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The Jackrabbit Dairy Review

Dairy Science

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The Jackrabbit Dairy Review

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The Jackrabbit Dairy Review

Winter 2015-2016

Dairy Science Department, Alfred Dairy Science Hall, South Dakota State University, Brookings, SD 57007-0647

DAIRY SCIENCE DEPARTMENT

Faculty

Sanjeev Anand *Professor, Dairy Manufacturing*
Jill Anderson *Assistant Professor, Dairy Production*
Howard Bonnemann *Lecturer, Dairy Manufacturing*
David Casper *Assistant Professor, Dairy Production*
Alvaro Garcia *Agriculture and Natural Resources
Program Director/Professor*
Joan Hegerfeld-Baker *Assistant Professor,
Extension Specialist-Food Safety, Food Science*
Padmanaban Krishnan *Professor, Food Science*
Sergio Martinez-Monteagudo *Assistant Professor,
Dairy Manufacturing*
Lloyd Metzger
Professor, Alfred Chair in Dairy Education
Vikram Mistry *Professor and Department Head*
Maristela Rovai
*Assistant Professor/Extension Dairy Specialist,
Dairy Production*
Kristen Uilk *Assistant Director-First Year Advising*
C. Y. Wang *Professor, Food Science*

Emeritus Faculty

Robert Baer *currently in the Black Hills area*
David Henning *currently in Wisconsin*
John Parsons *currently in Arkansas*
David Schingoethe *currently in Brookings*

Staff

Steve Beckman *Filtration Technologist*
Ananya Biswas *Research Associate*
Tracey Erickson *Extension Dairy Field Specialist*
John Haberkorn *Manager, Davis Dairy Plant*
Akimoto Ichinomiya
Assistant Manager, Davis Dairy Plant
Peter Linke *Manager, Dairy Research
and Training Facility*
Monica Markwed *Secretary, Dairy Bar*
Laura McMartin *Agricultural Foreperson,
Dairy Research and Training Facility*
Debra Patterson *Agricultural Foreperson,
Dairy Research and Training Facility*
Kristi Prunty *Secretary*
Jayne Raabe *Senior Secretary*
Melissa Schmitt *Assistant Manager,
Dairy Research and Training Facility*



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MESSAGE FROM THE DEPARTMENT HEAD



2015 was a very interesting year for the dairy science department; we started the year with extensive discussions on curriculum in dairy production and dairy manufacturing, resulting from input from students during exit interviews, faculty expertise, current professional needs of graduates, and striking a fine balance between teaching and research for faculty. The outcome was a curriculum that will better prepare our students for the future. This was followed by another extensive discussion on the incorporation of a new food science major at both the undergraduate and graduate levels. This is a defining new development, enabling the department to expand its reach from the dairy farm, to dairy processing and now to food processing. Given the tight connection between these areas, we are

now positioned to offer students in all areas opportunities that will have a lasting impact on their future and that of food production. This makes SDSU the only university in the country that offers extensive academic and research programs in dairy and food science within one department and with synergies between the three. We were also faced with faculty vacancies that had occurred in the previous year. While the process for filling these vacancies ensued, teaching and research continued. Thanks to our existing faculty members that took on additional responsibilities to help ensure seamless progression for students. The additional duties did not deter excellence; scholarship awards were at an all-time high of approximately \$114,000, the products judging team won their national contest for the eighth year in a row and faculty productivity in terms of research and publications was impressive; in fiscal year 2015 dairy science faculty members had secured over \$1.4 million in external grants through 30 projects to cover research projects and support graduate students and researchers. This reflected a 12 percent increase in external funding over the previous year. The Office of Technology Transfer reported that nearly one-fourth of the total disclosures at the university for technology transfer came from the dairy science department. This is a clear testimony of the top quality faculty and students in the department and the immense value of the newly renovated facilities. Student accomplishments, as reported in this newsletter, were equally impressive. We are particularly eager about 2016 as we prepare to welcome three new faculty members: Dr. Sergio Martinez-Monteagudo, assistant professor in dairy manufacturing; Dr. Johan Osorio, assistant professor in dairy production; and a new faculty member in food science. The teaching and research expertise of these individuals will help us strengthen all three program areas. Help us spread the word about exciting careers in dairy production, dairy manufacturing and food science along with the outstanding scholarship program and the opportunity to engage with world-class faculty and facilities. We are well poised to continue to serve the dairy and food industry through our teaching, research and service programs.

Vikram Mistry

INTRODUCING FOOD SCIENCE

The department is pleased to introduce food science as a new major at the undergraduate level with offerings of M.S. and Ph.D. degrees as well, effective with the 2015-2016 academic year. Food science, which previously resided in the College of Education and Human Sciences as an undergraduate emphasis, was formally transferred to the College of Agriculture and Biological Sciences and, specifically, to the dairy science department. The four-year curriculum is designed per the guidelines of the Institute of Food Technologists, the professional organization of the food industry and leads to a B.S. degree. In 2016, we will begin the IFT approval process for the new program. The major already has some 15 students enrolled, many of whom transferred from their previous program at SDSU and we are now actively promoting the food science major. The field offers numerous opportunities in the food industry around the country. Along with the transfer of the program, the department also welcomed Drs. Joan Hegerfeld-Baker, Padmanaban Krishnan and C. Y. Wang as food science faculty. In addition, through the Strategic Reinvestment Program at SDSU, a new food science faculty position was also created. We are currently recruiting to fill this position. Also in the plans is the renovation of labs that will be used for teaching and research activities in the new program. While the new program resides in the dairy science department, faculty expertise in other departments, such as in animal science, ag biosystems engineering and plant science also complements the food science program.

NEW FACULTY AND VISITORS

NEW FACULTY AND STAFF



Joan Hegerfeld-Baker joined the dairy science department as part of the new food science program. She is assistant professor/Extension food specialist. Dr. Hegerfeld-Baker has a B.S. in public health sciences; M.S. in education, curriculum and instruction; and Ph.D. in nutritional sciences, all from SDSU. She was first affiliated with Food Safety Extension at SDSU in 1994 and became Food Safety Extension Specialist in 2002. Prior to joining the dairy science department she was affiliated with the College of Education and Human Sciences. She works extensively with specialty crop producers in the state for food safety matters. She also played a key role in South Dakota raw milk regulations. She teaches the food safety management and food product development classes in her new role.



Padmanaban Krishnan has been a faculty member at SDSU since 1988 when he joined the Department of Nutrition, Food Science and Hospitality as an instructor. He holds a B.S. degree in botany from the University of Madras, India, M.S. in food and nutrition from NDSU, and Ph.D. in cereal science from NDSU. He moved to the dairy science department from the College of Education and Human Sciences as part of the new food science program. Dr. Krishnan has a very active program in cereal science and is very actively engaged in research in value-added utilization research in wheat, corn, oats and soybeans. In his new role, he is responsible for teaching several classes in food science, including food chemistry, food analysis and food processing.



Peter Linke is currently the longest-serving employee at the Dairy Research and Training Facility and has served in several capacities. In March 2015 he was appointed as manager of the DRTF. He joined the DRTF as ag foreperson in 2004 after he completed his B.S. in dairy production at SDSU. Over the 11-year period he developed extensive experience at the DRTF and now as manager he oversees all operations, including supervision of employees, coordination of research and teaching activities and is a liaison with the College of ABS Farm Department. Peter is also in the process of completing a master's degree in dairy production.



