The Jackrabbit Dairy Review

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DAIRY SCIENCE DEPARTMENT
Faculty
Sumayr Arain Associate Professor
Jill Lockett Assistant Professor
Howard Boonmann Instructor
David Casper Assistant Professor
Albert Garcia Professor/Extension Dairy Specialist
Ashraf Hassan Associate Professor
Kenneth Kalscheur Professor
Lloyd Metzger Professor, Alfred Chair in Dairy Education
Vikram Mistry Professor and Head
Hasmukh Patel Assistant Professor
Emeritus Faculty
Robert Baer
Dairy Production
Dairy Graduate Students
Thomas Vanderwal
Melissa Schmidt
Tracey Renelt
Jayne Raabe
Chenchaiah Marella
Pete Linke
Anil Kommineni
Stephen Crego
Ananya Biswas
Melinda Bennett
Jacob Anderson
Staff
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South Dakota State University
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Brookings, SD 57007-0647

MESSAGE FROM THE DEPARTMENT HEAD
I have been honored to serve as the head of the Dairy Science Department for 10 years, and as a faculty member for 26 years. With each passing year I have been fortunate to witness numerous changes within the department, the college and the university. Each of these changes has been strategically designed to address contemporary and future needs within current constraints. All through these changes, the mission of the department “to help create a prosperous future for the dairy industry of South Dakota, the region, nation, and world” has remained at the forefront. To help achieve this, in 2012 we welcomed two new faculty members, Dr. Hasmukh Patel in Dairy Manufacturing, and Dr. Jill Anderson in Dairy Production. We also welcomed two new staff members, twenty six new undergraduate students and eight new graduate students. To fully utilize our new teaching and dairy plant facilities, our goal is to recruit more students at both, undergraduate and graduate levels. Our faculty members have excelled in their areas, Dr. Kalscheur was recognized as a top researcher in the College of Agriculture and Biological Sciences and also received the Gamma Sigma Delta research award, Dr. Casper received a national research award for forage research, Dr. Jill Anderson received a national award for her graduate research, Dr. Metzger was recognized as coach of the year for dairy products judging. Faculty members were invited to assist in various projects, e.g., Dr. Garcia was invited to Saudi Arabia for expert advise, several faculty members served on boards of national and local organizations. Faculty members actively sought external funds for conducting research and supporting graduate students, they also not just taught scheduled classes, but sought ways to design and redesign classes to cover new, relevant topics, using updated teaching methods. Extension faculty integrated their programs into the newly organized SDSU Extension and assisted producers in the areas of nutrition, health, milk quality, labor management, etc. Thus, the diversity of activity of faculty and staff is truly impressive and humbling. While the new dairy plant has been operational for over a year we continue to welcome new supporting members; in 2012, Saputo Cheese and bel brands USA joined the Jackrabbit Dairy Council. We were pleased to welcome Francisce Moudry, project manager of bel brands USA as she embarked on an exciting project of building a new $100 million cheese plant. As we look at 2013 and beyond, we will shortly engage in the development of a new strategic plan once the university and college planning phases are completed in spring. Further, we are already engaged in developing plans for significantly upgrading our dairy research and training facility for our dairy production teaching and research programs. As we look forward to our new directions we thank you for your past support and invite your input for our future endeavours.

Vikram Mistry

2012 Dairy Club students reminiscing the past.
NEW FACULTY AND STAFF

VISITORS

Thomas Vander Wal joined the Department as Agricultural Foreman and is responsible for feeding cows and replacement heifers and overall maintenance at the Dairy Research and Training Facility. Tom holds an Associate's Degree in Farm Operations and Management/Dairy Farming from Ridgewater College in Willmar, MN. Prior to SDSU, Tom was employed at Farmer’s Implement in Brookings.

