.

Professor Ross has been part of the Teagasc Moorepark Food Research Centre in Ireland for more than 12 years and was instrumental in securing funding for the Teagasc Biotechnology Centre for research on food and health and animal biotechnology. He is the inventor on 11 patents and has licensed a number of technologies to Irish industries, including the use of lactacin antimicrobial peptides for food uses. He also acts as an adjunct professor of

the University College Cork where he lectures on food biotechnology.

"I'm delighted and flattered to receive this recognition for our work, and I'm very pleased to share this honor with my collaborators, researchers and students at Teagasc, University College Cork, and the Alimentary Pharmabiotic Centre," said Ross. "Looking ahead, there's great potential for functional foods to be the big breakthrough in the dairy sector. To achieve this, however, there needs to be an increased investment in transdisciplinary research, which spans food science through to medical research and cell biology to provide the essential scientific evidence for health promotion."

Established in 2004, the William C. Haines Dairy Science Award was created to recognize individuals who 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. Nomination forms for the 2008 award are available online at www.cdrf.org under "Awards & Giving." The deadline to submit 2008 nomination forms and supporting materials is September 21, 2007.

CDR

Kraft unveils new line of digestive-friendly dairy items

By *Kate Rockwood*, Medill News Service

Kraft Foods Inc. plans to unveil a line of probiotic cheese cubes and individual cheese sticks that includes living microorganisms aimed at balancing naturally occurring gut flora and at aiding consumer digestion. A cottage cheese includes prebiotic fiber, marketed to help consumers boost their daily fiber intake and maintain regularity.

In March, Kraft became the first mainstream North American company to market probiotic cheese at a national level, selling LiveActive at Canadian supermarkets. The cheese is coming to the United States in September.

“Probiotics are hot hot hot and it seems like the United States is finally ready to embrace talking about bacteria in the gut,” Donna Berry, editor of Dairy Food Magazine, said in a talk on industry trends at the American Dairy Products Institute’s annual conference in Chicago.

Dannon launched Activa yogurt at the beginning of 2006 and in its first year it surpassed \$100 million in annual U.S. retail sales, a goal achieved by fewer than one tenth of 1 percent of all new products, according to Dannon.



Jim Armetta, 40, of Naperville, consumes three or four bottles of drinkable yogurt with probiotics manufactured by White Plains, N.Y.-based Dannon Co. He was turned onto the trend when his father, Dominic, was instructed to take probiotics by his doctor.

My 84-year-old father has a condition that affects his

lungs, and it makes him more susceptible to infections,” Armetta said. “He was getting infections every one or two weeks. He started drinking probiotics at Christmas and he hasn’t had an infection since.”

In other parts of the world, probiotics are a well-established though still-expanding market. Dannon first introduced its DanActive line of probiotic drinkable yogurts in Europe in 1984.

Likewise, Dean Foods Co. recently brought its probiotic yogurt brand, Rachel’s Organic, to the United States. The brand has been a hit in the U.K. for years.

Morton Grove-based Lifeway Foods Inc. added a line of probiotic, organic milk drinks in January. Called ProBugs, the line is aimed at children, packaged in flexible, juice box-like pouches with no-spill tops.

In late March, Dean introduced probiotic cottage cheese under its Dean Foods, Country Fresh and Land O’ Lakes brands.

Probiotics fits into a larger trend of “functional” foods and beverages—products pumped with everything from Vitamin D to Omega-3 fatty acid in an effort to boost nutrition and lure customers willing to pay top dollar for super foods.

Americans got a sneak peek at the LiveActive label when Kraft introduced cottage cheese with prebiotic fiber under the Breakstone’s and Knudsen brands in late March.

EDD

Probiotics may protect against food poisoning

By *Stephen Daniells*, FoodNavigator.com 3-20-07

Irish scientists report that a combination of five probiotic strains may reduce food poisoning by salmonella, if results of their pig study can be translated to humans.

“The administered probiotic bacteria improved both the clinical and microbiological outcome of Salmonella infection,” wrote the researchers, led by Colin Hill from University College Cork. “These strains offer significant benefit for use in the food industry and may have potential in human applications.”

According to the European Commission, salmonella-induced food poisoning costs the U.K. economy alone billions each year, with 160,000 cases reported annually in Europe. About 1.4 million Americans are estimated to suffer annually from salmonella, according to the Centers for Disease Control and Prevention.