Laura McMartin joined the DRTF in summer 2015 as ag foreperson. She serves as the lead person to feed cows and replacement heifers, maintain overall appearance of the farm including grounds maintenance and performs routine maintenance and general repairs on equipment. Laura is in the process of completing a bachelor's degree in dairy production.



Kristi Prunty joined the dairy science department as secretary in January 2015. Kristi provides secretarial support to the dairy science department as well as the State Dairy Lab and Dairy Extension Specialist. She plays the important roles of managing student payroll, assisting with purchase procedures and managing the department switch board. She holds a B.S. in political science from SDSU.



C.Y. Wang joined the dairy science department in a partial appointment in 2015 as part of the new food science program. He joined SDSU in 1993 as assistant professor in the Department of Nutrition and Food Science. Dr. Wang's B.S. degree is in agronomy from Shenyang Agricultural University, China, and M.S. and Ph.D. degrees are from Iowa State University in food science and technology. His research interests are in genomics, proteomics, metabolomics in human nutrition research; chemistry, analysis and health benefits of phytochemicals; processing and chemistry of cereal and oilseed components; proteins, carbohydrates, and lipids; processing and utilization of corn and soybeans; instrumental analysis of food components. In his new role he teaches food safety management and food product development.

VISITORS

Randy Gross, former president of Holstein Association, USA, and retired assistant branch manager of Northwest Farm Credit Services of Washington State, served as visiting instructor in dairy production classes. Gross's wealth of experience was most valuable to our students.

Leyby S. Guifarro, an undergraduate student from Honduras, spent the summer under the mentorship of Dr. Maristela Rovai learning about South Dakota's dairy industry. Through this program she assisted Rovai with her research and also worked at Golden Dakota Farms in Flandreau and MoDak Dairy in Goodwin.

Dr. Jorge Gutiérrez, a Spanish veterinarian specializing in small ruminants who works for Spain's MSD Animal Health (Merck) in ruminant Scientific Field Affairs (SFA) spent 15 days at SDSU with Dr. Maristela Rovai. Along with Rovai, Gutiérrez visited commercial dairies and participated in the Dairy Tool Box Talks — An Educational Pilot program of dairy farm employee's training sponsored by the High Plains Intermountain Center for Agricultural Health & Safety from Colorado State University.

Walt Wosje, alumnus and retired CEO of Michigan Milk Producers served as guest lecturer in several of our classes and conducted individualized practice interviews for our students. Wosje was also the recipient of a distinguished alumnus award of the SDSU Alumni Association in 2011.

2015 GRADUATES

Ph.D.

Ananya Biswas, Manufacturing
Haridas Meletharayil,
Manufacturing
Jon Pretz, Production
William Weich, Production

M.S.

Subash Acharya, Production
Khilendra Bhanduriya,
Manufacturing
Somil Gupta, Manufacturing
Kayla Hultquist, Production
Rhea Lawrence, Production
Suresh Sutariya, Manufacturing

B.S. Manufacturing

Rachel Achen
Samantha Berg
Rachel Johnson
Andrew Kaskie
Kevin Kral
Natasha Laska
Weina Liu
Geena Mott
Della Stage

B.S. Production

Jennifer Casperson
Ben Choudek
Kyle Fischer

Emily Martin
Riley Pitman
Andrea Pfaffenbach
Meg Viland
Bobbi Jo Wild

B.S. Production & Manufacturing

Teresa Sandberg
Samantha Schaefer
Holly Schmitt
Brent Van Middendorp

B.S. Food Science

Kalley Besler
Ted Mohr

FOOD SCIENCE CLUB



Club members attended the Institute of Food Technologists Annual Meeting in Chicago in June. In September the club kicked off the 2015-2016 academic year with a pizza party to welcome new and returning club members. Additional activities this year included volunteering with SDSU concessions and participating in National Ag Day, Sanford All About Science Festival, and Farm Fest (Redwood Falls, Minnesota). Students have also been working on a project to develop Jackrabbit cookies. 2015 officers are Ashley Adamski, president; Poonam Singha, co-vice president; Ted Mohr, co-vice president; Logan Johnson, treasurer; Maria Velazco Fasce, secretary; Maggie Becher and Emily Resch, historians. Dr. Padmanaban Krishnan is the adviser.

JUDGING ACTIVITIES

DAIRY CATTLE EVALUATION

The SDSU Dairy Judging Team coached by Jon Pretz competed in several contests throughout 2015. The team members consisted of Audrey Souza, Jacob Johnson, Bernice Vander Wal and David Trcka. At the Southwestern Exposition and Livestock Contest in Fort Worth, Texas, the team placed 12th overall. The team placed fifth in Jerseys, ninth in Brown Swiss, 13th in Holsteins and eighth in oral reasons. Audrey Souza was fourth high individual in Brown Swiss, Jacob Johnson was ninth high individual for reasons, Bernice Vander Wal was ninth high individual for Jersey and David Trcka was 21st high individual for Jersey. On their way to Texas the SDSU team practiced at dairies in Kansas, Oklahoma and Texas. The team also competed in the 22nd Annual Accelerated Genetics Intercollegiate Dairy Cattle Judging Contest in Viroqua, Wis. The team placed fifth High Team overall and fifth High Team in reasons. David Trcka finished first High Individual in the Guernsey Breed and 15th High Individual overall. A total of 12 teams participated in this year's contest. They judged Guernsey, Holstein, Jersey and Milking Shorthorn with each participant placing 10 classes and giving five sets of oral reasons. Another competition included the 95th Annual National Collegiate Dairy Cattle Judging Contest in Madison, Wis., at the World Dairy Expo. The team placed 16th High Team overall and 10th High Team in Reasons. The team placed 12th in Ayrshire, 16th in Brown Swiss, 11th in Guernsey, 12th in Holstein and 13th in Jersey. Jacob Johnson finished 16th High Individual in the Holstein Breed. A total of 18 teams participated in this year's contest representing 69 contestants from 15 U.S. states and two countries. They judged Ayrshire, Brown Swiss, Guernsey, Holstein, Jersey, Milking Shorthorn and Red and White.



Dairy Judging Team

DAIRY CLUB



Club members attended ADSA-SAD regional conference at the Wisconsin Dells in February. In June, club members hosted youth at the 12th annual Jackrabbit Dairy Camp and co-hosted the second annual Cow to Cup 5K. Other club activities throughout the past year included the South Dakota State Fair, Ag-Bio Ice Cream Social, National Ag Day, Relay for Life, World Dairy Expo and cheese boxes for which students cut, packaged and shipped almost 8,000 pounds of cheese around the country under the leadership of co-chairs Chelsea Schosow, Cole Hoyer and Eric Ode. 2015 Officers were Megan Schaefer, president; Maggie Stiles, vice president; Chelsea Schosow, secretary; Bernice Vander Wal, treasurer; Katelyn Johnson and Kiley Van Eck, historians; Sarah Post and Sam Fuchs, activities coordinators; and Megan Schaefer, Dairy Digest editor. Advisors were Dr. Jill Anderson, Dr. Lloyd Metzger, John Haberkorn and graduate students J on Pretz and Billy Weich.