VISITORS

Jill Anderson joined the Department as Assistant Professor in Dairy Products. Dr. Anderson is interested in dairy hoof health and nutrition and teach undergraduate and graduate courses. She received her B.S. in Animal Science from the University of Minnesota and Animal Science in dairy cattle nutrition at SDSU under the supervision of Dr. David Schingoethe. In 2005, she was appointed as a Research Assistant to manage the dairy cattle nutrition laboratory in the Department. In search of greater challenges, she began her Ph.D. program in 2008 in dairy cattle nutrition under the supervision of Dr. Kenneth Kalkeuche, completing it in August 2012. Her Ph.D. research was titled “Growth, nutrient utilization, metabolic profiles, and long term performance of dairy heifers fed distillers grains.” Her studies demonstrated that feeding distillers grains maintained the average daily gain, skeletal growth and energy status of prepubertal heifers similar to feeding corn and soybean meal. She showed that heifers fed the distillers diets had similar or improved milk yields and lactation performance compared to those fed the corn and soybean meal diet. Her study demonstrated that producers can feed high amounts of distillers grains in place of corn and soybean meal in growing heifer rations without compromising growth, development, or future performance. She has authored or co-authored five refereed journal articles and 11 abstracts. As a faculty member, Dr. Anderson will conduct research in the area of dairy heifer nutrition and teach undergraduate and graduate courses.

Anil Komineeni joined the Department as Assistant Manager of the Dairy Institute of Ingredient Processing. He received his M.S. in Dairy Manufacturing from SDSU in 2011. He then worked for Schwan’s Enterprises in Marshall, MN, as Food Scientist. In his current role at SDSU, Anil is responsible for assisting with ingredient development research.

Hasmukh Patel has joined the Department as Assistant Professor of Dairy Products. Dr. Patel brings with him more than 15 years of highly valuable and international experience in the area of research, new product development and processing and quality assurance of dairy and food products. Dr. Patel received his B.Sc. in Dairy Technology from Gujarat Agricultural University (GAU) in India and M.Sc., in Dairy Technology and Dairy Clarity from GAU. He received his Ph.D. in Food Technology from Massey University in New Zealand under the direction of Dr. Harinder Singh and Lovrie Creamer, leading figures in the field of dairy protein structure and functions in the food systems.

During his 15 years in industry, Dr. Patel worked for multi-national dairy companies in New Zealand and India and made significant contribution to the dairy and food industry. He has an outstanding track record of scientific and commercial successes throughout his career. He is a co-inventor of three process patents and has written nearly 50 peer-reviewed publications including invited book chapters, original scholarly publications in recognized international journals and many invited presentations and keynote addresses at international conferences and meetings. Dr. Patel spent 10 years as a Research Scientist at the Fonterra Research Center in New Zealand involved in groundbreaking research in new technologies and development of value added dairy ingredients with novel functional properties and nutritional benefits. At SDSU, Dr. Patel will teach undergraduate and graduate classes in Dairy Manufacturing and initiate a program in applied dairy processing. The main focus of his research will be to develop new basic mechanisms that can be applied to provide new insights and new knowledge which enables design of new products, new ingredients and new processes.

2012 GRADUATES

Ph.D.

Jill Anderson, Production Kerri Herrick, Production

M.S.

Jacob Albesch, Production John Gough, Production

Gagan Deep, Manufacturing Som Kunal, Manufacturing

Dwarkan Singh, Manufacturing.

B.S. Manufacturing


B.S. Production

Emily Zimmerman, Emily Haver, Valerie Moller, Brittney Mower

JUDGING ACTIVITIES

DAIRY CATTLE EVALUATION & DAIRY CHALLENGE

Our Dairy Cattle Judging team consisting of Aliyah Vander Wal, Chelsey Johnson and Christopher Schulze participated in the North American International Livestock Judging contest in Louisville, Kentucky. Stephen Crego was the coach. There were twenty teams in the collegiate division with SDSU placing 16th. Chelsey Johnson placed third in Holsteins and Chris Schulze placed 25th overall. Earlier in the year, our team participated in the 25th annual Accelerated Genomics Intercollegiate Dairy Cattle Judging Contest in Wisconsin. The senior team consisted of Chelsey Johnson, Aliyah Vander Wal and Chris Schulze. The team of Brian Remart, Matthew Holdtrolg, and Rachel Amsden. Eighteen teams were present representing 36 individuals. The team placed seventh overall and seventh in Holstein. The team placed fifth in Jersey, fourth in Milking Shorthorn. Overall, Aliyah Vander Wal placed seventh and Chris Schulze was ninth. Overall, the SDSU team placed third in the contest. The team also attended the Southwestern Exposition and Livestock Show in Fort Worth, Texas. The team consisted of Chelsey Johnson, Chas Schulze, Sara Josting, and Aliyah Vander Wal and was steered by Joe Crego and Megan Smith. The team placed fifth in Brown Swiss and Jersey classes. Chris Schulze and Aliyah Vander Wal placed fifth and 10th, respectively. In Jersey, Aliyah placed second in Brown Swiss. In overall individual placing, Aliyah and Chris were second and 24th respectively. Aliyah placed 15th and Chelsey 16th in overall individual round. Oklahoma State University hosted judging prior to the contest in Fort Worth. At this practice test from Kansas State University and North Dakota State University also participated.

