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The Jackrabbit Dairy Review

Dairy Science

Winter 2014

The Jackrabbit Dairy Review

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The Jackrabbit Dairy Review

Winter 2013-2014

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

DAIRY SCIENCE DEPARTMENT

Faculty

Sanjeev Anand *Associate Professor*
Jill Anderson *Assistant Professor*
Howard Bonnemann *Lecturer*
David Casper *Assistant Professor*
Alvaro Garcia *Professor/Extension Dairy Specialist*
Ashraf Hassan *Associate Professor*
Kenneth Kalscheur *Professor*
Lloyd Metzger
Professor, Alfred Chair in Dairy Education
Vikram Mistry *Professor and Department Head*
Hasmukh Patel *Assistant Professor*

Adjunct Faculty

Thom Huppertz
K. Rajinder Nauth

Emeritus Faculty

Robert Baer
David Henning
John Parsons
David Schingoethe

Staff

Steve Beckman *Filtration Technologist*
Ananya Biswas *Research Associate*
Melinda Cornelison *Secretary*
Stephen Crego *Manager, Dairy Research and Training Facility*
John Haberkorn
Manager, Davis Dairy Plant
Akimoto Ichinomiya
Assistant Manager, Davis Dairy Plant
Anil Kommineni *Assistant Manager, Institute for Dairy Ingredient Processing*
Pete Linke
Ag Foreman/Fresh and Sick Cows/Calf Care
Sonia Patel
Application Technologist, Institute for Dairy Ingredient Processing
Jayne Raabe *Senior Secretary*
Tracey Erickson (Renelt) *Extension Field Specialist*
Melissa Schmitt
Assistant Manager, Dairy Research and Training Facility
Ty Wilczinski *Ag Foreman/Feeding, Maintenance*

MESSAGE FROM THE DEPARTMENT HEAD



2013 marked the beginning of a new strategic plan for South Dakota State University, IMPACT 2018, a very insightful pathway which, through excellence in research, teaching and service, will help the university have a positive impact on the state and region. The Dairy Science Department is positioned to be an integral part of this exciting pathway. Activities in our new facilities, the Alfred Dairy Science Hall, and Davis Dairy Plant, are off to an excellent start. In fact, we have already seen the graduation of the first group of students that received hands-on experience in the new Davis Dairy Plant. We look forward to the coming years when many more such students will graduate under the very able guidance of our new plant manager, John Haberkorn. Having completed these two major infrastructure projects, our eyes are now set on another large project, renovation/remodeling of the Dairy Research and Training Facility. The current facility has housed our cows and hosted numerous teaching and research projects since 1994 and is due for a replacement or major upgrade. To begin this process we will engage our faculty, students, producers and industry in sessions that will investigate needs for teaching, research and service that will be relevant to the growing and changing industry of the state. This will then guide the planning, designing and ultimately fundraising efforts to help complete the project. Our three new faculty members, Drs. Casper, Patel and Anderson are off to a good start in their teaching and research efforts. Long-term faculty members continue to make impacts at home and abroad and Dr. Hassan, for example, was invited by USAID to assist cheese makers in the Republic of Georgia. Dr. Garcia traveled to Greece and Latin America for conveying his knowledge on dairy cattle feeding and milk quality. Dr. Kalscheur led a group of students to New Zealand. Dr. Metzger travelled to China and Singapore for promoting the U.S. dairy industry and presenting his work. He also has been most successful in keeping alive and vibrant the strong dairy products judging legacies of Shirley Seas and Bob Baer by winning the sixth straight national title. Dr. Anand actively engages graduate and undergraduate students in research and discovery and represents the department in the Van D. and Barbara B. Fishback Honors College. Howard Bonnemann received a patent on milk flavor research work that he and Dr. Baer had done. In fiscal year 2013 dairy science faculty members had secured more than \$1 million in external grants through 25 projects to cover research projects and support graduate students and researchers. We were saddened to see Jacob Anderson leave after starting up the Davis Dairy Plant and embarking on another exciting opportunity with the new Bel Brands plant in Brookings. Another highly experienced alumnus, John Haberkorn has filled this position. Help us spread the word about exciting careers in dairy science, and an outstanding scholarship program, made possible by so many generous donors, and the opportunity to engage with world-class faculty and facilities. We are hopeful that all of these and other inspiring activities will help us continue increase enrollment in dairy science. We are well poised to increase our undergraduate student count from the current 85 to near 125 to help serve the industry.

Vikram Mistry

2013 GRADUATES

Ph.D.

Prafulla Salunke, Manufacturing

M.S.

Angela Manthey, Production
Laura Mealey, Manufacturing
Adlai Schuler, Production
Megan Smith, Production

B.S. Manufacturing

Kyle Anderson
Austin Asche
Megan Huegli
Justin Ochsner

B.S. Production

Tom Hammink
Cassandra Hulstein
Kaitlin Hartkopf
April Johnson
Grace Liebenstein
Lael Schoessler
Angela Sellner

Danielle Tews

Cody Van Eck
Alisha Vander Wal

B.S. Manufacturing and Production
Roxane Chapman

GRADUATE STUDENTS

Dairy Production

Ishwary Acharya
Subash Acharya**
Fernando Diaz-Royon
Dana Gadeken
Kayla Hultquist**
Nadeesha Jayasinghe
Rhea Lawrence**
Angela Manthey

Jon Pretz*

Sanjeewa Ranathunga
Juan Sanchez-Duarte*
Shruti Srivastava
Brittney Strayer
Ulises Salas Vega
William Weich
Brittney Strayer
William Weich