DAIRY CHALLENGE

The Dairy Challenge Team earned a second place award at the 13th Annual North American Intercollegiate Dairy Challenge® that was held in Ft. Wayne, Indiana. In total, 264 students from 37 colleges across the U.S. and Canada attended this educational event co-hosted by Purdue University, Michigan State University and The Ohio State University. The team, composed of David Berning, Matt Holdvogt, Chelsey Johnson and Holly Schmitt, ranked second from a field of eight teams, which evaluated the same operating dairy in the tri-state area. The team was coached by Kenneth Kalscheur, David Casper and Melissa Schmitt. In addition, a number of industry professionals assisted with practices to help prepare the team. For the contest, participants visited six dairy farms in Indiana, Michigan and Ohio, as part of their training to help farmers evaluate and adapt management to optimize success and animal care. Also, industry professionals presented cutting-edge research, new programs and career opportunities to students. Academy participants from SDSU included Jennifer Casperson, Sam Fuchs, Emily Martin, Riley Pitman and Sara Sontag.



Dairy Challenge Team

DAIRY PRODUCTS

The Dairy Products Judging Team placed first in All Products at the 2015 Collegiate Dairy Products Evaluation Contest that was held at the International Dairy Show in Chicago, Illinois. This was the eighth consecutive year that SDSU has won the National Championship. SDSU has a long history at the contest and has won the national championship 23 times in the 94-year history of the contest. The team placed first in butter, cheddar cheese, cottage cheese and ice cream and placed second in milk and yogurt. A total of 44 undergraduate and graduate contestants from 12 universities in the U.S. and Canada participated in the contest. SDSU team members were Nicole Jax, Waltham, Minnesota; Michaela VanderWal, Milbank; Kaylee Wegner, Faribault, Minn.; and Dikshi Bawa, Karnal, India. The team is coached by Lloyd Metzger, SDSU professor of dairy science and Alfred Chair in Dairy Education, Natasha Laska, SDSU graduate student and Lee Alexander, SDSU graduate student. Jax placed first overall, second in yogurt, milk, butter and cottage cheese and fourth in ice cream. As the top overall judge Jax received the Robert Rosenbaum Award. VanderWal placed fourth overall, fourth in cheddar cheese, fifth in cottage cheese and sixth in milk. Wegner was sixth overall, first in cheddar cheese and second in ice cream. In the graduate student contest, Bawa placed first overall and was first in ice cream, second in butter, and third in yogurt and cottage cheese. As the top overall graduate student judge Bawa received the Genevieve Christen Award. For placing first overall, the SDSU team won the Shirley Seas Memorial Scholarship. This scholarship is in memory of Shirley Seas, who coached the SDSU team for 21 years. Metzger also received the Aurelia and George Weigold Coach of the Year Award. The contest was hosted by the International Dairy Show and the International Dairy Foods Association and was sponsored by the U.S. Department of Agriculture and more than 30 dairy associations, companies and suppliers.



Dairy Products Judging Team

PROFESSIONAL ACTIVITIES OF FACULTY AND STAFF

Faculty and students together presented numerous papers including refereed publications in scientific journals, abstracts, presentations, book chapters, extension publications, theses or dissertation, and Extension presentations. All publications are listed on our website at www.sdstate.edu/ds.

Dr. Sanjeev Anand has been on the dairy science faculty since 2006 and teaches and conducts research in dairy microbiology and food safety. He routinely mentors undergraduate researchers as well as graduate students working towards M.S. and Ph.D. degrees. Anand's research is in the areas of biofilm development and control, control of spores in dairy processing, nonthermal methods for improving product quality, dairy products with enhanced health benefits, and general food safety education. He serves as the department representative to the Functional Genomics Core Facility (2007-present), dairy science representative for the Van D. and Barbara B. Fishback Honors College (2013-present) and department library representative (2014-present).

Dr. Jill Anderson joined the Department of Dairy Science as assistant professor in 2012 and teaches several classes and has established a research program in calf and heifer nutrition. She served on the College of ABS curriculum taskforce. Anderson has served as adviser to four graduate students and four undergraduate researchers. She also serves as chair of the Midwest ADSA Extension Symposium.



Howard Bonnemann has been on the dairy science faculty since 1997. He teaches a wide range of classes in dairy science as well as the introductory food science class. He serves as academic adviser to all undergraduate students in the department. He is the assessment coordinator for the department and the College of Agriculture and Biological Sciences representative on the University Assessment Committee. He is also the department curriculum coordinator and has conducted many FFA dairy products judging clinics across the state.

He serves as the executive secretary for the South Dakota Dairy Association.

Dr. David Casper began his research and teaching position as assistant professor of dairy science in 2011 and serves in various capacities on boards of the American Dairy Science Association and the American Society of Animal Science. He served as co-coach of the Intercollegiate Dairy Challenge team. Among several other classes, he co-taught an ag-bio class in spring for a study abroad trip to New Zealand. During summer 2015 he traveled to China on an industry trip surveying the dairy industry. He serves on the SDSU Faculty Senate and on the Institutional Animal Care and Use Committee.

John Haberkorn is the manager of the Davis Dairy Plant. In addition to managing the plant he also provided tours of the plant to numerous groups, initiated several new programs for the plant, including student edition cheeses, GMP program, development and production of a large range of flavored cheeses, and a positive release program. All initiatives involve student participation.

Dr. Joan Hegerfeld-Baker is the Extension food safety specialist and serves as treasurer of the South Affiliate of the National Extension Family Consumer Sciences. She is a committee member of the SDSU Institute of STEM Education Enhancement coordinator of the South Dakota FFA Food Science and Technology Career Event. She served on the South Dakota Raw Milk Working Group that was led by South Dakota Secretary of Agriculture Lucas Lentsch.

Dr. Padmanaban Krishnan conducts research in food science and teaches food science classes. He is president-elect of the Great Plains subsection of the Institute of Food Technologists and past chair of the Vitamins Methods Committee of the American Association of Cereal Chemists. Dr. Krishnan works collaboratively with scientists in the plant science department and industry on oats and wheat and their processing.

Peter Linke is manager of the Dairy Research and Training Facility. While overseeing all aspects of farm operations, he also helps coordinate all research and teaching activities at the farm.

Dr. Lloyd Metzger served as director of the Midwest Dairy Foods Research Center and the executive secretary of the North Central Cheese Industries Association. Member, ADSA Dairy Foods Milk Protein and Enzyme Committee and member of the editorial board of the Journal of Dairy Science. Metzger has served as coach of the dairy products judging team and led the SDSU team to a record eighth national championship.

Dr. Vikram Mistry served as the U.S. editor of the French Journal of Dairy Science and Technology and associate director of the Midwest Dairy Foods Research Association. He served on the boards of the American Dairy Association of South Dakota, South Dakota Dairy Producers and American Dairy Science Association Foundation. He also served as an advisor to the North Central Cheese Association and the South Dakota Dairy Producers.



Dr. Maristela Rovai started as Extension dairy specialist in 2014 and has already developed comprehensive programs including the educational pilot program Dairy Tool Box Talks. This program, sponsored by the High Plains Intermountain Center for Agricultural Health and Safety from Colorado State University, offered an innovative training course for the dairy workforce in a context that follows the same structure used by the engineering and construction industries. She also taught a dairy Spanish class on campus in 2015 for both undergraduate and graduate students. The aim of this unique course, that covers basic grammar, cultural differences and dairy issues, is to increase Spanish fluency of our students and state dairy industry workforce.

