Ensuring animal health and welfare

Mark Levenstein, Department of Biology, UW-Platteville
“Nanosculpted silicon membranes for shape-based biological separations”
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Levenstein is an assistant professor of molecular biology and biotechnology and academic director of the Master of Science in applied biotechnology program. He teaches a variety of courses in biological sciences including animal tissue culture, where he trains students in aseptic technique and laboratory cell culture.

Project summary: Dairy farmers contend with a broad array of pathogens in their efforts to produce high-quality milk. For example, almost 20 different microbes are known to cause mastitis, the most common disease of dairy cattle. These infections are often treated using broad spectrum antibiotics, which raises concerns of antibiotic resistance. Isolating and identifying specific culprits from small test samples will enable farmers to incorporate more focused treatment regimens with less productivity loss for their livestock. To achieve this goal, we propose to develop a nanofiltration system that can be customized to isolate microbial species. While techniques exist for the separation of particles by mass or size, they lack the precision to separate by shape. We propose a novel method to separate particles based on shape and size, using precision nanoporous membrane filters. This platform will provide a significant step forward in our ability to isolate pathogens and enable dairy farmers to more effectively manage the health of their herds.

Kerri Coon, Department of Bacteriology, UW-Madison
“Competency of flies to acquire and transmit pathogenic bacteria to dairy cows”
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Coon is an assistant professor in the Department of Bacteriology. Research in her lab centers on insect-microbe interactions, with a current focus on understanding the diversity and function of gut microbes in mosquitoes and other insect disease vectors.

Project summary: Mastitis and enteritis are two of the most common and costly diseases affecting dairy cattle in the United States and worldwide. However, very little is known about how
dairy cows acquire mastitis and enteritis-causing bacteria from the environment. The overall objective of this research is to determine the capacity of flies (Diptera: Muscidae) to transmit disease-causing bacteria to Wisconsin dairy cattle. The presence and abundance of potentially pathogenic bacteria will be examined in fly and manure samples collected from dairy farms across southeastern Wisconsin. Results of this study will provide new insight into the underlying environmental persistence and transmission of bacterial pathogens that are harmful to cow health and production. This research will also establish a cross-disciplinary collaboration between researchers at UW-Madison and support the development of new resources and outreach materials to engage dairy farmers, dairy partners and the public. Collaborators include Garret Suen, Department of Bacteriology, Johanna Elfenbein, Department of Pathobiological Sciences and Andrew Sommer, Department of Bacteriology.

Sylvia Kehoe, Department of Animal and Food Science, UW-River Falls
"Improving the health and welfare of dairy calves"
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Kehoe is a professor in the Department of Animal and Food Science teaching a variety of courses related to dairy and nutrition.

Project summary: This project addresses research questions related to calf welfare and health. The first project is to refine a disbudding paste applicator prototype. Although paste is an easier method of disbudding, it can be done wrong with serious ramifications to the calf, such as face burns. The prototype is a safe applicator that has the potential for patenting and wide distribution. The second aspect of the project is to survey mineral and vitamin concentrations in calves who are fed pasteurized waste milk. In general, these calves do not eat as much grain starter due to their high intake of milk. With a lack of vitamin and mineral intake, calves can become deficient over time which will impair immune function and growth. These two projects are aimed at helping farmers raise their calves with less labor, better health and less stress.

Hub-funded research introductions
Stewarding land and water resources

Veronica Justen, Department of Plant and Earth Science, UW-River Falls
"Novel dairy cropping systems to enhance economic and environmental resilience of Wisconsin dairy farms"
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Justen is an associate professor of crop science in the Department of Plant and Earth Science. She teaches courses on grain crop production, sustainable agriculture, plant breeding and genetics. Her research interests are in enhancing diversified crop rotations including cover crops and winter hardy small grains. She has been at UW-River Falls since 2010.

Project summary: Cover crops are a best management practice shown to have positive impacts on land and water resources by minimizing soil and nutrient loss from agricultural lands. Cover crop options for dairies in Wisconsin have mostly been limited to cereal rye established after corn harvest due to seasonal, machinery and crop production restraints. Interseeding cover crops into standing corn silage would provide additional opportunities for growers to establish cover crops and increase the diversity of cover crop species utilized. Identifying new cover crop varieties, including oilseed or tilling radishes, would expand opportunities to improve dairy farm resiliency. This project aims to enhance cropping system options for dairy farms by 1. Conducting interseeding cover crop trials in wide and traditional row silage corn, 2. Evaluating oilseed radish germ plasm to identify superior varieties for Wisconsin dairy farms and 3. Creating “Virtual Field Day” videos that demonstrate these cover crop systems to farmers and other agricultural professionals. This research will be conducted with collaboration from Jason Cavadini and Matt Akins from the Marshfield Agricultural Research Station and Matthew Oehmichen, a crop adviser with Short Lane Ag Supply.

**Hal Evensen, Engineering Physics, UW-Platteville**

“Local virtual enclosures to enforce managed grazing”
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Evensen is a professor in the Department of Engineering Physics. 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 Internet of Things (IOT)-related education.