Continued on page 6

News & Notes *continued from page 5*

The new research divided 15 weaned pigs and fed them milk supplemented with a mixture of five *Lactobacillus* probiotic strains (two strains of *Lactobacillus murinus* and one strain each of *Lactobacillus salivarius* subsp. *salivarius*, *Lactobacillus pentosus*, and *Pediococcus pentosaceus*), or placebo (regular milk) for 30 days.

After six days of the probiotics, the pigs were given an oral dose of *Salmonella enterica* serovar Typhimurium. The health and microbiology of the faeces were monitored for 23 days.

The pigs receiving probiotics showed reduced incidence, severity, and duration of diarrhoea as well as significantly lower numbers of *Salmonella* in faecal samples 15 days post-infection, reported the researchers in the journal *Applied and Environmental Microbiology*.

The benefits for gut health have been reported to be due to the probiotic bacteria adhering to the walls of the intestine, which inhibits the ability of the pathogenic *Salmonella* to stick and colonize the gut, thereby reducing the infection.

EDD

Probiotic teams more useful than single strain

By Stephen Daniells, DairyReporter.com, 4-25-07

A combination of different probiotics strains reduces the ability of potentially pathogenic bacteria to colonize the gut more than single strains, says new research that proposes industry should look to expand research in this area.

The research, published in *Food Research International*, reports the effects of commercial probiotic strains of reducing the adhesion and colonization of pathogenic bacteria that could promote poor gut health.

“These results suggest that combinations of probiotics strains could be useful and more effective in inhibition of pathogen adhesion,” wrote lead author Carmen Collado from the Functional Foods Forum, University of Turku.

“The inhibition and displacement profiles were very different suggesting that different mechanisms are implied in both processes.”

Probiotic products containing ‘friendly’ bacteria are now well accepted by consumers in many European countries, with putative benefits highlighted for gut and immune health.

The benefits for gut health have been reported to be due to the probiotic bacteria adhering to the walls of the intestine, which inhibits the ability of pathogenic bacteria to stick and colonize the gut, thereby reducing the infection.

The researchers, including collaborators from Abo Akademi University in Finland, evaluated the ability of four commercial probiotic strains (*Lactobacillus rhamnosus* GG, *L. rhamnosus* LC705, *B. breve* 99 and *Propionibacterium freudenreichii* ssp. *shermanii* JS) either alone or in various combinations to inhibit, displace and compete with selected pathogens (*Bacteroides vulgatus* DSM 1447, *Clostridium histolyticum* DSM 627, *Clostridium difficile* DSM 1296, *Escherichia coli* K2, *Listeria monocytogenes* ATCC 15313, *Salmonella enterica* serovar *Typhimurium* ATCC 12028, *Staphylococcus aureus* DSM 20231).

Collado reports that all the different probiotic combinations tested inhibited pathogenic infection by over 40 percent for some pathogens tested, and proposed that they could be “excellent candidates” for their use as new combinations in fermented dairy products.

EDD

UC Davis food safety institute’s director to retire

When Jerry Gillespie, founding director of the Western Institute for Food Safety and Security at the University of California, Davis, retires July 1, leadership of the five-year-old institute will pass to interim director Rob Atwill, a Cooperative Extension veterinarian whose research focuses on waterborne infectious diseases.

A veterinary pathologist, Gillespie has guided development of the institute’s research and education program, drawing together scientific expertise from government, industry and academia to address critical issues related to the nation’s food supply.



Dr. Jerry Gillespie

Atwill, until recently, has been working at UC Davis’ Veterinary Medical Teaching and Research Center in Tulare. A member of the faculty since 1994, he currently is

the lead epidemiologist researching the medical ecology and environmental spread of *E. coli* O157:H7 in the Salinas area.

In other leadership areas at the institute, Linda Harris and Michael Payne are guiding efforts in research and outreach, respectively.

Harris, a Cooperative Extension food microbiologist in the Department of Food Science and Technology, serves as the institute's associate director for research. An internationally recognized leader in the area of microbial food safety, Harris' research focuses on the microbiology of fresh fruits and vegetables, as well as tree nuts. She is in charge of the competitive grants program at the institute and directs its research laboratory and program.

Payne is the institute's outreach coordinator. A veterinarian, he has provided leadership for the California Dairy Research Foundation, the Food Animal Residue Avoidance Database, and special projects for the California Department of Food and Agriculture. He has led various outreach programs for animal welfare, food safety and environmental issues related to the dairy industry.