Dr. David Schingoethe, Distinguished Professor Emeritus, was recognized with the highest award of the National Dairy Shrine, the Pioneers Award, in recognition of his 45 years of dairy research and teaching. Schingoethe resides in Brookings and continues to serve the department, most recently as chair of a faculty search committee.

Dr. C.Y. Wang holds a part-time appointment in the food science program. He is also the associate dean of research and Extension in the College of Education and Human Sciences.

YEARS OF SERVICE

Howard Bonnemann was recognized for 20 years of service to SDSU. Bonnemann is presently lecturer in dairy science and teaches a wide range of classes and is adviser to all undergraduate students in the department.

STUDENT ACCOMPLISHMENTS

Cole Hoyer and **Sara Sontag** attended the Cornerstone Dairy Academy in Madison, Wisconsin, as part of dairy's professional development organization.

Dairy Club elected new officers for 2016: **Bernice Vander Wal**, president; **Chelsea Schossow**, vice president; **Olivia Klinzmann**, secretary; **Brandon Hawkins**, treasurer; **Brianna Lee** and **Megan Schaefer**, historians; **Cole Hoyer** and **Audrey Souza**, activities coordinators. **Megan Schaefer** is the Dairy Digest editor. Dr. Jill Anderson, Dr. David Casper and John Haberkorn are faculty advisers.

Food science students participated in the Sanford Health Science Fair. Our students presented the exciting world of food science and processing to attendees.

Ph.D. and M.S. students in dairy production, dairy manufacturing and food science presented their research at the annual meetings of the American Dairy Science Association in Orlando and Institute of Food Technologists in Chicago.

Chelsey Johnson received the National Dairy Shrine Student Recognition Award. Johnson completed her B.S. in dairy production, and agriculture education, communication and leadership with an education specialization in 2014 and is currently employed as a digital communications coordinator at Accelerated Genetics in Baraboo, Wis.

Nine students received National Dairy Promotion and Research Board scholarships. Recipients include: **Morgan Goche**, **Jacob Johnson**, **Kirby Krogstad**, **Andrea Pfaffenbach**, **Sarah Post**, **Kristen Mohr**, **Megan Schaefer**, **Audrey Souza** and **Kaylee Wegner**. On behalf of dairy farmers, the National Dairy Promotion and Research Board each year awards nationwide up to 19 \$1,500 scholarships. Our students have an excellent record in this program. Since 2003, 94 SDSU dairy science student have been recipients.

Jon Pretz, graduate student working toward his Ph.D. in dairy production and coach of the dairy cattle judging team received a National Milk Producers Federation scholarship.

Audrey Souza, **Maggie Stiles** and **Kaylee Wegner** were selected as Ag Bio Ambassadors by the College of Agriculture and Biological Sciences. They help promote college programs to high school students around the region.

Maggie Stiles, dairy production major, was selected as Miss Brookings 2015 and was a finalist for Miss South Dakota. As Miss Brookings, she promoted chocolate milk and dairy to numerous groups.

Bobbi Jo Wild, working under the mentorship of Dr. Jill Anderson, received first place in the 2015 Alltech Young Scientist Undergraduate competition for her research paper "Ruminal degradability and intestinal digestibility of sorghum distillers dried grains compared to corn co-products and soybean meal."

ONGOING FUNDS FOR SUPPORTING RESEARCH

Completed projects are listed on our website: www.sdstate.edu/ds.

Anand, S. K. Does feeding lactic acid bacteria as a “direct fed microbial” to lactating dairy cows influence microbial quality of raw milk. 5/1/2014 to 12/31/2015. Midwest Dairy Foods Association. \$8,990.

Anand, S. K. Intervention strategies to control food pathogens in dairy processing environment. A review paper. 1/30/2015 to 12/31/2016. Midwest Dairy Foods Association. \$4,999.

Anand, S. K. Reported incidences of food pathogens in milk and dairy products. A review paper. 5/1/2014 to 06/30/2016. Midwest Dairy Foods Association. \$4,999.

Anand, S. K. Role of Exopolysaccharides (EPS) in Biofilm Formation. 1/1/2015 to 06/30/2016. Midwest Dairy Foods Association. \$23,150.

Anand, S. K. To improve the microbial quality of milk powders by controlling thermally resistant spore forming and spores. 8/1/2012 to 07/31/2016. Dairy Research Inst. \$315,756.

Anand, S. K. Understanding the process of spore germination or sporulation and biofilm formulation under simulated skim milk powder manufacturing conditions. 10/15/2014 to 12/31/2016. Dairy Management Inc. (UMN). \$83,902.

Anderson, J. L. Evaluation of growth performance, nutrient utilization, metabolic profile, and onset of puberty in dairy heifers fed reduced fat distillers dried grains in replacement of forage in limit-fed rations. 5/10/2013 to 12/31/2015. Minnesota Corn Research and Promotion Council. \$83,340.

Anderson, J. L. Evaluation of long-term reproductive and lactation performance of dairy heifers fed increasing dietary concentration of reduced fat distiller dried grains in replacement of forage during pubertal development. 3/31/2014 to 6/30/2016. Minnesota Corn Research and Promotion Council. \$17,259.

Anderson, J. L. Feeding microbially enhanced soyprotein in dairy calf starter with traditional or accelerated milk replacer. 5/1/2014 to 6/30/2015. S.D. Soybean Promotion and Research Council. \$37,853.

Anderson, J. L. Evaluation of the potential for use of nonfood oilseed meals as feedstuffs for growing dairy heifers. 8/1/2015 to 6/30/2016. S.D. Oilseed Initiative. \$25,000 (subaward).

Anderson, J. L., Rovai, M. R. Growth performance and drinking preferences of dairy calves given water treated with the Culligan Reverse Osmosis (RO) System compared to other water sources. 7/1/2015 to 3/31/2016. Culligan Water Conditioning of Brookings. \$29,954.

Caffe, M., Krishnan, P., Byamukama, E., Jing, L. Effect of genotype and growing environment on Ochratoxin A (OTA) level in oats. 2/1/2015 to 1/31/2017. Grain Millers Inc. \$76,750.

Caffe-Trembl, M., Gonzalez, J., Wu, J., and Krishnan, P. Accelerating genetic improvement for oat milling and nutritional quality. 11/1/2015-10/31/17, USDA/NIFA, \$150,000.

Casper, D. P. Effects of rumen-protect methionine and histidine sources fed to lactating dairy cows. 11/4/2013 to 10/31/2015. Kemin Industries. \$67,981.

Casper, D. P. High quality forage blends. 6/4/2014 to 7/1/2016. Ceres Trust. \$10,000.

Casper, D. P. The evaluation of XPC yeast and antioxidants alone or in combination when fed to mid-lactation cows. 1/27/2014 to 12/31/2015. Diamond V Mills Inc. \$147,722.

Hegerfeld-Baker, J. and Wang, C.Y. Enhancing the market of aronia berry products 9/30/2015 to 9/29/2018. S.D. Department of Agriculture. \$49,395.