Four Dairy Science students traveled to Bozeman, Virginia, to participate in the Eleventh Annual National Intercollegiate Dairy Challenge (NIDC). The SDSU Dairy Challenge Team consisted of Megan Forst, Kaitlin Harland, Mitch Maher, and Megan Rice. The contest included 128 students from 32 universities and colleges across the United States and Canada. Associate Professor Kenneth Kalscheur, Assistant Professor, David Casper, Assistant Farm Manager Melissa Schmit, and Farm Manager Steve Crego helped coach the team. The two-day competition began with a walk-through of an operating dairy, analysis of farm data, and question and answer session with farm owners. Then each team developed recommendations for nutrition, reproduction, milking procedures, animal health, housing, and financial management. The teams presented their recommendations to judges who were evaluating by a panel of five judges—dairy producers, veterinarians, farm finance specialists, and industry personnel. Team members commented on the contest in their teams’ othercollegeteam experiences. The knowledge and hands-on experience gained through Dairy Challenge will be used by many participants for years to come. Earlier in the year, five SDSU students traveled to St. Joseph, Missouri, to participate in the 10th Annual Midwest Regional Dairy Challenge. SDSU students were mixed from students with 19 other Midwest universities and colleges to work in teams of four or five to assess all aspects of a working dairy farm and present recommendations to a panel of judges and the dairy farm owners. Representing SDSU were Megan Forst, Mitch Maher, Valerie Moger, Megan Rice, and Anna Schaefer.

Dairy Products

Our Dairy Product Judging team placed first in All Products at the Collegiate Dairy Products Evaluation Contest for the fifth consecutive year. SDSU teams have won the national championship 20 times in the 31-year history of the contest. The 2012 team placed first in milk and Cheddar cheese, second in ice cream, third in cottage cheese, fourth in butter, and fifth in cheese spreads from 17 universities in the U.S. and Canada participated in the contest. Team members were Austin Anche, Cassandra Halsed, Lee Alexander, and Laura Moosal.

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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, pluses or dissertations, and extension presentations. All publications are listed on our website at http://www.sdstate.edu/ds.

Dr. Jianan Anand is South Dakota State resource person in food safety and added in the “Food Safety Contacts Directory” of USDA, COREES, July 2007-present.

Jacob Anderson served as the manager of the Dairy Davis Plant and as a Dairy Club advisor. In addition to managing the plant he also visited with students and their families during prospective student visit days.

Dr. Jill Anderson joined the Dairy Science Department as Assistant Professor in September 2012 and immediately began her teaching activities and developing her research program in honey nut cultivar.

Howard Bonnemann served as secretary/treasurer of the South Dakota Dairy Association. He conducted several dairy product judging clinics for South Dakota high schools. Beginning in January 2011 Howard became full-time instructor and dairy plant research manager. Howard serves on the Benchmark Committee.

Dr. David Casper served in various capacities on boards of the American Dairy Science Association and the American Society of Animal Science. He was awarded the Pioneers Ho-Ho Forage Research award at the annual meeting of the American Dairy Science Association. He served as co-chair of the Intercollegiate Dairy Challenge team.

Dr. Alvaro Garcia has been a faculty member in Dairy Science since 2001 and has developed a strongly recognized dairy extension program. Dr. Garcia was invited to speak in Uruguay. He was also appointed by the U.S. Secretary of Agriculture to the Agricultural Advisory Committee (ATAC) for international Trade in Animals and Animal Products. Dairy science summer 2012. Dr. Garcia was invited to travel to Saudi Arabia to discuss distillation grases applications and other dairy cattle nutrition matters at Almari and other dairies.

Dr. Ashraf Hassan was a member of the International Animal Agricultural Committee of the American Dairy Science Association and of the expert panel on low fat cheese research of the Dairy Management, Inc., and now a member of the editorial board of the Journal of Dairy Science.

