2021 Dairy Innovation Symposium
Thursday, Nov. 18: 8 a.m. – 4 p.m.
Varsity Hall, Union South, UW-Madison and livestream

DAIRY INNOVATION HUB

Speaker information and abstracts

Listed in presentation order

Opening plenary

Randy Jackson, Department of Agronomy, UW-Madison
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Jackson is a professor of agronomy and a collaborator on the NetZero Initiative. This new multi-state, multi-institution project is working to help cut greenhouse gas emissions in the U.S. dairy industry and is funded in part through a $10 million grant from the Foundation for Food & Agriculture Research (FFAR). Jackson's lab focuses on the structure and function of managed, semi-natural, and natural grassland ecosystems. Landscape-level nutrient exchange, ecosystem-level carbon and nutrient cycling, and plant community responses to disturbance.

Concurrent track
Enriching human health and nutrition

"Suppressing intestinal inflammation with dairy ingredients"
Yu Hasegawa, Department of Food Science, UW-Madison
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Hasegawa is a postdoctoral researcher in the Department of Food Science at UW-Madison working in Brad Bolling's lab. Bolling's research focuses on food chemistry and analysis in the context of functional foods and chronic disease prevention. Prior to coming to UW, Hasegawa completed her PhD in Food Science and Technology at UC-Davis.

Project summary: Fermented milk products (FMPs) such as yogurts and kefir are increasing in popularity in the U.S. While consumer acceptance of the established health-promoting properties of FMPs is increasing, it's not fully understood how FMPs promote health. With a better understanding of these products and their health benefits, it is expected that the food industry will be able to produce FMPs with improved health-promoting properties and consumer appeal. The objective of this project is to determine how FMPs regulate gut inflammation and how they could help prevent chronic systemic inflammation. This research will be conducted with guidance from Brad Bolling, professor of food science.

"Predicting the mouth-feel sensations of ice cream"

Bidhan Roy, mechanical and industrial engineering, UW-Platteville
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Roy is an associate professor of mechanical engineering and specializes in continuum mechanics, biofluid mechanics, applied mathematics and computational methods.

Tom Zolper, mechanical and industrial engineering, UW-Platteville
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Zolper is an assistant professor of mechanical engineering and specializes in fluid mechanics, energy systems and polymer rheology.

Project summary: Wisconsin ranks as a major producer of ice-cream and most manufacturers have been in business for over 50 years, many are small family-owned businesses. To sustain a robust economic growth, the ice-cream industry must keep strides with recent advances in science, technology and customer preference. To be at the forefront in producing nutritious products in an economically, environmentally and socially sustainable manner, the industry must innovate. This study builds understanding of the fluid mechanical characteristics of an ice-cream mix prepared by students as part of their coursework. Using a neural network model, the characteristics are correlated with the mouth-feel sensations of the ice-cream samples. This enables prediction of the taste sensations for various types of ice-cream mixes

"The genetic determinants of gastrointestinal tract colonization by Listeria monocytogenes"

Tu Anh Huynh, Department of Food Science, UW-Madison
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Huynh is an assistant professor in the food science department at UW-Madison. She began to study c-di-AMP signaling in Listeria monocytogenes as a postdoctoral researcher and continues to explore its mechanisms in her current lab at UW-Madison.

Project summary: Listeria monocytogenes (Listeria) is a dangerous foodborne pathogen commonly associated with dairy product outbreaks. Listeria infection has remarkably high hospitalization and mortality rates, thus the FDA implements a zero-tolerance policy for Listeria in ready-to-eat products. Listeria is also a common pathogen of dairy animals, such as cattle, sheep and goats. Although most adult cattle have a high tolerance for Listeria infection, this pathogen can cause encephalitis (circling disease), death in young calves and abortion in pregnant animals. Additionally, fecal shedding of Listeria is very common in dairy cattle, who often show no symptoms. This may increase transmission within the herd, particularly compromising susceptible animals. Additionally, shedding increases the likelihood of dairy product contamination with Listeria. This project evaluates Listeria samples obtained from Wisconsin dairy cows for antibiotic resistance, outbreak potential and environmental persistence, and investigates the mechanisms behind cows with Listeria having no symptoms.

"Opportunities to collaborate with CDR: academic departments, pilot plants and entrepreneurs"
John Lucey, director, Center for Dairy Research
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John has a PhD in Food Science and over 20 years of research experience. He previously worked in Ireland, the Netherlands and New Zealand. As CDR Director he provides leadership to CDR staff to help CDR move forward and live up to its reputation as a world-class research center focused on applications, outreach and education. He is also a professor in the Food Science department and conducts research on the functionality of dairy foods. He has published more than 130 peer-reviewed articles and 20 book chapters.