Dairy Manufacturing

Ashley Adamski**
Dikshi Bawa**
Khilendra Bhanduriya
Kimberly Buehner
Nuria Garcia-Fernandez
Dustin Grossbier**
Somil Gupta
Sowmya Marka

Dipakkumar Mehta**

Gopinathan Haridas
Meletharayil
Suresh Sutariyaa

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*New students in 2013

**New students in 2014

NEW FACULTY AND STAFF, VISITORS AND ALUMNI

NEW FACULTY AND STAFF



Haberkorn

John Haberkorn joined the department in October 2013 as manager of the Davis Dairy Plant. John graduated from SDSU with a degree in dairy manufacturing in 1985 and has had extensive experience in the dairy processing industry. Immediately before joining SDSU, John was operations manager at Western Quality Foods in Cedar City, Utah. After graduation, he started as the assistant quality assurance manager at Sinton Dairy, in Colorado Springs, Colo. He was promoted to quality assurance manager, and was responsible for production of cultured products including cottage cheese, sour cream and buttermilk. In 1992 he accepted the challenge of converting an old cultured plant in Utah into an extended shelf life dairy. John closed the old plant, and built and started up a new facility. John's extensive commercial experience, quality and safety operations, maintenance and budgeting will be of immense value in his new position as plant manager, where he will be responsible for operating the plant as well as supervising and training students to enter the dairy industry after graduation.



Patel

Sonia Patel joined the dairy science department as applications technologist for the Institute of Dairy Ingredient Processing. Sonia holds a B.S. and M.S. in microbiology and her experience includes product development and commercialization, and product formulation at Fonterra Research Center in New Zealand. She was also quality assurance officer at Mother Dairy in Gandhinagar, India. As application scientist she will serve as a link between research and dairy ingredient users.



Wilczinski

Ty Wilczinski joined the department as ag foreperson at the Dairy Research and Training Facility. In this position he will be responsible for feeding cows and replacement heifers and overall maintenance. Prior to this new position Ty was employed as dryer operator at Sterling Technology in Brookings.

VISITORS

Marine Fourot was a visiting exchange student from ENSAT, France, with Dr. Alvaro Garcia and Dr. Sanjeev Anand. She spent the summer in the department and investigated dairy manure treatment technologies.

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 the Dairy Breeds and Breeding, Dairy Farm Management and Cattle Judging classes. Randy's wealth of experience was most valuable to our students.

Thom Huppertz, currently principal scientist, Dairy and Ingredient Technology at NIZO, Ede, The Netherlands, was appointed Adjunct Professor. Dr. Huppertz is an internationally recognized scientist with numerous publications and presentations. As adjunct, Dr. Huppertz will work closely with Dr. Hasmukh Patel and will participate in joint research projects and teaching activities. This appointment will help strengthen research partnerships of the dairy science department with NIZO.

Jim Linn, Professor Emeritus of Animal Science, University of Minnesota, was the invited speaker for the first Don Otterby Lecture in Dairy Science. Dr. Otterby received a B.S. in 1954, his master's in dairy production at SDSU in 1958 and received a Ph.D. in animal nutrition from North Carolina State University. In 1963, he joined the animal science department of the University of Minnesota, St. Paul as a faculty member. His distinguished career spanned 35 years, and he made many contributions to the dairy industry through his teaching and research activities in the areas of dairy nutrition, husbandry and management. He received the highest teaching award from the University of Minnesota, the Horace T. Morse Alumni Association Award for Contributions to Undergraduate Education in 1989. Dr. Linn, a former student of Dr. Otterby, delivered a lecture titled "The future of dairying in the context of contemporary agricultural constraints."

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

ALUMNI ACCOMPLISHMENTS

Dairy Science alumni have been very productive in their professions. While it is difficult to keep track of all alumni and their accomplishments, here are a few examples:

Jill Anderson, Ph.D. 2012. See below under faculty.

Micheal Brouk, Ph.D., 1994, and currently professor at Kansas State University, received the DuPont Pioneer Forage Award of the American Dairy Science Association.

Jeffrey DeFrain, Ph.D. 2004, and currently research nutritionist, Zinpro Corporation, was listed in Vance Publishing Corporation's inaugural 40 Under 40 in Agriculture Awards. These individuals were selected for their leadership and commitment in advancing the cause to double food production by 2050.

Kevin Herrick, who received his Ph.D. in dairy science from SDSU in 2012 under the guidance of Arnold Hippen and Kenneth Kalscheur, received the Alltech Inc. Graduate Student Paper Publication award at the American Dairy Science Association meeting in Indianapolis. He also was awarded the Young Dairy Scholar Award at the 2013 Midwest ADSA-ASAS Meeting.

Maneesha Mohan, M.S. 2011, under Dr. Sanjeev Anand and currently Ph.D. candidate at the University of Tennessee received the best dairy foods research paper presentation award at the American Dairy Science Association meeting in Indianapolis.

Marvin Post, a Dairy Manufacturing graduate and currently dairy farmer in Volga was honored with the SDSU's Eminent Farmer Award at a ceremony on campus in fall 2013. Marv is also very active with the South Dakota Dairy Producers and the American Dairy Association of South Dakota.

Nagendra Shah, M.S., 1982, and currently professor of food science and technology at the University of Hong Kong, received the Distinguished Service award of the American Dairy Science Association in recognition of his many years of service to the dairy industry.