Hultquist, K. Can valine enhance milk production? 12/15/2014 to 12/31/2015. Women and Giving Fund. \$1,000.

Krishnan, P. A collaboration between South Dakota and Washington to improve the supply and health value of American milling oats. 4/1/2015 to 3/31/2018. Grain Millers, Inc. \$70,139.

Krishnan, P. Food grade DDG for human consumption—value enhancement of a corn coproduct year 2. 7/1/2015 to 6/30/2016. Minnesota Corn Research & Promotion Council (MCR&PC). \$150,000.

Krishnan, P. S.D. Wheat Commission FY16: End use research and wheat education to enhance the value South Dakota wheat. 7/1/2015 to 6/30/2016. Wheat Commission—FY16. \$40,000.

Metzger, L. E. Application Labs Institute for dairy ingredient processing 2015. 1/1/2015 to 12/31/2015. Dairy Research Institute. \$167,045.

Metzger, L. E. Application scientist at the IDIP. 7/1/2013 to 6/30/2015. Dairy Research Institute. \$155,400.

Metzger, L. E. Commercial feasibility of SSPS for enhancing lactose crystallization in lactose manufacture. 4/1/2015 to 12/31/2016. Dairy Research Institute. \$43,050.

Metzger, L. E. Evaluation of a Centritherm evaporator for concentration of micellar casein. 1/30/2015 to 12/31/2015. Midwest Dairy Foods Association. \$9,000.

Metzger, L. E. Exploring consumer perception of permeate-based sodium reduction with different permeate sources. 7/1/2014 to 6/30/2016. Dairy Research Institute \$85,803.

Metzger, L. E. Pharmaceutical Applications of milk proteins: Bioengineering of milk proteins to design novel nanocarriers for drug delivery applications. 1/1/2015 to 12/31/2015. Midwest Dairy Foods Association. \$14,634.

Metzger, L. E. Scale-up of modified milk protein concentrate to replace rennet casein. 7/1/2013 to 12/31/2015. Dairy Research Institute. \$73,496.

Metzger, L. E. Understanding the effects of electromagnetic field conditioning on physical, chemical and functional properties of milk and milk products. 10/1/2013 to 12/31/2015. Dairy Research Institute. \$46,971.

Metzger, L. E., Anand, S. K., Amamcharla, J. Use of novel surface modification techniques to reduce biofilms on plate heat exchangers. 9/1/2013 to 12/31/2015. Dairy Research Institute. \$54,871.

Metzger, L. E. Role of Bacillus SUPP. in spoilage of yogurt and sour cream. 1/1/2014 to 12/31/2016. Daisy Brand. \$154,200.

Patel, H. A. Clean Labels: Capitalize on the structure of dairy proteins to eliminate chemicals from food labels—phase 2. 1/1/2015 to 12/31/2015. Midwest Dairy Foods Association. \$45,366.

Patel, H. A. Clean Labels: Capitalize on the structure-building properties of dairy proteins to eliminate chemicals from food labels. 1/1/2013 to 6/30/2015. Midwest Dairy Foods Association. \$81,250.

Patel, H. A. Comparison of functionality and properties of liquid concentrates and dried dairy ingredients. 10/15/2014 to 12/31/2017. Dairy Management Inc. (UMN). \$93,912.

Patel, H. A. Controlled cavitation technology for improving quality and functional properties of dairy ingredients. 1/30/2015 to 12/31/2015. Midwest Dairy Foods Association. \$9,000.

Patel, H. A. Scale-up and implementation of strategies to improve quality and process efficiency during manufacture of dairy ingredients. 9/1/2014 to 8/31/2016. Dairy Research Institute. \$107,343.

Patel, H. A. Single droplet drying technology for optimization of dairy ingredients with best quality and functionality. 8/1/2014 to 12/31/2017. Dairy Research Institute. \$142,050.

Rovai, M. R. HICAHS/Dairy Tool Box Talks: An educational pilot project. 5/15/2015 to 9/14/2015. CDC/NIOSH FPT Colorado State University. \$10,000.

DAIRY FACILITIES

The **Davis Dairy Plant** attracts a wide range of visitors, including school groups, alumni, prospective students, professionals and those curious about the manufacture of dairy products. (Take a virtual tour at www.sdstate.edu/ds/plant/video.) The plant processes approximately 1 million pounds of milk annually, converting it to 25,000 pounds of cheese, 20,000 gallons of fluid milk, 40,000 gallons of ice cream and 1,600 pounds of butter. One day a week is set aside for maintenance and repair, inventory and environmental cleaning.

Through the very comprehensive programs developed by plant manager John Haberkorn, students receive excellent hands-on training for product manufacture, quality assurance, product development and general plant management.

In 2014, SDSU dairy science students began manufacturing their own cheese flavors under the Student Edition Cheese program. In this program, cheese flavors are developed by a dairy science student and undergoes quality testing at the Davis Dairy Plant. Once the cheese completes a positive release it is cut, wrapped and labeled. The label features the type of cheese and the name of the originating student.

In spring 2015 our students traveled to the Wisconsin Cheese Industry Conference in Madison to participate in the conference and industry evaluation of their cheeses.

A similar program is being initiated with ice cream. The first flavor developed and now in great demand is “Barry Berry” named for Dean Barry Dunn, who has promoted experiential learning for students.

In 2015, invitations were extended to Jackrabbit Dairy Council members and donors for the dairy plant project to come to campus to conduct interviews for summer internships and permanent positions. Fifteen donor companies visited and conducted over 200 interviews and follow-up onsite interviews. Job offers for permanent positions and summer internships are being finalized.

Our **Dairy Research and Training Facility** has approximately 150 certified and registered milking cows and a total of 300 animals including approximately 50 Brown Swiss. The herd is used for research projects primarily in nutrition and also for teaching. In addition, K-12 students also benefit from it through the Dairy Camp and cattle judging contests that are hosted at the farm. Peter Linke with assistant manager Melissa Schmitt and student managers Brennan Albrecht, Nicole Knips and Tucker Roeker, manage the farm. Laura McMartin serves the farm as ag foreman and has the duty of feeding and maintenance. We are now embarking on a project for renovating and remodeling the facility to help meet future teaching and research goals. Over the next year, dairy producers and other industry groups will be invited to provide input into planning the new facility.



SCHOLARSHIPS

Our students were once again the beneficiaries of the generosity of many alumni, friends, and industry. At the spring 2015 banquet approximately \$114,820 in scholarships were awarded for the 2015-2016 academic year.