Tom Guerin, research program manager, Center for Dairy Research
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With two decades of experience in the research and development of food ingredients with the Kerry Group, Tom has worked with manufacturers on different applications in countries and markets across the globe. As the research program manager at CDR, Tom works with staff to build on current CDR successes and helping the organization become more aligned with the changing demands and trends of the food industry. He is a native of Ireland and has a Ph.D. in Biochemistry from the National University of Ireland, Galway.

Concurrent track
Stewarding land and water resources

"Virtual enclosures to enforce managed grazing"
Hal Evensen, Engineering Physics, UW-Platteville
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Evensen is a professor of engineering physics at UW-Platteville. His collaborative research explores the self-assembly of semiconducting carbon nanotube films, and application of these to electronics and sensors. He is additionally involved in developing IOT-related education.

Cyrus Habibi, electrical engineering, UW-Platteville
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Habibi is an associate professor in the electrical and computer engineering at UW-Platteville. In addition to teaching, his research interest lies in the field of industrial instrumentation and control, signal processing, and sensors.

Project summary: Chris Wilson rotates his grazing dairy herd by manually moving lightweight fencing, which is cumbersome. Digital solutions for confining livestock exist, involving use of GPS collars. However, these systems are costly and over-designed for the end goal, which is merely to move the cattle through a grazing area. This project is developing "local" means to establish and enforce a virtual, progressive grazing area by moving a physical fence or objects; and moving a virtual fence using short-range wireless technologies.

"Efficacy of manure nutrient prediction and variable rate technology to improve nutrient use efficiency"

Iris Feng, Department of Biological Systems Engineering, UW-Madison
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Iris (Xiaoyu) Feng is a postdoctoral researcher in the Department of Biological System Engineering at UW-Madison working in Matt Digman's lab. Feng has expertise in methane emission analysis, and predictive modeling of air quality and manure nutrients. For both swine and dairy. Prior to coming to UW, Feng completed her PhD in Agricultural and Biological Engineering at Purdue University.

Project summary: Applying manure nutrients to meet agronomic needs can maximize yields and minimize nutrient losses to the environment. Unfortunately, current methods require lab testing weeks before or after land application. In addition, manure analysis does not reflect the nutrient concentration of the entire manure storage contents. Near infrared sensing systems provide real-time estimates of manure nutrients, allowing application rates to be adjusted in the field. While this has great potential for improvements in manure application systems, the ability to accurately predict nutrients and the impact to the entire cropping system needs to be assessed to determine if this technology holds value for farmers. This research assesses manure nutrient sensing systems in the lab to determine the ability to measure manure nutrient constituents in comparison to accepted laboratory methods. In addition, a sensing system is being integrated on a manure tanker to assess the impact to nutrient variability and to crop yield compared to traditional application methods.

"Water quality, nitrogen use efficiency, and soil health: the shovel-ready projects of the UW-Discovery Farms"

Matt Ruark, Department of Soil Science, UW-Madison
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Matt Ruark is a professor and extension specialist in the Department of Soil Science at UW-Madison. He has program affiliations with UW Discovery Farms, the Center for Integrated Agricultural Systems, USDA Sustainable Dairy Project, Wisconsin-Agribusiness Association and the Wisconsin Crop Management Conference.

Project summary: The UW-Discovery Farms program was established in 2001 to conduct edge-of-field water quality monitoring on farms in Wisconsin. Since then, it has expanded into on-farm assessment of nitrogen use efficiency and soil health. However, data has been collected at a pace that far exceeds the ability to analyze it. The datasets built through Discovery Farm's activities are unique in terms of quantity and quality. This research will fund a postdoctoral researcher to aid in analysis of datasets, with the goal of developing best management practices for reducing impacts on water quality, increasing efficient Nitrogen use, and improving soil health on dairy farms. There are three objectives of this project: First, use data sets to determine effects of manure management, soil management, weather and soil conditions on phosphorus runoff; Second, benchmark nitrogen use efficiency on a regional basis for corn grain and corn silage production in Wisconsin; and finally, identify which biological indicators of soil health should be promoted in Wisconsin. The goal of this research is scientific-based recommendations for manure, fertilizer and soil management on dairy farms.

Concurrent track

Ensuring animal health and welfare

"Harnessing the power of computer vision systems to improve animal health and welfare in transition dairy cows"

Joao Dorea, Department of Animal and Dairy Sciences, UW-Madison
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Dorea is an assistant professor in precision agriculture and data analytics. After completing his PhD, Dorea spent two years coordinating dairy and beef research in Latin America for DSM, a global supplier of animal health and nutrition products. He developed his expertise in data analytics and sensor technology when he came to the UW–Madison in 2016. In August of 2019, Dorea became faculty in the Department of Animal and Dairy Sciences.