DAIRY CLUB



2013 Officers: Chelsey Johnson, president; Christopher Schulze, vice president; Matthew Holdvogt, secretary; Alisha Vander Wal, treasurer; Rachel Achen and Maggie Stiles, historians; Sara Sontag and Kevin Berg, activities coordinators; and Chelsey Johnson, *Dairy Digest* editor. Advisors were Stephen Crego, Drs. Jill Anderson, David Casper, Alvaro Garcia, Kenneth Kalscheur and Lloyd Metzger. Club members attended ADSA-SAD regional conference in Ames, Iowa, at Iowa State University in February. In June, club members hosted youth at the 10th annual Jackrabbit Dairy Camp. Other club activities throughout the past year included the South Dakota State Fair, Ag-Bio Ice Cream Social, National Ag Day, Relay for Life, Hobo Day festivities, cheese boxes and assistance for fundraising for victims of the massive October blizzard in western South Dakota.

JUDGING ACTIVITIES

DAIRY CATTLE EVALUATION

Our Dairy Cattle Judging Team, coached by Steve Crego, farm manager, competed at the 93rd annual National Collegiate judging contest at the World Dairy Expo in Madison, Wis., and at the Southwestern Livestock Exposition Contest in Fort Worth, Texas. Team members for Madison were Chelsey Johnson, Alisha Vander Wal, Benjamin Choudek, Christopher Schulze and Matthew Holdvogt. The team placed 14th out of 19 teams. Chelsey Johnson placed seventh in Brown Swiss classes. Christopher Schulze placed seventh in the Red & White classes. Saturday and Sunday prior to the contest the teams practiced at several farms in the Madison area. The team was also joined by Mikayla Piller, Abigail Weyrens and Benjamin Choudek. The Fort Worth team members were Rachel Achen, Benjamin Choudek, and Matthew Holdvogt. Eleven teams participated in the contest. The SDSU team placed third in Brown Swiss and fifth in Team Oral Reasons. Chelsey Johnson, Alisha Vander Wal and Christopher Schulze also accompanied the team on the judging trip to continue developing their judging skills. The team practiced with teams from North Dakota State University and Kansas State University in Oklahoma on the Friday prior to the contest at Chupp's Guernseys, Chapman's Holsteins and the Oklahoma State University's Dairy Research Farm.

DAIRY CHALLENGE

Our Dairy Challenge Team placed first in the 12th Annual North American Intercollegiate Dairy Challenge (NAIDC), held April 4-6 in Fort Wayne, Ind. The team included Cassandra Hulstein, April Johnson, Lael Schoessler and Alisha Vander Wal and was coached by Dr. Kenneth Kalscheur, Dr. David Casper and Melissa Schmitt. A total of 128 students from 32 universities across the U.S. and Canada participated in the contest. The three-day competition began with analysis of farm data and records, followed by a walk-through of the dairy operation, and a question-and-answer session with dairy owners. Each team then developed recommendations for nutrition, reproduction, milking procedures, animal health, housing and financial management. The teams presented their recommendations to the owners, while being evaluated by a panel of five judges including dairy producers, veterinarians, farm finance specialists and industry specialists. Members of the team were each awarded a \$200 scholarship. Participants of the Dairy Challenge all agreed that this competition was a great opportunity to apply information learned through their dairy science coursework.

DAIRY PRODUCTS

The dairy products judging team won its sixth-straight national title and 21st overall. The team coached by Lloyd Metzger, professor of dairy science and the Alfred Chair in Dairy Education included Suresh Sutariya, Taylor Jones, Timothy Pennings, Megan Huegli, and coach Cassandra Hulstein. Taylor Jones, a senior from Huron, received the Robert Rosenbaum Award as the undergraduate champion in the individual all products category. He also was second in ice cream, third in butter and cheddar cheese, and fourth in milk. SDSU's streak of six straight titles is the longest in the event's history. Overall, the team placed first in ice cream and cottage cheese, second in butter, third in yogurt and fifth in milk and cheddar cheese. As the national champion, SDSU won the Shirley Seas Memorial Scholarship, in honor of Shirley Seas who coached for 21 years. Other SDSU individuals competing were: Timothy Pennings, a senior from Arlington, finished first in cottage cheese and fifth in all products; Megan Huegli, a senior from Hartland, Wis., was third in ice cream, fourth in yogurt and sixth overall; Suresh Sutariya, a graduate student from Ahmedabad, India, was first in butter and second in yogurt, milk and ice cream on his way to a second-place overall finish. Cassandra Hulstein, an SDSU student and winner of the 2012 undergraduate individual all-products title was assistant coach. Metzger received the Aurelia and George Weigold Coach of the Year Award. A total of 41 undergraduate and graduate contestants from 11 universities in the U.S. and Canada participated in the contest. 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 20 dairy associations, companies, and suppliers.



Dairy Cattle Judging Team



Dairy Challenge Team



Dairy Products Judging Team



From the past.

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 dissertations and Extension presentations. All publications are listed on our website at www.sdstate.edu/ds.

Dr. Sanjeev Anand is the S.D. State resource person in food safety and added in the *Food Safety Contacts Directory* of USDA, NIFA, July 2007-present. He serves as the department representative to the Functional Genomics Core Facility (2007-present), and the Van D. & Barbara B. Fishback Honors College (2013-present).

Dr. Jill Anderson joined the dairy science department as assistant professor in September 2012 and has been busy teaching classes and initiating her research program in heifer nutrition. She also was awarded the ADSA Young Dairy Scholar Award at the 2013 Midwest ADSA-ASAS Meeting and gave an invited presentation on feeding distillers grains to dairy heifers.