Dr. Kenneth Kalchschmidt was promoted to Professor in 2012. He was recognized as College of Agriculture and Biological Sciences Distinguished Researcher of the year and also received the SDSU Gamma Sigma Delta Outstanding Researcher Award. He served as the President of the Midwest ADSA/SAS Board of Directors, and as member of the editorial board of the Journal of Dairy Science and Technology. He was an active participant on a NC multi-state research project; NC 1042, Management Systems to Improve the Economic and Environmental Substantiality of Dairy Enterprises. Dr. Kalchschmidt also served as co-chair of the Intercollegiate Dairy Challenge team.

Stephen Crego served as Manager of the Dairy Research and Training Facility. He also coached the dairy cattle judging team.

Dr. Lloyd Metzger was granted tenure and was promoted to Professor in 2012. He serves as the 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. President of the ADSA Dairy Foods Division and member of the editorial board of the Journal of Dairy Science. Dr. Metzger has served as coach of the dairy products judging team and continues the legacy of Shirley Stry and Bob Bue.

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 Center. He also served on the boards of the American Dairy Association of South Dakota, South Dakota Dairy

YEARS OF SERVICE

Howard Bonnemann was recognized for 15 years of service to SDSU. He joined the Dairy Science Department as Instructor and Dairy Plant Manager in 1997. Prior to this he graduated from Dairy Science with B.S., and M.S. degrees and was employed in the dairy industry.

Jayme Raabe was recognized for 5 years of service to SDSU. Jayme is currently Senior Secretary in the Dairy Science Department. She joined the department as Staff Assistant in 1997 and became Senior Secretary in 1991. In this position she has been overseeing department accounting, purchasing, scholarships, and many other operations.

DAIRY FACILITIES RENOVATION

We have completed two years in the newly renovated Alfred Dairy Science Hall and just over a year in the Davis Dairy Plant. In 2012 we extended invitations to all our Jackrabbit Dairy Council members and donors for the dairy plant project to campus for conducting interviews for summer internships and permanent positions. Nine donor companies visited the dairy plant and conducted 100 interviews. Job offers are being finalized.

NEW AND ONGOING FUNDS FOR SUPPORTING RESEARCH

Anand, S. K. To improve the microbial quality of milk powders by controlling thermally resistant spores and salmonella. 03/01/2010 to 02/28/2012. Dairy Science Research Institute. $530,270.

Anand, S. K., Metzger, L. E. Thermophile and thermotolerant sporeforming bacteria in whey and cream ingredients. 08/01/2012 to 12/31/2013. Midwest Dairy Foods Research Center. $52,204.

Anand, S. K. Training modules for understanding the significance and control of thermotolerant bacteria in dairy processing and production environments. 01/01/2012 to 01/31/2013. Midwest Dairy Foods Research Center. $8,969.

Anand, S. K. Review article: Cleaning and sanitation challenges in dairy industry. 01/01/2012 to 12/31/2013. Dairy Science Research Institute. $5,000.

Anand, S. K., Hegerfeld, J., Krishnan, P., Mukthumarakkaran, K., Wong, Y. Recruitment and retention of a diverse population of food safety students using novel approaches to market enhanced programs. 09/01/2008 to 08/31/2012. USDA/COREES FT South Dakota State University. $85,572.


Anand, S. K., Mukthumarakkaran, K. Modification of CIP protocol to prevent and control biofilms in dairy processing environments. 11/01/2011 to 12/31/2013. Dairy Science Research Institute. 8,100,000.


Capans, D. P. Bioremediation into bacteriology alcohol of vivian digital dermatitis using serology and culture and genetic methodologies. 03/01/2012 to 12/31/2013. NADC-USDA-ARS. 48,822.

Garcia, A. D. Producer surveys and outreach/extension programs for live-stock producers. 01/05/2010 to 06/30/2012. USDA Agricultural Research Service. $36,000.

Hassan, A. Biofilm formation on dairy separation membranes as affected by substrate and choice starters. 03/01/2012 to 12/31/2012. Midwest Dairy Foods Research Center. $24,810.

Hegerfeld, J., Anand, S. K., Dalley, B., Bainch, L., Underwood, K. Innovative STEM instructional techniques to increase the number and diversity of students in food safety related majors. 09/01/2011 to 08/31/2014. USDA/NEF-BME Grant. 246,141.