Project summary: Nearly all cows will experience negative energy balance to support the high energy demands of lactation during the transition period. This can lead to a variety of metabolic disorders. Body condition score is a commonly used tool to monitor and manage these disorders. However, body condition is a periodic, subjective measurement that cannot detect small changes in body shape or composition. Consequently, the development of a computer vision system to assess body condition scores in real-time will play a crucial role to precisely detect changes in body condition. The objective of this project is to develop a platform that uses sensors for real-time detection of body shape and animal behavior. Results will be used for precise and early detection of metabolic disorders and associated health problems. The primary research goal is to develop artificial intelligence technologies to solve

real-world problems on dairy farms. Implementing computer vision systems enables data-driven solutions that can directly impact dairy farmers' life.

"Precision animal-monitoring technologies and animal welfare research outcomes"

Jennifer Van Os, Department of Animal and Dairy Sciences, UW-Madison
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Van Os is an assistant professor and extension specialist in animal welfare on the faculty of the Department of Animal and Dairy Sciences at UW-Madison. The research in her lab focuses on understanding, evaluating, and improving the welfare of dairy animals from biological and social science perspectives. The goal of Van Os' extension program is to promote best practices in management and housing to help the dairy community adapt as our scientific knowledge about animal welfare continues to grow.

Project summary: Understanding and promoting animal welfare is an essential part of achieving sustainability in food animal production. To this end, the applied research questions in Van Os' program follow these broad themes:

- Understanding the needs of farmed animals from a biological, species and life-stage-appropriate perspective: what behaviors are important for them to be able to express and what resources do they need?
- Improving the fit between farmed animals and their environments: how do housing, management, and handling decisions affect behavior, physiology, and production?
- How do we evaluate animal welfare effectively in both research and commercial farm settings?

"Using DHIA data to predict feed intake in lactating cows"

Billy Brown, Department of Animal and Dairy Sciences, UW-Madison
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Brown is a post-doctoral research associate in Heather White's lab, having previously completed degrees at Kansas State University and Michigan State University. His work has focused on metabolic and inflammatory mechanisms of feed intake regulation in peripartum dairy cows. He has also conducted research on the use of novel feed byproducts in lactating dairy diets, forage processing methods, and silage hygiene.

Project summary: Accurate prediction of dairy cow dry matter intake (DMI) is difficult without individual feeding stations, therefore determining individual cow feed efficiency is not currently possible on a large scale. Recent modeling work used cow factors, milk production, milk mid-infrared spectra, and behavioral sensors to predict DMI with reasonable success. Prediction models generally use averaged data over time, which is not feasible on most dairy farms, but

new Feed Saved PTA could be beneficial for on-farm DMI prediction. DHIA data streams offer a wealth of information that could be useful for DMI predictions but predicting DMI using combination of single DHI milk sample, milk fatty acids, and PTA has not been tested. The objective of this research is to develop DMI prediction models using single point-in-time data, including cow descriptive factors, a single DHI milk sample with fatty acid profile, and PTA for production and efficiency.

Concurrent track

Growing farm business and communities

"Student innovation competitions; benefits and opportunities"

Heidi Zoerb, external relations, UW-Madison (moderator and panelist)
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Zoerb is the associate dean for External Relations in CALS where she coordinates college communications and builds relationships with stakeholders.

Tera Montgomery, dairy and animal science, UW-Platteville
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Montgomery is a professor of dairy and animal science in the UW-Platteville School of Agriculture and is the campus liaison for the Dairy Innovation Hub at UW-Platteville. Montgomery is also advisor to the Pioneer Dairy Club, coaches the Dairy Challenge team, and is the advisor for the student-managed ice cream business, Pioneer Sweets.

Chuck Nicholson, Department of Agricultural and Applied Economics, UW-Madison
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Nicholson is an associate professor specializing in dairy economics and agribusiness related to the U.S. and Wisconsin dairy supply chain, dairy markets and policy. His position is part of the first faculty cohort funded by the Dairy Innovation Hub at UW-Madison.

Project summary: With help from a short-term, high -impact grant from the Dairy Innovation Hub, Heidi Zoerb joined forces with the Madison-based Hyper Innovation agency to create an experience where students from UW-Madison, UW-Platteville and UW-River Falls could participate in a team-based innovation competition to develop solutions to challenges facing the dairy community. With guidance from dairy professionals, students participated in a "hack-a-thon" to brainstorm ideas and then develop the most promising ideas for commercialization. This session will detail Zoerb's project and discuss best practices for creating and managing student competitions for student success, real-world application and learning outcomes. Nicholson and Montgomery will share insights from their student-centered approaches at Cornell University and UW-Platteville, respectively.

"Calf management practices, animal welfare and the social sustainability of the dairy community"

Albert Boaitey, Department of Agricultural Economics, UW-River Falls
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Boaitey is an assistant professor in the Department of Agricultural Economics who teaches agricultural price and marketing courses. His research is focused on the economics of livestock production and consumption.