Bonnemann

Howard Bonnemenn was promoted to lecturer effective July 2013. He has been a faculty member since 1997, initially as instructor and dairy plant manager, and since 2011 as instructor and research manager. He teaches Introduction to Dairy Science at the freshman level, Dairy Foods, parts of Dairy Product Processing I and II, Dairy Plant Management, Field Experience and Undergraduate Research. He also serves as academic advisor to 20 students per semester. He is the assessment coordinator for the department and ABS college 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 executive secretary for the S.D. Dairy Association. Howard was also granted a patent titled "Method for Removing Oxidized Off-Flavor from Milk."

Dr. David Casper served 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.

Dr. Alvaro Garcia has been a faculty member in since 2001 and has developed a strong, highly recognized dairy Extension program. Dr. Garcia was invited to speak in Uruguay, Chile and Greece. He was invited by the U.S. Grains Council to serve as technical advisor to various countries, especially in Central and South America for technical discussions with local farmers and industry with the goal of developing U.S. markets for distillers grains. He hosted two groups of Latin American dairy producers, consultants and feed industry personnel that were on a U.S. visit with the U.S. Grains Council.

John Haberkorn is the new manager of the Davis Dairy Plant. In addition to managing the plant he also provides tours of the plant to numerous groups.



Hassan

Dr. Ashraf Hassan was a member of the International Animal Agriculture Committee of the ADSA and of the expert panel on low-fat cheese research of Dairy Management, Inc., and now is a member of the editorial board of the "Journal of Dairy Science." He was invited to participate in a Farmer to Farmer (F2F) program of the U.S. Agency for International Development in 2013 and was assigned to help a small dairy factory in the Republic of Georgia manufacture Mozzarella cheese locally and sustain its business. The factory manufactures a local

Georgian cheese similar to mozzarella made from raw milk and whey cheese. Dr. Hassan helped enhance quality, consistency and safety of the Georgian cheese and improve process efficiency. He also taught the production team how to make mozzarella cheese from pasteurized milk using various methods.

Dr. Kenneth Kalscheur served as member of the editorial board of "Animal Feed Science and Technology." He was an active participant on an NC multi-state research project—NC 1042, Management Systems to Improve the Economic and Environmental Sustainability of Dairy Enterprises. He is a member of the FASS Public Policy Committee and ADSA Foundation Board

and also served as co-coach of the Intercollegiate Dairy Challenge team. He was invited to Pakistan for a presentation on contemporary aspects of dairy cattle feeding. Dr. Kalscheur co-led a group of students to New Zealand where they visited a number of agricultural facilities, including dairy farms.

Stephen Crego served as manager of the Dairy Research and Training Facility. He also coached the Dairy Cattle Judging Team.

Dr. Lloyd Metzger continues to serve as director of the Midwest Dairy Foods Research Center and the executive secretary of the North Central Cheese Industries Association. He is a member of the ADSA Dairy Foods Milk Protein and Enzyme Committee, president of the ADSA Dairy Foods division and a member of the editorial board of the "Journal of Dairy Science." Dr. Metzger has served as coach of the dairy products judging team and led the team to a record sixth national championship. He also travelled to China and Singapore where he presented his research work and promoted the U.S. dairy industry.

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 also served on the boards of the American Dairy Association of South Dakota, South Dakota Dairy Producers, ADSA Foundation, and advisor to the North Central Cheese Association and the South Dakota Dairy Producers.



Patel

Dr. Hasmukh Patel received the 2013 ADSA Foundation Scholar Award in Dairy Foods in recognition of his work and experience in dairy ingredients and dairy processing. He is a co-inventor of two patents and has more than 50 scholarly publications including 16 peer-reviewed papers, three book chapters and several invited keynote addresses and presentations at international conferences. The focus of Dr. Patel's research is to help understand the basic mechanisms and provide new knowledge which enables design of novel, value-added ingredients with tailored functional and nutritional properties and develop new products and processes and to solve the existing problems in the dairy industry.

Tracey Erickson (Renelt) continues as Extension dairy field specialist at the Watertown Regional Center. She is co-chair of the 2014 I-29 Dairy Conference and the lead department person for iGrow activities. In addition to her Extension work, she serves as the secretary of the S.D. Dairy Fieldmen's Association. She is the vice chair for the university's Professional Staff Advisory Council, representing more than 500 professional staff (nonfaculty exempt) employees at SDSU. She also serves on the Central Plains Dairy Association Advisory Board of Directors overseeing the CPDA Expo and yearly dairy events and co-coordinates the youth 4-H Dairy Cattle Evaluation and serves as an advisor to the 4-H Dairy Cattle program in South Dakota.

YEARS OF SERVICE



Biswas

Ananya Biswas, Ashraf Hassan and Lloyd Metzger were each recognized for 10 years of service to SDSU. Ananya, currently a research associate began his employment as a graduate research assistant, after which he served as microbiologist in the State Dairy Laboratory and then as research assistant in Dairy Science. Dr. Hassan joined the department as assistant professor and is currently associate professor. He teaches dairy manufacturing classes and is renowned for his work on exopolysaccharides in dairy products. Dr. Metzger joined the department as associate professor and Alfred Chair in Dairy Education and is currently professor and director of the Midwest Dairy Foods Research Center.



Metzger

NEW AND ONGOING FUNDS FOR SUPPORTING RESEARCH

Anand, S. K. (PI, microbiology), Jayendra Amamcharla, and Lloyd Metzger. Use of novel surface modification techniques to reduce biofilms on plate heat exchangers. 01/01/14 to 12/31/15. Dairy Research Institute. \$52,258 (S. Anand) of a total of \$100,000.