Kalchschmidt, K. F. Alfalfa Fodder in Dairy Science. 08/01/2010 to 07/31/2012. Alftech, Inc. $35,100.


Kalchschmidt, K. F. Methionine and lysine supplementation in dairy cows. 09/01/2010 to 03/31/2013. Kemins Industries Inc.$7,672.

Kalchschmidt, K. F. Rotational dryland cropping to reduce feed fuel inputs. 09/01/2010 to 08/31/2012. USDA/NEF. $4,269.


Our students were again the beneficiaries of the generosity of many alumni, friends and industry. At the spring 2012 banquet, 220 attendees witnessed the awarding of 95 scholarships and awards valued at $91,714.

2012 Dairy Science Banquet

Midwest Dairy Association (2 @ $1,500 each), $3,000
Central North Dakota Dairy Science Association (2 @ $1,800, 2 @ $700), $5,000
Olaf Family, $500
Ralph Rogers Memorial, $400
Ross Baker Memorial, $400
Ryan Graner Memorial, $1,000
Scabeesse Funds, $1,000
Schniede Funds, $1,000
Shelley Sena Memorial, $400
South Dakota State Dairy Association (4 @ $1,000 each), $4,000
Susan Hawkins, $1,000
T. M. Olson, $600
Todd and Erica Stahl, $1,000
Valley Queen Cheese Factory, $4,000
Vlad and Yvonne Wisse, $1,000
WODV Logists’ Donald E. Uschig, $1,000

Graduate Student Scholarships

Dairy Recog and Education Foundation (2 @ $250), $500
Dairy Judging (4 @ $200), $800
Dairy Judging Production, $150
Dairy Judging Manufacturing, $150
Dairy Challenge (4 @ $200), $800
Dairy Judging Manufacturing, $350
Dairy Judging Production, $150
Dairy Judging (4 @ $5,937), $23,748
Dairy Judging (4 @$500), $2,000
Dairy Judging (4 @ $2,000 each), $8,000
Dairy Judging (4 @ $1,000 each), $4,000
Dairy Judging (4 @ $500 each), $2,000
Dairy Judging (2 @ $1,500 each), $3,000
Dairy Judging (4 @ $1,000 each), $4,000
Dairy Judging (2 @ $500 each), $1,000
Dairy Judging (2 @$2,000 each), $4,000

REGIONAL D A I RY B OOTH W ORKSHOPS

Applied Food Safety Education Lab Workshop IV

Dr. Lloyd Metzger serves as Executive Secretary and Dr. Vikram Mistry as Advisor to the NC CIA. The annual meeting was held in Sioux Falls on Oct. 26 and 27, attended by over 130 cheesemaker and suppliers from the upper Midwest.

K-12 STUDENTS

Dairy Camp

The Dairy Club hosted the 9th annual Dairy Camp in June 2012 for youth ages 8-18. Activities for the 37 participants included a visit to a local commercial dairy, training on care of heifers, judging, visit to the SDSU dairy plant, making ice cream, ice cream 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 and Randy Gross served as a judge for the show.

High School Visits

These students for our 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 also visited schools in these states.

EXTENSION

Seventh Annual I-29 Dairy Conference

More than 200 dairy farmers improved their understanding of sustainability concepts at an I-29 Regional Dairy Conference held on Oct. 26 and 27, attended by over 130 dairy producers from South Dakota, Minnesota, Illinois, and Texas spoke on the theme “Future Global Dairy Issues.”

UPDATE: DAIRY RESEARCH & TRAINING FACILITY

Our dairy farm has approximately 150 certified and registered milking cows and a total of 300 animals. This includes about 50 Brson Swiss. The rolling herd average attained a record of just over 25,000 pounds per year. The herd is used for research projects primarily in the cattle nutrition area 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. Matthew Hedgcock and Benjamin Cholevsek serve as student managers. Stephen Cresco and Melissa Schmitt, manager and assistant manager, respectively managed the farm. Thomas Vander Wolters joined the DRF as Ag Foreman and took on the role of feeding and maintenance. Farm research was enhanced recently with the purchase of a new Data Ranger.

Dairy Science at World Dairy Expo

The Dairy Science Department and the South Dakota Department of Ag jointly displayed a booth at the World Dairy Expo in Madison, WI, 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 and to say hello.