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. Therefore, we propose to investigate and develop “local” means to establish and enforce a virtual, progressive grazing area. We will pursue two approaches: moving a physical fence or objects; and moving a virtual fence using short-range wireless technologies. For the “virtual” option, some technologies under consideration are ultra-high frequency RFID and Bluetooth Low Energy (BLE) tags. Using beacons or readers, the animal’s rough location will be monitored, allowing it to be directed toward “acceptable” locations as determined by the farmer.
Jill Coleman Wasik, Department of Plant and Earth Science, UW–River Falls
“Strategic study of factors influencing contaminant transport from the land surface into aquifers”
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Coleman Wasik is an associate professor in the Department of Plant and Earth Science. Her research interests include how human activity impacts the transport of nutrients and other contaminants through natural systems. The ultimate goal of her work is to understand how human activities benefit from natural processes while also lessening their impacts on natural systems.

Project summary: Groundwater contamination is a threat to dairy farms in Wisconsin for a variety of reasons. This project will study contaminant leaching and transport under different cropping and nutrient management practices. The goal is to develop precise land management recommendations for dairy farmers in western Wisconsin based on soil conditions and aquifer susceptibility. The work will leverage the close collaboration that has developed over the past two years between the Plant and Earth Science Department and the Western Wisconsin Conservation Council. The council provides cost-share funding for alternative cropping and nutrient management practices thus providing this project with a group of landholders interested in studying the benefits and consequences of different field management strategies. The research conducted will also provide preliminary data about regional aquifers that will be used to develop proposals for other funding sources.

Hub-funded research introductions
Enriching human health and nutrition

Tu Anh Huynh, Department of Food Science, UW–Madison
“The genetic determinants of gastrointestinal tract colonization by Listeria monocytogenes”
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Huynh is an assistant professor in the food science department. 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 will evaluate Listeria samples obtained from Wisconsin dairy cows for antibiotic resistance, outbreak potential and environmental persistence, as well as investigate the mechanisms behind cows with Listeria having no symptoms. The findings will inform treatment and intervention strategies to enhance animal health and food safety.

Denise Ney, Department of Nutritional Sciences, UW–Madison
“Treating obesity by manipulating satiety hormones and the gut microbiota”
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Denise Ney is a professor in the Department of Nutrition Sciences 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.

Project summary: This research will create a value-added product from cheese whey, a GMP protein supplement, to treat obesity and prevent related health problems in humans. Obesity affects one in three adults and contributes to inflammation, diabetes, cardiovascular disease and premature death. GMP is a 64 amino acid glycophosphoprotein isolated from cheese whey. Pilot studies in humans and mice indicate that GMP has anti-obesity properties, especially in females. GMP reduces hunger hormones and inflammation, increases fat burning and leads to better digestion. Additional human research is needed to support GMP supplements to treat obesity. The tangible outcome of this research is to create a new GMP protein supplement from sweet cheese whey that treats obesity. This research team anticipates a GMP supplement will be available for sale by 2021–2022.

Rodrigo Ibanez Alfaro, Center for Dairy Research
“Manufacturing natural cheeses containing bioactive peptides with improved antihypertensive properties”
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A native of Chile, Ibanez Alfaro is associate scientist at CDR focusing on microbiological topics related to cheese and dairy products, along with writing research proposals and supporting
research and outreach activities at CDR. He hopes his contribution in research will improve the quality and competitiveness of U.S. dairy products.

Project summary: Cardiovascular diseases such as hypertension, are the main cause of death in the United States and consumers are looking for food products with beneficial effects in human health. Fermented dairy products (cheese) contain bioactive peptides with antihypertensive peptides generated during manufacture/ripening. Cheese manufacturing techniques can improve production of bioactive peptides. This research proposal aims to obtain a natural cheese with enhanced antihypertensive properties obtained from a traditional (by selecting rennet and starter/adjunct cultures) and an alternative approach (by incorporating an enriched peptide isolate during manufacturing). Cheeses with the highest antihypertensive properties will be further evaluated in model systems to determine if these bioactive compounds with antihypertensive properties are improved, maintained or degraded after gastrointestinal digestion as well as the potential to be absorbed. This will allow Wisconsin cheesemakers to manufacture differentiated and enriched high added value products, which will enhance human health and nutrition and will have the potential to reach new domestic and export markets.

**Hub-funded research introductions**

**Growing farm business and communities**

**Marin Skidmore, Nelson Institute for Environmental Studies, UW-Madison**

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

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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. This research supports the Wisconsin Dairy Task Force 2.0 recommendation #47: “Need for regulatory certainty and consistency” and #19: “Capital for new and emerging technology”. Marin Skidmore, a postdoctoral fellow in the Nelson Institute for Environmental Studies is collaborating on this research.

Albert Boaitey, Department of Agricultural Economics, UW–River Falls
“Calf management practices, animal welfare and the social sustainability of the dairy community”
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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. This research will be conducted in collaboration with Sylvia Kehoe, professor of animal and food science.