Project summary: Changes in consumer preferences, the emergence of substitute products, and the increased role of health, environmental and farm animal welfare considerations in food choice poses significant challenges to the US dairy community. One of the most important yet controversial farm animal welfare issues facing the industry are concerns about current calf management practices. Specifically, the separation of calves from cows and how calves are housed post separation. While producers and other industry experts favor cow-calf separation, data from many consumer surveys suggest the opposite. Previous work also suggests that consumers prefer group housing to individual housing methods. However, the extent to which housing choice addresses consumer concerns about calf separation is unknown. Most importantly, the role of concerns about calf management in consumer dairy product choice decision has not been previously addressed. There may be creative ways through which farmers can address these concerns to ensure the long-term financial and social sustainability of the dairy industry. Using data from consumer and farmer surveys, we will analyze perceptions relating to calf management under different information treatments. The intended outcomes include an increased understanding of perception and knowledge gaps between consumers and farmers, increased farmers' understanding of consumer perspectives and increased adoption of incremental animal welfare improvements by dairy farmers.

"Changing agricultural land: understanding impacts on southern Wisconsin's dairy farms and rural communities"

Claudine Pied, Department of Social Sciences, UW-Platteville
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Pied is an associate professor of sociology and anthropology. Her research interests include rural politics and economic change and land ownership and access in the US.

Shan Sappleton, Department of Social Sciences
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Sappleton is an associate professor of political science focusing on comparative and international politics. Her research includes Francophone West Africa, ethnic politicization and

democratic consolidation.

Project summary: As record numbers of small and mid-sized dairy farms have closed, agricultural lands are changing hands, often being converted out of agriculture, or consolidated into larger farms. This project will study the effects of land changes on southern Wisconsin dairy farms and communities and will explore the possibilities of land stewardship to alleviate farmers' struggles. In the first phase of the project, researchers will analyze existing data on the economies, populations and land sales of Grant and Dane counties. In the second phase, student and faculty researchers will interview farmers and community members to learn about their relationship to the land, how their land use has changed and the benefits and barriers of various agricultural land-use programs. In phase three, a survey will focus on differences in the towns and regions of southern Wisconsin. Study results will ultimately help dairy leaders, government agencies and nonprofit organizations make decisions about land use policy. One of the primary goals is to increase student awareness of land stewardship, strong farms, and healthy communities and build stronger connections between social science and agriculture at UW-Platteville.

"Analyzing the costs and benefits of manure regulations for dairy farm economic viability and soil and water sustainability"

Marin Skidmore, Nelson Institute for Environmental Studies, UW-Madison
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Skidmore is a postdoctoral researcher in the Nelson Institute for Environmental Studies at UW-Madison. She studies the interaction of agriculture, development, and the environment. Until this project, her primary focus has been on in the Brazilian Amazon, focusing on how zero-deforestation policies in the cattle sector affect both deforestation and agricultural productivity.

Project summary: Stewarding land and water resources and overcoming the financial hardships that lead many farms to exit the dairy business are two key challenges faced by the Wisconsin dairy community. A future where Wisconsin waterways are clean with an economically thriving dairy community requires effectively designed environmental and economic policies. The goal of this project is to analyze how and under what circumstances manure regulations improve water quality. This research will produce a dataset of local manure regulation over time, shedding light on current policy structure and inconsistencies and facilitating scientific analysis of regulatory impacts. This data will be used to test whether current manure policies, and which aspects in particular (eg. storage vs spreading regulation), improve local water quality. Researchers will also consider how the local context (eg. farm sizes, soil depth, typical climate patterns) interact with policy effectiveness. The study will add to the understanding of how regulation of non-point sources improves water quality. This information

will help policy makers craft regulation based on sound science that maximize the benefits to waterways and minimize their costs to farmers.

Closing plenary

Denise Ney, Department of Nutritional Sciences, UW-Madison
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Ney is a professor in the Department of Nutrition Sciences at UW-Madison and is director of the Didactic Program in Dietetics. Her research program addresses gastrointestinal physiology with a special interest in the dairy protein produced during cheesemaking, glycomacropeptide (GMP). Ney has pioneered the use of medical foods made with GMP for the dietary management of phenylketonuria (PKU), a rare genetic disease. Her work with dairy is also helping a new population – postmenopausal women.

Event emcee

Heather White, Faculty Director, Dairy Innovation Hub
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Heather White is an associate professor in the Department of Animal and Dairy Sciences at UW-Madison. Her research focuses on the health and nutrition of dairy cows during the transition period. In 2019, White was named faculty director of the Dairy Innovation Hub.

Questions? Contact Maria Woldt, Dairy Innovation Hub program manager, (608) 265-4009, maria.woldt@wisc.edu