Anand, S. K. Training modules for understanding the significance and control of thermophilic bacteria in dairy production and processing environments. 01/01/2013 to 12/31/13. Midwest Dairy Foods Research Center. \$9,000.

Anand, S. K. To improve the microbial quality of milk powders by controlling thermally resistant spore forming and spores. 08/01/2012 to 07/01/2015. Dairy Research Institute. \$214,131.

Anand, S. K. Cleaning and sanitation challenges in dairy industry: a review. Midwest Dairy Foods Research Center. 01/01/2013 to 06/30/2014. \$5,000.

Anand, S. K. Relationship of thermophilic biofilms and microbiologically influenced corrosion. 01/01/2013 to 12/31/2014. Midwest Dairy Foods Research Center. \$20,174.

Hegerfeld-Baker, J., Anand, S. K., Basil Dalaly, Laura Ruesch, Keith Underwood. Innovative STEM instructional techniques to increase the number and diversity of students in food safety related majors. NDSU and NMSU are collaborators. 09/01/2011 to 08/31/2014. USDA/NIFA, HEC Grants Program. \$280,341.

Anand, S. K., Liu, W. Interaction of starter cultures and gas producing thermophilic bacteria to control the blowing or slit defects of Cheddar cheese. 05/28/2013 to 12/31/2013. Griffith undergraduate research award, SDSU. \$3,000.

Anand, S. K., Megan Huegli. Role of thermophilic bacteria in split defects found in Swiss cheese. 01/01/2013 to 05/31/2013. ABS undergraduate engagement award, SDSU. \$3,000.

Anand, S. K., Metzger, L. E. Determining the role of thermophilic and thermophilic sporeformers and their biofilms in cheese spoilage. 11/01/2011 to 12/31/2013. Dairy Research Institute. \$135,931.

Anand, S. K., Metzger, L. E. Thermophilic and thermophilic sporeforming bacteria in whey and whey ingredients. 08/01/2012 to 06/30/2014. Midwest Dairy Foods Research Center. \$32,204.

Anand, S. K., Muthukumarappan, K. Modification of CIP protocol to prevent and control biofilms in dairy processing environments. 11/01/2011 to 12/31/2013. Dairy Research Institute. \$105,000.

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. 05/10/2013 to 12/31/2015. Minnesota Corn Research and Promotion Council. \$83,340.

Casper, D. P. Growth and health of pre-weaned dairy heifers fed PROTENATIVE SF in combination with LEVUCCELL. 05/10/2013 to 04/30/2014. Lallemand Animal Nutrition. \$28,374.

Casper, D. P. Commercial dairy farm evaluation of milk replacers with different protein concentrations and sources. 03/15/2013 to 09/30/2014. Milk Specialties Global. \$8,000.

Casper, D. P. Evaluation of Co-Max in a high forage total mixed ration in late lactation dairy cows. 07/01/2013 to 12/31/2014. Ralco, Inc. \$25,906.

Casper, D. P. Evaluation of MasterGraze silage for growing Holstein heifers. 03/15/2013 to 08/31/2014. Masters Choice. \$13,000.

Casper, D. P. Investigation into bacteriological etiology of bovine digital dermatitis using serology, culture and genomic methodologies. 07/01/2012 to 12/31/2013. NADC-USDA-ARS. \$4,322.

Casper, D. P. The Evaluation of Highly Digestible Corn Silage Hybrids Fed to Early Lactation High Producing Dairy Cows. 07/01/2013 to 01/31/2015. Masters Choice. \$63,000.

Casper, D. P. To determine if corn varieties that are high in energy density and digestible starch can improve the growth rates in young calves fed calf starter. 10/26/2012 to 02/01/2014. Master's Choice. \$21,892.

Cortus, E., Pohl, S., Garcia, A. D. Managing variable costs on dairy farms through energy use assessment and conservation. 07/01/2013 to 06/30/2014. North Central Risk Management Center. \$23,066.

Garcia, A. D., Kalscheur, K. F., Diaz-Royon, F. Effect of feeding Optimase® on metabolism and performance of high-producing dairy cows. 03/15/2013 to 10/15/2013. Alltech Inc. \$30,750.

Hassan, A. Biofilm formation on dairy separation membranes as affected by substrate and cheese starter. 01/01/2011 to 03/31/2013. \$28,831.

Hassan, A. Role of exopolysaccharides in biofilm formation and stability. 01/01/2013 to 12/31/2013. \$15,000.

Kalscheur, K. F. Alltech Fellowship in Dairy Science. 08/01/2010 to 12/31/2013. Alltech. \$55,200.

Kalscheur, K. F. Effect of DEMP in high and low forage diets on ruminal metabolism and lactation performance of high-producing dairy cows. 09/15/2012 to 06/15/2014. Alltech, Inc. \$45,600.

Kalscheur, K. F. Evaluation of LysiPEARL in lactating dairy cow diets. 12/21/2012 to 12/31/2014. Kemin Industries. \$74,434.

Kalscheur, K. F. Methionine and lysine supplementation to dairy cows. 09/01/2010 to 10/01/2013. Kemin Industries Inc. \$93,137.

Kalscheur, K. F., Hippen, A. R., Schingoethe, D. J. Monensin in dairy cow diets containing high RUFAL from corn distillers grains and low fractions of physically effective fiber. 12/01/2010 to 07/31/2014. Elanco Animal Health. \$124,695.

Metzger, L. E. Application scientist at the IDIP. 07/01/2013 to 06/30/2015. Dairy Research Institute. \$40,793.

Metzger, L. E. Concentration, storage stability and functionality of highly concentrated micellar casein. 11/01/2011 to 01/01/2014. Dairy Management Inc. \$91,822.