Agropur Inc. Dairy Manufacturing, \$1,000
 Agropur Inc. Dairy Production, \$1,000
 Alfred Herman Rishoi Memorial, (2/\$575) \$1,150
 Associated Milk Producers Inc., \$1,000
 Bel Brands USA, \$3,000
 Clyde Helsper Memorial, \$1,000
 Dairy Club, (2/\$500) \$1,000
 Dairy Connection, \$1,000
 Dairy Farmers of America, \$400
 Dairy Fest, (2/\$500) \$1,000
 Dairy Manufacturing, \$2,375
 Dave Clark/North Central Cheese Ind. Assoc., \$1,000
 David H. Henry Memorial in Ag & Bio Sciences, \$200
 David J. Schingoethe, \$1,000
 Davisco Foods/Jay Headley Memorial, \$1,500
 Dean Foods—Sioux Falls, \$1,250
 Derald, \$500
 Ed and Jennifer Bick—Food Science, \$700
 Emery Bartle Memorial, \$5,000
 George Marx, \$1,100
 Gibert T. & Olga Gilbertson Memorial, \$500
 H. C. Olson, \$500
 Harbarth, (6/\$800) \$4,800
 Idaho Milk Processors Association, (2/\$2000) \$4,000
 J. J. Yee, \$500
 James Marvel Memorial, \$350
 Jessica Goens, \$1,000
 Joan Hegerfeld-Baker and Alan Baker—Food Science, \$1,000
 John Anderson Memorial, (2/\$2000) \$4,000
 John C. Gross, \$1,000

Joseph Van Treeck, \$1,300
 Kemps LLC, \$1,500
 Kenneth I. Gross, \$1,000
 Kirk Mears Memorial, \$1,100
 Land O'Lakes—Region 65, \$300
 Leprino Foods, \$4,000
 Midwest Dairy Association, (2/\$3,500) \$7,000
 North Central Cheese Industries Association, (1/\$1,000, 2/\$2,000) \$5,000
 Ode Family, \$500
 Ralph Rogers Memorial, \$400
 Robert Chamberlain Scholarship in Food Science, \$1,400
 Ross Baker, \$500
 Royal and Helen Doner in Dairy Production, \$400
 Ryan Graber Memorial, \$1,000
 Saputo Cheese, \$2,000
 Schuch Family, (2/\$1,000) \$2,000
 South Dakota State Dairy Association, (1/\$1,250, 3/\$1,000) \$4,250
 Shirley Seas Memorial, \$450
 Susan Hawkins, \$2,000
 T. M. Olson, \$700
 Todd and Erica Stahl, \$1,000
 Valley Queen Cheese Factory, \$6,000
 Walt and Yvonne Wosje, \$1,000
 WOW Logistics/Donald E. Utschig, \$1,000

AWARDS

Alfred Tobkin Memorial, (4/\$100) \$400
 Dairy Challenge Team, (4/\$200) \$800
 Dairy Judging Manufacturing, \$150
 Dairy Judging Production, \$150
 Forbes Leadership, \$300
 Graber-Ford, \$150
 Howard Voelker Memorial, (4/\$250) \$1,000

INCOMING DAIRY STUDENTS

Clyde G. Helsper Dairy Fieldmen's Association, \$1,000
 Dairy Science Faculty, \$700
 Dr. S. K. Dash, \$1,000
 Howard Voelker Freshman Dairy Production, (1/\$1,000, 1/\$500) \$1,500
 Midwest Dairy Association, (3/\$1,000) \$3,000
 Richard and Kathy Hardegger, \$500
 S.D. Dairy Fieldmen's Association, (5/\$1,000) \$5,000
 S.D. State Dairy Association. (1/\$250, 2/\$1,000) \$2,250
 Todd and Erica Stahl, \$500
 Valley Queen Cheese Factory Freshmen, \$1,000
 William and Marge Kallemeyn & Sons, \$1,150

INCOMING STUDENT SCHOLARSHIPS

Leaders for Tomorrow, \$1,000
 Yellow and Blue, (1/\$1,500, 6/\$1,000) \$7,500

GRADUATE STUDENT SCHOLARSHIPS

Dairy Recognition and Education Foundation, (2/\$3,000) \$6,000
 Delbert and Robert Breazeale Memorial, \$745
 Wade Eisenbeisz Graduate Dairy Production, \$1,000



DAIRY AND FOOD SCIENCE STUDENTS

GRADUATE STUDENTS

Dairy Production

Ishwary Acharya, Nepal
 Subash Acharya, Nepal
 Ehsan Al Ainizi, Iraq*
 Taylor Aubrey, Amherst, N.H.*
 Kelly Froehlich, Graston, Minn.
 Carl Kass, Bruce*
 Olivia Kuester, Silver Spring, Md.
 Rhea Lawrence, Aurora
 Kali Linville, Cleburne, Texas*
 Peter Linke, Mitchell
 Angela Manthey, Janesville, Minn.
 Prakash Poudel, Nepal
 Jon Pretz, Dairy Cattle
 Judging Team Coach, Paola, Kans.
 Karla Rodriguez-Hernandez, Mexico
 Juan Sanchez-Duarte, Mexico
 Nirosh Senevirathne, Sri Lanka
 Sruti Srivastava, Nepal

Dairy Manufacturing

Lee Alexander, Twin Brooks
 Taghreed Almaski, Saudi Arabia*
 Nancy Awasti, India*
 Dikshi Bawa, India
 Steven Beckman, Lincoln, Neb.
 Ashok Kumar Bharathidasan, India
 Harsh Dahiya, India
 Nuria Garcia-Fernandez, Spain
 Dustin Grossbier, Minneapolis, Minn.
 Megan Huegli, Hartford, Wisc.*
 Shivali Jindal, India
 Dalia Khan, Saudi Arabia*
 Natasha Laska, Canton*
 Dipakkumar Mehta, India
 Neha, India*
 Venkateswarlu Sunkesula, India*
 Hiral Vora, India

Food Science

Ashley Adamski, Vadnais Height, Minn.*
 Waleed Alrayes, Kuwait

Jigyasha Mishra, Nepal*
 Theodore Mohr, New Ulm, Minn.*
 Davendra Paudel, Nepal*
 Bipin Rajpurohit, India*

UNDERGRADUATE STUDENTS

Manufacturing

Joshua Blasé, Twin Lakes, Wis.
 Jared Bowers, Hayti
 Rebecca Cantwell, New Lenox, Ill.*
 Lauren Chirside, Lees Summit, Mo.
 Cord Cnossen, Hereford, Texas*
 Kaelyn Dammann, Mitchell
 Kristin Erf, Oakdale, Minn.
 Morgan Goche, Burt, Iowa
 Brandyn Goehring, Herreid*
 Rob Goetz, Sioux Falls
 Anna Hemenway, Huron
 Nicole Jax, Waltham, Minn.
 Mitchell Jazdzewski, Gilman, Wis.
 Jacob Jewett, Glencoe, Minn.
 Krista Johnson, Russell, Minn.
 Gramm Johnson, Fulton
 Molly Kennedy, Beresford
 Rachel Larson, Beresford
 Kimberly Maassen, Rock Valley, Iowa
 Alysha Madsen, Corona*
 Kristin Mohr, New Ulm, Minn.
 Erik Ode, Brandon
 Hayden Palmer, Beresford
 Shayna Popkes, Rock Rapids, Iowa
 David Ramirez, Modesto, Calif.*
 Gregory Reeter, Volga
 Shelby Riddle, Sioux Falls*
 Cassie Scapanski, Sauk Rapids, Minn.
 Mackenzie Schmitz, Navasota, Texas*
 Jae Young Sim, Rep. Korea
 Zachary Sousa, Milbank*
 Alison Spiers, Monticello, Minn.*
 Mitchell Timp, Le Mars, Iowa*
 Michaela VanderWal, Milbank
 Joshua Weisbeck, Herreid*
 Mitchell Younie, Alpena