Through the institute, established in 2002, UC Davis' School of Veterinary Medicine, College of Agricultural and Environmental Sciences, and School of Medicine work in partnership with California's Department of Food and Agriculture and Department of Health Services, as well as with federal regulatory agencies and various industries to address safety issues, with the goal of reducing food-borne illnesses in California and beyond.

edd

Dairies aim to cut methane emissions, use trucks that run on fuel from cows

By John Holland, Modesto Bee staff writer

People in the dairy business are looking at two routes for improving the environment. One is literally a truck route. Western United Dairymen, based in Modesto, is launching a study in which four milk tankers supplying Hilmar Cheese Co. will run on methane derived from cow manure.

The yearlong project could reduce air pollution from diesel fuel while helping dispose of manure in a way that protects air and water, said Michael Marsh, the group's chief executive officer.

The second effort involves a marketplace for credits that businesses could earn by reducing emissions believed to contribute to global warming.

Scientists say methane is one of the most potent of these gases if it is allowed to simply waft into the atmosphere from manure and other sources. Burning it to

make energy—for heating, electricity generation and other uses—makes it much less of a threat, they say.

Under the credit system, a dairy farmer who controls methane from manure could receive certificates that could be sold to businesses that exceed emission standards.

Joseph Gallo Farms, a major cheesemaker in Atwater, already gets the credits with a manure digester installed in 2004. The farm captures about 30,000 tons of methane a year, and each ton is worth about \$3.70 at the current price on the Chicago Climate Exchange, Gallo General Manager Carl Morris said.

"It's not a fortune, but it's not insignificant either," said Morris, one of the speakers at a forum on the credits at the Stanislaus County Agricultural Center last week.

The credit income is on top of the money Gallo has saved by using methane in place of conventional fuels in its operations.

Global warming is believed to be caused by a buildup of atmospheric gases that trap the sun's heat. The phenomenon, disputed by a minority of scientists, could disrupt agriculture and wildlife habitat, intensify heat waves and storms, and raise sea levels as polar ice melts.

Carbon dioxide, mainly from fossil fuels, is believed to be the main contributor by volume. But each ton of methane, from livestock manure and other sources, does almost 20 times as much harm, Morris said.

About 20 manure digesters are in place at California dairies, a tiny slice of the total farms. They and future digesters could help the state meet its goal of reducing climate-changing gases 30 percent by 2020.

"Agriculture stands to gain a lot from being able to control emissions," said Ladi Asgill, a Modesto-based project manager for Sustainable Conservation, an environmental group that works with businesses.

The specific rules for measuring the reductions are being devised. Speakers at the forum said the system, at least for now, will not provide credits for feed crops planted by dairy farmers. The plants absorb carbon dioxide from the air as they grow.

The milk truck project is funded by a \$400,000 grant from the U.S. Environmental Protection Agency.

Over the next year, liquefied methane from manure will be used in place of diesel in tankers supplying Hilmar Cheese from a Tulare County dairy farm, Marsh said.

The dairy group and several partners will try to see if this is a practical use of methane and whether it might be expanded to other wastes from farming and food processing, he said.

edd

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Calendar of **EVENTS**

July 8–12, 2007

ADSA 2007 Annual Meeting

San Antonio, TX. For more information, visit www.adsa.org on the Web.

July 28–August 1

IFT Annual Meeting and Food Expo 2007

McCormick Place, Chicago, IL For more information, visit www.ift.org on the Web.

September 11–14, 2007

9th Dairy Science and Technology Basics for the Farmstead/Artisan Cheesemaker. Basics of quality cheese manufacture with emphasis on artisan/farmstead cheese manufacture. Includes one day of hands-on cheese making activities, cheese sensory evaluations, and other considerations in starting a small scale cheese making business. Location: Cal Poly Dairy Products

Technology Center, San Luis Obispo, CA. For more information please contact Laurie Jacobson at (805) 756-6097 or by e-mail: ljacobso@calpoly.edu.

October 16-17, 2007

11th Annual Dairy Cleaning and Sanitation Short Course. Designed to provide basics of plant and equipment cleaning and sanitation, as well as personal hygiene, and introduction to HACCP. Location: Cal Poly Dairy Products Technology Center, San Luis Obispo, CA. For more information please contact Laurie Jacobson at (805) 756-6097 or by e-mail: ljacobso@calpoly.edu.

November 7–9, 2007

4th International Symposium: Milk Genomics & Human Health. Location: Napa, California. For more information, contact Jennifer Giambroni, symposium coordinator, at info@imgconsortium.org.