Metzger, L. E. Development of modified milk protein concentrates and native casein concentrates that can be utilized as an alternative to rennet casein in process cheese product applications. 10/01/2010 to 12/31/2012. Dairy Management Inc. \$135,450.

Metzger, L. E. Institute for Dairy Ingredient Processing 2012. 01/01/2012 to 04/30/2013. Dairy Research Institute. \$166,950.

Metzger, L. E. Institute for Dairy Ingredient Processing 2013. 01/01/2013 to 12/31/2013. Dairy Research Institute. \$167,045.

Metzger, L. E. Manufacture of modified MPC utilizing injection of carbon dioxide. 01/01/2011 to 12/31/2012. Dairy Management Inc. \$63,000.

Metzger, L. E. Scale-up of modified milk protein concentrate to replace rennet casein. 07/01/2013 to 12/31/2015. Dairy Research Institute. \$22,004.

Patel, H. A. To improve the quality and efficiency of milk powder by developing strategies to minimize increase in the viscosity of milk. 12/01/2012 to 11/30/2014. Dairy Research Institute. \$58,800.

Patel, H. A. Clean Labels: Capitalize on the structure-building properties of dairy proteins to eliminate chemicals from food labels. 01/01/2013 to 12/31/2014. \$83,325.

Patel, H. A. The stability and functionality of Liquid dairy ingredients: Role of protein interactions in their heat stability. 08/16/2012 to 12/31/2013. \$27,796.

Renelt, T. Agricultural human resource management. 07/01/2012 to 12/31/2013. North Central Risk Management Education Center. \$37,559.

Schingoethe, D. J., Hippen, A. R., Kalscheur, K. F. Maximize the use of Canola meal in dairy feeds: amino acid nutrition and metabolism. 07/01/2010 to 07/01/2014. Canola Council of Canada. \$299,000.



SCHOLARSHIPS

Our students were the beneficiaries of the generosity of many alumni, friends and industry. At the spring 2013 banquet, 220 attendees saw the awarding of 65 scholarships and awards valued at \$94,000.

Alfred Hermann Rishoi (2@ \$550 each), \$1,100
 Associated Milk Producers Inc., \$1,000
 Bel Brands USA, \$3000
 Clyde Helsper Memorial, \$1,000
 Dairy Club (2@ \$500 each), \$1,000
 Dairy Connections, \$1,000
 Dairy Farmers of America, \$400
 Dave Clark, N. Central Cheese Ind. Assoc., \$1,000
 David H. Henry Memorial, \$200
 David J. Schingoethe, \$1,000
 Davisco Foods Int'l, Jay Headly Memorial, \$1,500
 Dean Foods—Land O'Lakes, \$1,250
 Derald, \$500
 DuPont (2@ \$1,000 each), \$2,000
 Emery Bartle Memorial, \$5,000
 George Marx, \$850
 Gilbert T. & Olga Gilbertson Memorial, \$450
 H. C. Olson, \$500
 Harbarth (4@ \$800, 1@ \$400), \$3,600
 Heifers for State (2@ \$500 each), \$1,000
 Idaho Milk Proc. Assoc. (2@ \$2000), \$4,000
 J. J. Yee, \$500
 James Marvel Memorial, \$300
 John Anderson Mem. (2@ \$2,000 each), \$4,000
 John C. Gross, \$1,000
 Joseph Van Treeck, \$1,300
 Kemp's LLC, \$1,500
 Kirk Mears Memorial, \$950
 Land O'Lakes—Region 65, \$250
 Leprino Foods, \$4,000
 Midwest Dairy Assoc. (2@ \$1,500 each), \$3,000
 North Central Cheese Industries Association (2@ \$2,000, 1@ \$1,000), \$5,000

Ode Family, \$500
 Ralph Rogers Memorial, \$400
 Ross Baker Memorial, \$450
 Royal and Helen Doner in Dairy Prod., \$400
 Ryan Graber Memorial, \$1,000
 Saputo Cheese, \$1,000
 Schuch Family, \$500
 South Dakota State Dairy Association (3@ \$1,000 each, 1@ \$1,100), \$4,100
 Shirley Seas Memorial, \$400
 Susan Hawkins, \$1,000
 T. M. Olson, \$600
 Todd and Erica Stahl, \$1,000
 Valley Queen Cheese Factory, \$4000
 Walt and Yvonne Wosje, \$1,000
 William & Marge Kallemeyn & Sons, \$1,050
 WOW Logistics' Donald E. Utschig, \$1,000

AWARDS

Arnold Hippen Dairy Challenge (4@ \$250), \$1,000
 Dairy Judging Manufacturing, \$150
 Dairy Judging Production, \$150

Forbes Leadership, \$300
 Graber-Ford, \$100
 Students Employee Excellence (2@ \$250), \$500
 Alfred Tobkin Memorial (4@ \$200 each), \$800
 Howard Voelker Memorial (3@ \$265 each), \$795

INCOMING STUDENT SCHOLARSHIPS

Agropur Inc. Dairy Manufacturing, \$1,000
 Agropur Inc. Dairy Production, \$1,000
 Clyde G. Helsper Dairy Fieldmen's, \$1,000
 Dairy Science Faculty (2@ \$600), \$1,200
 Howard Voelker Freshman Dairy Prod., \$1,000
 Midwest Dairy Assoc. (2@ \$1,000), \$2,000
 South Dakota Dairy Fieldmen's Association (5@ \$1,000), \$5,000
 South Dakota State Dairy Association (2@ \$500), \$1,000
 Valley Queen Cheese Factory, \$1,000