Production

Brennen Albrecht, Stewart, Minn.
 Olivia Bartel, New London, Wis.
 Jacob Bierstedt, Pipestone, Minn.
 Riley Boadwine, Baltic
 Hudson Bos, Bakersfield, Calif.*
 Hersain Cancino, Saint Peter, Minn.
 Zachary Carlson, Murdock, Minn.*
 Taylor Gilmore, Dillsburg, Pa.*
 Katelyn Groetsch, Albany, Minn.
 Brandon Hawkins, New Ulm, Minn.
 Joseph Hoffman, New Ulm, Minn.
 Cole Hoyer, West Salem, Wis.
 Jacob Johnson, Heron Lake, Minn.
 Joseph Kalina, Montgomery, Minn.*
 Tyler Kiefer, Taopi, Minn.*
 Makaila Klejeski, Claremont, Minn.*
 Mohit Manoj Kotkar, India*
 Kirby Krogstad, Eyota, Minn.
 Brianna Lee, West Union, Iowa
 Brody Lindquist, Kerkhoven, Minn.
 Laura McMartin, Gerber, Calif.
 Eric Metzger, Lester, Iowa
 Dennisen Nelson, Lonsdale, Minn.
 Bradlee Oestreich, Watertown, Minn.*
 Tyler Pieper, Davis, Ill.*
 Sarah Post, Chandler, Minn.
 Jacob Post, Chandler, Minn.*
 Christopher Reiter, Medford, Minn.
 Julius Sachs, Eyota, Minn.*
 Megan Schaefer, Paynesville, Minn.
 Chelsea Schosow, Houston, Minn.
 Cody Schroeder, Marshall, Minn.
 Brady Schumacher, Waseca, Minn.*
 Han Si, China*
 Chelsea Smith, Chesterfield, Mass.*
 Audrey Souza, Milbank
 Jacob Stadick, New Ulm, Minn.
 Margaret Stiles, Lakeville, Minn.
 Megan Struss, Courtland, Minn.
 Jackson Sudbeck, Harrington, Neb.*
 Kyle Tews, Hutchinson, Minn.*
 Megan Viland, Pipestone, Minn.

Jacob Weg, Worthington, Minn.
 Kaylee Wegner, Faribault, Minn.
 David Wick, Jordan, Minn.
 Angela Wick, Jordan, Minn.
 Austin Winberg, Walnut Cove, N.C.

Production and Manufacturing

Bennet Baker, Kasota, Minn.
 Caleb Blaisdell, Starbuck, Minn.*
 Carla Bromenschenkel, Brownston, Minn.*
 Katelyn Johnson, Sleepy Eye, Minn.
 Mohammad Khawaja, Pakistan
 Walker Sundstrom, Lynden, Wash.

Manufacturing and Production

Laura Frye, Logansport, Ind.*
 Mohit Manoj Kotkar, India
 Kayla Post, Chandler, Minn.*
 Makayla Reed, Porterville, Calif.

Food Science

Kirsten Anderson, Prior Lake, Minn.
 Maggie Becher, Somerset, Wis.*
 Brady Bury, Webster
 Jill Folsland, Baltic*
 Rachel Hepfner, New Hope, Minn.
 Jessica Hoffman, White Owl
 Logan Johnson, Rosholt
 Gatlin Miller, Mitchell*
 Clarissa Ober, Glencoe, Minn.
 Emily Resch, Spirit Lake, Iowa*
 Katelyn Smith, Canby, Minn.
 Alexander Snyder, Dell Rapids
 Maria Velazco Fasce, Venezuela
 Joshua vonWinckelmann Belrose,
 Sioux Falls
 Jinhao Zhao, China

*New students in 2015-2016

OUTREACH

Area Dairy Expos

Area Expos alumni, students, staff and faculty of the department participated in Central Plains Dairy Expo in Sioux Falls and the World Dairy Expo in Madison, Wis. Faculty and students also participated in the Washington Pavilion Ag Day events in Sioux Falls, demonstrating various dairy activities to participants.

North Central Cheese Industries Association

Dr. Lloyd Metzger serves as executive secretary and Dr. Vikram Mistry as adviser to the NCCIA. The annual meeting was held in Rochester, Minn., in October and attracted over 130 cheese makers and suppliers.

Jackrabbit Dairy Drive

Roger Scheibe, industry relations director of the Midwest Dairy Association, and alumnus, collaborated with SDSU athletics for the third Jackrabbit Dairy Drive at a home women's basketball game. The purpose of the event was to honor dairy producers, promote the dairy industry and raise funds for the dairy research and training facility renovations. In the fall another dairy drive was organized by industry at an SDSU home football game.

Faculty Hosts Nutrition Bloggers

Faculty members Howard Bonnemann, Jill Anderson, John Haberkorn and Vikram Mistry hosted a group of eight nutrition bloggers from Bel Brands USA for a dairy education workshop. During the workshop extensive information on milk production and processing was provided.

Virtual Labs

Faculty members Joan Hegerfeld-Baker and Sanjeev Anand collaborated with New Mexico State University over the past five years to create eight virtual labs in collaboration with the Food Safety Scientist curriculum created by SDSU. This program has received national recognition with well over 1 million high school and college students experiencing the food safety virtual labs. Students are better prepared for the science laboratory classroom through an increase in knowledge, laboratory techniques and confidence. Experience the virtual labs at: myfoodsciencelab.org/.

K-12 STUDENTS

Dairy Camp

The Dairy Club hosted the 12th annual Dairy Camp in June for youth ages 8-18. Activities included a visit to a local commercial dairy, training on care of heifers, judging, visit to the SDSU dairy plant, making ice cream, clipping and showing cattle, and entertainment. Participants showcased what they learned at a showmanship contest on the final day of the camp. Parents were invited to attend the show.

High School Visits

Recruiting students for dairy science programs is a year-round activity and a priority. Dairy Science Ag-Bio Ambassadors visited several high schools throughout the year in South Dakota, Iowa and Minnesota. In addition, the department visited schools and career fairs in Minnesota and South Dakota.

EXTENSION

Dairy Tool Box Talks: An Educational Pilot Program

This program, led by Maristela Rovai, sponsored by the High Plains Inter-mountain Center for Agricultural Health and Safety from Colorado State University, offered an innovative training course for the dairy workforce in a context that follows the same structure used by the engineering and construction industries. This new



training gave farm workers a basic understanding of the modern practices of a dairy, including basic animal care and handling, cow comfort and personal safety. The educational topics also focused on preventing zoonosis, animal well-being awareness, the risks posed by animal rights organizations and important cultural differences.

I-29 Dairy Consortium

The I-29 Dairy Consortium which includes Extension from SDSU, NDSU, ISU, UMN, UNL and dairy producer organizations in the five states, along with Minnesota Dairy Initiative representatives, was very active during 2015 with a wide range of programs including Boots on the Farm heifer tour, a winter workshop series and a dairy beef short course. Their theme for 2015 winter workshops was "Raising your Best Calf Ever." The group also started an e-newsletter, "I-29 Moo University e-Newsletter," as a joint effort of Extension articles and latest happenings. They are presently reaching people across the globe with their newsletter. The programs have been very well attended and are detailed on their Facebook page; www.facebook.com/I29DairyOutreachConsortium as well as at www.iGrow.org

Second Annual Dairy Fest



The second annual Dairy Fest was held June 5-6, 2015, at the Swiftel Center in Brookings. This two-day event was hosted by the Dairy Festival Steering Committee made up of dairy industry representatives and dairy producers. The mission of the steering committee was "to help educate consumers about the dairy industry and the future of dairy youth education. Proceeds from the event were used in the form of two scholarships in the SDSU Department of Dairy Science at \$500 each to support the future of youth in the dairy industry.