Applied Food Safety Education Lab Workshop IV

Joan Hegydfield-Baker from Nutrition and Health Sciences and Samiere Anand from Dairy Science jointly organized this USD/SAE/HSF challenge grant workshop, for hands-on in training in microbiological analytical procedures and virtual labs, at Riggs High School Science Lab, Pierre. Fifteen teachers participated in the workshop.

Food Safety Workshop

Joan Hegydfield-Baker from Nutrition and Health Sciences and Samiere Anand from Dairy Science jointly organized this USD/SAE/HSF challenge grant workshop, for hands-on in training in microbiological analytical procedures and virtual labs at SDSU. Eighteen student-teachers attended this workshop.

Dairy Club

2012 Officers: Grace Liebenstein, President; Chelsey Johnson, Vice President; Matt Holdswort, Secretary; Alisha Vander Wal, Treasurer; Kaylee Morgenstern and Lydia Olson, Historians. Sara Johnson and Christopher Slutzke, Activities Coordinators, and Chelsey Johnson and Jonathan Vander And Wal, Dairy Digest editors. Advisors: Jacob Anderson, Steve Cresco, Dvs. Alvario Garcia, Kenneth Kalcheutz, and Lloyd Metzger. Club members attended ADSA-SAD regional conference in Champaign, IL in February. In June, Club members hosted youth at the ninth annual Jackrabbit Dairy Camp. Other club activities this past year included the Fall Central Plains Dairy Sale, Hubo Days festivities, World Dairy Expo in October and cheese boxes. The Dairy Club was selected as the Student Club of the Year for 2012.
RESEARCH HIGHLIGHTS

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

Structure-function Relationship of Milk Proteins and Design of Dairy Ingredients with Tailored Functionality, Improved Nutrition and Health Benefits: Drs. Hassanah Patel, Lloyd Metzger, and Bonny Specker. 1) Improve our knowledge of structure-function relationship of milk proteins. 2) Identify 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 for this project include: 1) Evaluate 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. 2) 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. 3) 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.

Improving Feed Efficiency through High Forage Rations as a Feeding Strategy to Increase the Profitability & 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 become 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 for this project include: 1) Study the role of thermophilic bacteria in influencing shelf life of milk products such as cheese. Objective: 2) Reducing the cross contamination in dairy processing environments by controlling bacterial biofilms.

Role of Exopolysaccharides-Producing Cultures in Biofilms Formation and as a Texturizing Agent: Drs. Ashraf Hassan, Vikram Garcia, and Sanjeev Anand. 1) Optimize manufacturing conditions for the production of 50% reduced fat and low fat Cheddar cheeses with characteristics similar to those in the full fat types using EPS-producing cultures. 2) Develop novel functional ingredients from whey containing exopolysaccharides. 3) Study the formation of biofilms on whey RO membranes as a cause of membrane fouling.

Metabolic Relationships in Supply of Nutrients for Lactating Cows: Drs. David Casper, David Schingoethe and Kenneth Kalscheur. The long-term goal is to improve the efficiency of milk production, cow health and longevity, and thus promote environmental and economic sustainability in the U.S. dairy industry. The approach to achieve this goal is to systematically identify those biological and nutritional management processes that will provide the greatest improvements in milk production and sustainability of dairy systems.

Management Systems to Improve the Economic and Environmental Sustainability of Dairy Enterprises: Dr. Kenneth Kalscheur. The purpose of this project is to develop decision support systems that address nutrition, management, environmental impacts, and economics of dairy systems. Research projects are targeted for process cheese product applications.

Safety and Quality Improvement of Milk and Cheese: Dr. Sanjeev Anand. 1) Study the role of thermophilic bacteria in influencing shelf life of milk products such as cheese. Objective: 2) Reducing the cross contamination in dairy processing environments by controlling bacterial biofilms.

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 of the projects are: 1) Determine the impact of carbon dioxide injection on membrane performance, mineral content, and functionality of milk protein concentrate. 2) To evaluate the effectiveness of transesterification 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.

Use of Biofuel Coproducts to Improve Nutrient Utilization in Dairy Cattle: Drs. Kenneth Kalscheur, David Schingoethe and Alvaro Gons. This project examines nutrient utilization of dairy cattle fed diets using biofuel coproducts to reduce losses to the environment.