GRADUATE STUDENT SCHOLARSHIPS

Dairy Recognition and Education Foundation (2@ \$3,500), \$7,000
 Delbert and Robert Breazeale Memorial, \$750



2013 Dairy Club

UNDERGRADUATE STUDENTS

Rachel Achen, Ambia, Ind., Manufacturing
 Lee Alexander, Twin Brooks, S.D., Manufacturing
 *Bennet Baker, Kasota, Minn., Production
 Kevin Berg, Baltic, S.D., Manufacturing
 Samantha Berg, Pipestone, Minn., Manufacturing
 Jennifer Casperson, Brookings, S.D., Production
 Bethany Chapman, Winfred, S.D., Production
 *Lauren Chirnside, Lees Summit, Mo., Mfg.
 Benjamin Choudek, Owatonna, Minn., Production
 *Jorden Eich, Salem, S.D., Manufacturing
 Jordan Evans, Pipestone, Minn., Production
 Kyle Fischer, New Ulm, Minn., Production
 Sam Fuchs, Eureka, S.D., Prod., Manufacturing
 Daniel Gacke, Beresford, S.D., Manufacturing
 Morgan Goche, Bancroft, Iowa, Manufacturing
 Jennifer Gunnink, Lake Benton, Minn., Production
 Nicole Hans, Wynot, Neb., Production
 *Brandon Hawkins, New Ulm, Minn., Production
 *Maxwell Henn, Norfolk, Neb., Production
 Joseph Hoffman, New Ulm, Minn., Production
 Matthew Holdvogt, Eden Valley, Minn., Production
 Nicole Jax, Waltham, Minn., Manufacturing
 *Mitchell Jazdzewski, Gilman, Wis., Manufacturing
 *Krista Johnson, Russell, Minn., Manufacturing
 Rachel Johnson, Russell, Minn., Manufacturing
 Courtney Johnson, Huron, S.D., Manufacturing
 *Katelyn Johnson, Sleepy Eye, Minn., Prod., Mfg.
 Chelsey Johnson, Heron Lake, Minn., Production

*Jacob Johnson, Heron Lake, Minn., Production
 Taylor Jones, Huron, S.D., Manufacturing
 Kaleb Juntunen, Courtland, Minn., Manufacturing
 *Morgan Kaiser, Winthrop, Minn., Prod., Mfg.
 Andrew Kaskie, Hudson, S.D., Manufacturing
 Molly Kennedy, Beresford, S.D., Manufacturing
 *Mohammad Khawaja, Pakistan, Prod., Mfg.
 Kevin Kral, Hanska, Minn., Manufacturing
 *Rachel Larson, Beresford, S.D., Manufacturing
 Natasha Laska, Norfolk, Neb., Manufacturing
 Weina Liu, China, Manufacturing
 Bridgette Louwagie, Cottonwood, Minn., Prod., Mfg.
 Kimberly Maassen, Rock Valley, Iowa, Mfg.
 Emily Martin, Rochester, Minn., Production
 Laura McMartin, Gerber, Cal., Production
 *Eric Metzger, Lester, IA, Production
 Geena Mott, Minneapolis, Minn., Manufacturing
 Larissa Neugebauer, Dimock, S.D., Production
 Joshua Oakley, Dakota Dunes, S.D., Manufacturing
 *Hayden Palmer, Beresford, S.D., Manufacturing
 Timothy Pennings, Arlington, S.D., Manufacturing
 Andrea Pfaffenbach, Roann, Ind., Production
 Riley Pitman, Chatham, N.H., Production
 *Sarah Post, Chandler, Minn., Prod., Mfg.
 Christopher Reiter, Medford, Minn., Production
 Teresa Sandberg, Taylors Falls, Minn., Prod., Mfg.
 Samantha Schaefer, Lake Benton, Minn., Mfg., Prod.
 *Megan Schaefer, Paynesville, Minn., Production

Holly Schmitt, Thorp, Wis., Prod., Mfg.
 *Chelsea Schossow, Houston, Minn., Production
 *Kari Schumacher, Sleepy Eye, Minn., Production
 Chelsey Shumski, Fairmont, Minn., Production
 Jae Young Sim, South Korea, Manufacturing
 Sara Sontag, Shafer, Minn., Production
 *Audrey Souza, Milbank, S.D., Prod., Mfg.
 *Jacob Stadick, New Ulm, Minn., Production
 Della Stage, Vesta, Minn., Manufacturing
 Margaret Stiles, Lakeville, Minn., Production
 Brent Van Middendorp, Sioux Center, Iowa, Mfg., Prod.
 Alisha Vander Wal, Pipestone, Minn., Production
 *Nathan Vanderpoel, Los Banos, Cal., Production
 Michaela VanderWal, Milbank, S.D., Manufacturing
 Megan Viland, Pipestone, Minn., Production
 Kaylee Wegner, Faribault, Minn., Mfg., Prod.
 Abigail Weyrens, Plano, Texas, Production
 *David Wick, Jordan, Minn., Production
 Bobbi Jo Wild, Lansing, Iowa, Production
 Mitchell Younie, Alpena, S.D., Manufacturing
 Matthew Zirbel, Ortle, S.D., Production

*New students in 2013-2014

OUTREACH

Area Dairy Expos

Alumni, students, staff and faculty of the dairy science 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 advisor to the NCCIA. The annual meeting was held in Rochester, Minn., in October and attracted more than 130 cheese makers and suppliers from the upper Midwest.