The festival began with a "Got Milk" Gala on June 5, hosting 180 participants and featured various dairy products in food entrées, while educating the attendees about the region's dairy industry. Also on Friday, June 5, youth from area after-school/summer programs participated in the interactive dairy carnival. This carnival was then open to the public on Saturday morning through early afternoon. There were an estimated 400 people who went through the carnival. Saturday, June 6, began with the Cow to Cup 5K run followed by a Dairy Youth Carnival and a public forum on dairy matters. Volunteers included SDSU Dairy Club, SDSU dairy science faculty, dairy producers and dairy industry people to coordinate the event's hands-on activities, teaching youth and their parents about dairying, where the milk goes, how it is turned into dairy products, and the nutritional value of dairy products. The carnival also included tours to a local dairy farm and the Davis Dairy Plant.

Training 4-H Program Advisers and Leaders

Training 4-H program advisers and leaders: Joan Hegerfeld-Baker and Extension field specialists Lavonne Meyer and Christine Wood conducted food science 4-H fast and furious workshops in Sioux Falls and Rapid City for 4-H program advisers and volunteer leaders. The workshops and other similar activities conducted by faculty and staff are essential for promoting the numerous opportunities in food and dairy science to youth.

Dairy Science at World Dairy Expo

The dairy science department and the South Dakota Department of Agriculture jointly displayed a booth at the World Dairy Expo in Madison, Wis. in October. The booth highlighted the dairy development efforts and dairy education and research activities and opportunities in South Dakota. Many interested people and alumni stopped by to learn about the South Dakota dairy industry and education.

South Dakota Local Foods Conference

The conference, which was held in Deadwood, connected with over 100 local food producers and processors from across the state. Joan Hegerfeld-Baker and Rhoda Burrows (horticulture) conducted an introductory "Good Agricultural Practices Food Safety training." Hegerfeld-Baker also presented "Promoting to Grow Your Market."



CHANGE SERVICE REQUESTED

RESEARCH HIGHLIGHTS

Faculty research activities are supported by the Agricultural Experiment Station and external grants. The broad areas of research are as follows:

Metabolic Relationships in Supply of Nutrients for Lactating Cows (NC-1009) *Dr. David Casper* The objective is to quantify supply, availability and interaction of nutrients and bioactive compounds utilized for efficient milk production while reducing environmental impact. To identify and quantify molecular, cellular, and organismal signals that regulate partitioning and efficient conversion of nutrients to milk. To use this knowledge of feed properties and metabolic and molecular quantitative relationships to challenge and refine nutrient requirement models leading to more precise feeding systems for dairy cattle.

Management Systems to Improve the Economic and Environmental Sustainability of Dairy Enterprises (NC-2042) *Dr. Jill Anderson* The objective is to optimize calf and heifer performance through increased understanding of feeding strategies, management systems, well-being, productivity and environmental impact for productivity and profitability. Improve dairy cow management decisions through nutrient utilization, well-being and profitability. Analyze whole farm system components and integrate information into decision-support tools to improve efficiency, enhance profitability and environmental sustainability.

Evaluation of Different Dietary Energy Sources of Growth Performance and Metabolism of Replacement Dairy Heifers *Dr. Jill Anderson* Determine how different dietary energy sources impact calf and heifer growth, nutrient digestion, metabolism and reproductive development. Determine if energy and protein from distillers grains can replace energy and protein from forage sources in growing dairy heifer rations in precision feeding scenarios. Determine how particle size of the ration forage with slowly degradable concentrate sources influences total tract digestion of feedstuffs in precision-fed rations for dairy heifers. Determine how much supplemental fat can be fed in replacement of starch from corn in moderate forage heifer diets. Long term goal. Determine if manipulation of the energy sources in diets of dairy heifers can decrease age at puberty and breeding and therefore shorten the time it takes to initiate lactation without negatively impacting milk production of primiparous cows.

Manufacture of Dairy-Based Ingredients *Dr. Lloyd Metzger* This project will focus on the manufacture of modified milk protein concentrates and their utilization as ingredients and will include several related research projects. The objectives are: 1) to determine the impact of carbon dioxide injection on membrane performance, mineral content and functionality of milk protein concentrate; and 2) to evaluate the effectiveness of transglutaminase to modify the functionality of native casein concentrate and milk protein concentrate when they are used as ingredients in process cheese products and to evaluate the commercial feasibility of a novel process for producing a unique dairy-based ingredient that is targeted for process cheese product applications.

Structure-Function Relationship of Milk Proteins and Design of Dairy Ingredients with Tailored Functionality, Improved Nutrition and Health Benefits *Drs. Has Mukh Patel, Lloyd Metzger and Bonny Specker* The objectives are: 1) to improve our knowledge of structure-function relationship of milk proteins; 2) to provide link between food structure and bioavailability/nutrient delivery; 3) to improve understanding and provide insights for designing new dairy ingredients with improved nutrition and functionality.

Improving Feed Efficiency Through High Forage Rations as a Feeding Strategy to Increase the Profitability and Sustainability of Dairy Production

Dr. David Casper This research is intended to identify and evaluate methods to improve the feed efficiency of dairy cows through traditional forage quality and new forage hybrids that may come available for use in dairy cattle diets. Most evaluations will be as feeds for lactating cows, although some evaluations (e.g. specific nutrient profiles) may be with growing heifers or dry cows. Specific objectives include evaluating the nutritional composition and feeding value of highly digestible forages and new forage hybrids for maximum inclusion rate for feeding high forage diets to lactating dairy cows. Techniques will include ruminal fermentation with continuous culture fermenter system, measurement of gas production from ruminal fermentation and rational feeding methods of lactating dairy cows. The second objective is to evaluate the maximum forage inclusion rates for mid-to late-lactation dairy cows. Highly digestible forages could result in very high forage diets that will reduce the feed costs of these cows. Lastly to evaluate the nutrient composition, dry matter digestibility, fiber digestibility, starch digestibility to accurately predict the feeding value of forages and new forage hybrids for dairy cattle.

Safety and Quality Improvement of Milk and Cheese *Dr. Sanjeev Anand* The objectives are to study the role of thermotolerant bacteria in influencing shelf life of milk products such as cheese, and to reduce the cross contamination in dairy processing environments by controlling bacterial biofilms.

Investigations of Compositional and Functional Traits of Cereal Grains and Oils Seed Crops to Enhance their Economic and Health Benefits *Dr. Padmanaban Krishnan* The objectives are: 1) to investigate the rheological traits and food functionality applications for South Dakota wheat varieties in new applications (asian noodle, tortilla, pizza dough, flat breads); 2) to investigate the development of high-value selenium wheat fractions (vital gluten, high-selenium bran, high selenium and whole white wheat) from South Dakota wheat varieties; 3) to provide collaborative assistance in the discipline of cereal chemistry to the wheat breeding program at SDSU; 4) to provide technological and scientific support for the development of healthy food products that aid in disease risk reduction.