Jackrabbit Dairy Drive

Roger Scheibe, industry relations director of the Midwest Dairy Association, and alumnus, collaborated with SDSU athletics for the first jackrabbit Dairy Drive at a women's basketball game on campus. 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.



K-12 STUDENTS



Dairy Camp

The Dairy Club hosted the 11th annual Dairy Camp for youth ages 8-18. Activities included a visit to a local commercial dairy, training on care of heifers, judging, a 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 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 visited schools in Minnesota and South Dakota.

EXTENSION

Eighth Annual I-29 Dairy Conference

More than 200 individuals in dairy farming improved their understanding of sustainability concepts at an I-29 Regional Dairy Conference held in Sioux Falls, S.D. The theme was "To prepare and develop a sustainable dairy community."

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 and to say hello.

STUDENT ACCOMPLISHMENTS

Nuria Garcia-Fernandez, a Ph.D. student under Dr. Ashraf Hassan, received the best graduate student dairy foods poster presentation award at the annual meeting of the ADSA in Indianapolis.

Nicole Jax, sophomore dairy science student, was the finalist in the Princess Kay of the Milky Way program of Minnesota, a very competitive program that selects the Minnesota Dairy Ambassador from among the finalists.

April Johnson received the 2013 National Dairy Shrine Student Recognition Award. April completed her B.S. in dairy production, and agriculture education, communication and leadership with an education specialization in 2013 and is currently member services coordinator for Associated Milk Producers Inc., (AMPI) New Ulm, Minn. Johnson was a member of a first place team at the 2013 North American Intercollegiate Dairy Challenge.

Taylor Jones was the top dairy products judge in the nation in 2013.

Laura Mealy, Khilendra Bhanduriya and Kimberly Buehner, members of the Dairy Product Development Team competed at the Idaho Milk Processors Association (IMPA) Product Development Contest in Sun Valley, Id. SDSU competed against teams from across the country and received a \$5,000 prize for placing second in the contest. The product developed by SDSU was Moo Delights which is a hybrid between a candy and protein bar.

Sanjeeva Ranathunga, a Ph.D. student under Dr. Kenneth Kalscheur received the third place award in the dairy production poster presentation at the annual meeting of the ADSA in Indianapolis.

Audrey Souza, a freshman dairy science student, served as the South Dakota Dairy Princess, promoting the dairy industry.

PLANT AND FARM UPDATES



The Davis Dairy Plant is in its third year of operation and has had a wide range of visitors including school groups, alumni, prospective students, professionals, the consul generals of Canada and Israel, and many others. We hired the Image Group of Michigan to create a video tour of the new plant which provides an excellent perspective of the plant and can be seen at

www.sdstate.edu/ds/plant/video.cfm. The first group of students that received hands-on training at the new plant have already graduated and are employed in the industry or have served as interns around the country. In 2013, we invited all of our Jackrabbit Dairy Council members and donors to the dairy plant project to come to campus to conduct interviews for summer internships and permanent positions. Twelve donor companies conducted 177 interviews and follow-up on-site interviews. Job offers for permanent positions and summer internships are being finalized.



Our Dairy Research and Training Facility has about 150 certified and registered milking cows including approximately 50 Brown Swiss and 300 animals total. 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 for teaching. K-12 students, too, have benefited through Dairy Camp

and cattle judging contests hosted at the farm. The farm is overseen by Stephen Crego, manager, and Melissa Schmitt, assistant manager, with Benjamin Choudek and Christopher Reiter serving as student managers. Ty Wilczinski joined the DRTF as ag foreman and took on the duties of feeding and maintenance. We are now embarking on a project for renovating and remodeling the facility to help us meet the teaching and research goals of the future. For planning of the new facility, we will invite dairy producers and other industry groups for input over the next year.



South Dakota State University
Dairy Science Department
Alfred Dairy Science Hall 136
Brookings, SD 57007

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RESEARCH HIGHLIGHTS

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

Management Systems to Improve the Economic and Environmental Sustainability of Dairy Enterprises *Drs. Kenneth Kalscheur and Jill Anderson* 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.

Strategies to Improve Nutrient Utilization of Biofuel Co-Products and Alternative Feedstuffs in Dairy Cattle Diets *Dr. Kenneth Kalscheur* The overall goal of the proposed research is to improve nutrient utilization of dairy cattle diets using alternative protein sources and biofuel coproducts. By improving the ruminal digestion of feedstuffs, nutrient utilization of the diet is improved resulting in a decrease in nutrient excretion to the environment while maintaining or improving milk production. The overall goal will be addressed through the following objectives: Evaluate the inclusion of new biofuel coproducts on ruminal digestion, microbial protein synthesis, overall nutrient utilization, and nutrient excretion in dairy cattle. Evaluate the inclusion of alternative protein sources such as canola meal in comparison to distillers grains and soybean meal on nutrient utilization in dairy cattle. Evaluate the inclusion of rumen-protected amino acids on meeting the amino acid requirement of lactating dairy cows while improving productivity and minimizing excretion of nutrients to the environment.

Evaluation of Different Dietary Energy Sources on Growth Performance and Metabolism of Replacement Dairy Heifers *Dr. Jill Anderson* Overall: 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 (> 50%) 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 of the projects are: 1) 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. Hasmukh Patel, Lloyd Metzger and Bonny Specker* 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 for this project include the following: 1) To 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) 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. 3) 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* Objective 1: To 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 Mistry and Sanjeev Anand* Objective 1. To 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. Objective 2. To develop novel functional ingredients from whey containing exopolysaccharides. Objective 3. To study the formation of biofilms on whey RO membranes as a cause of membrane fouling.