Heidi Zoerb, CALS External Relations, UW–Madison
"Dairy Innovation Hub student challenge"
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Heidi Zoerb is the associate dean for External Relations in CALS where she coordinates college communications and builds relationships with stakeholders.

Project summary: By joining forces with the Madison-based Hyper Innovation agency, students from UW-Madison, UW-Platteville and UW-River Falls will participate in a team-based innovation competition to develop solutions to challenges facing the dairy community. With guidance from dairy professionals, students will participate in a “hack-a-thon” to brainstorm ideas and then develop the most promising ideas for commercialization. This fall-semester competition will be hosted entirely online. The best student projects will be showcased at the Dairy Innovation Hub Summit in November. Learn more at go.wisc.edu/dairyhubstudentchallenge. Sandra Bradley from Hyper Innovation is collaborating on this project.

Supply chain panel discussion
“Opportunities and innovations in the supply chain”
- Speakers TBA

John Umhoefer, Wisconsin Cheese Makers Association (moderator)
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John Umhoefer is the executive director of the Wisconsin Cheese Makers Association. WCMA serves dairy processors and industry supplier partners as a policy advocate, networking hub, and source of education and information.

Farmer panel discussion
“Critical challenges for today’s dairy farms”

Amy Penterman, Dutch Dairy, Thorpe
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Amy Penterman dairy farms with her husband, Sander. She has also worked as a crop insurance agent for more than 20 years. Sander grew up in the Netherlands on a 60-cow dairy farm and immigrated to the U.S. in 1999. After an internship to gain knowledge on dairying in Wisconsin, Sander and his family bought Dutch Dairy in 2002 and started milking 320 cows. Today, they milk 850 cows and are the sole owners of the farm. They farm 1,275 acres and employ 12 full-time and
two part-time employees. For Amy, the most rewarding part of farming is raising her family on the farm to learn the values of hard work, dedication, teamwork and pride. We love our cows and our farm.

**Andy Buttles, Stone-Front Farm, Lancaster**  
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Andy Buttles owns and manages Stone-Front Farm with his wife Lyn. Together, Andy and Lyn successfully own and manage the dairy as equal partners. The dairy is currently in the process of expanding to 1,200 cows, 1,200 youngstock and employs 25 team members. Andy is a graduate of UW-Madison and received his degree in dairy science.

**Mitch Breunig, Mystic Valley Dairy, Sauk City**  
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Mitch and Jacquie Breunig and family own and operate Mystic Valley Dairy, a 450-cow farm in Sauk City. Mitch’s parents, Louis and Jeannette, started the farm in 1961 with 120 acres and 35 cows. It grew to around 80-100 cows with 400 acres by the late 1980s. After Mitch graduated from the University of Wisconsin-Madison and worked in feed sales for a year, he returned to the farm. In 1998, the current milking parlor and free stall barn were built, and Mystic Valley Dairy LLC was formed. Mitch is now the sole owner.

Mitch has remained connected to the UW community by participating in numerous research trials on his farm. He has also hosted tours and events for student and alumni groups. Mitch currently serves as the advisory council chairperson for the Dairy Innovation Hub.

**Katie Roth, Banner Ridge Farms, Platteville**  
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Katie Roth and her husband TJ are partners with John and LuAnn Shea and family in Banner Ridge Farms – a medium sized dairy located in Platteville. TJ manages feeding and fieldwork and Katie serves as herdsperson. John and LuAnn continue to stay involved; Jill manages calves and Steve manages equipment. Both families collaborate on efforts to open their doors to the public through dairy breakfasts, local grade schools and FFA events.

In addition to her work on the farm, Katie serves as an assistant student services coordinator for the College Business, Industry Life Science and Agriculture at UW-Platteville.
**Shelly Mayer, Professional Dairy Producers of Wisconsin (moderator)**  
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Shelly is the executive director of the Professional Dairy Producers of Wisconsin (PDPW). The organization has led the national effort to define dairy animal well-being and maintain customers’ confidence that our industry embraces the moral obligation to take good care of our animals and produce safe and abundant dairy and meat products. Together with her husband Dwight and three children, Shelly dairy farms and manages an agri-tourism business near Slinger.

**Legislative panel discussion**

**“Support for the Hub and Wisconsin agriculture”**

**Sen. Howard Marklein**  
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Senator Howard Marklein (R-Spring Green) was raised on a dairy farm in rural Spring Green. Prior to joining the Wisconsin Legislature, Sen. Marklein was a certified public accountant. He was first elected to the State Assembly in 2010 and to the State Senate in 2014. In the State Senate, Sen. Marklein chairs the Committee on Agriculture, Revenue and Financial Institutions and is the vice chair for the Committee on Transportation, Veterans and Military Affairs. He is a member of the Senate Committee on Finance, Senate Committee on Natural Resources and Energy, Joint Committee on Finance and Joint Legislative Council. Along with several other legislators, Sen. Marklein introduced Senate Bill 186, which funded the Dairy Innovation Hub.

**Rep. Dave Considine**  
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Representative Dave Considine (D-Baraboo) was born in Janesville and raised in North Prairie. Rep. Considine and his family have farmed and maintained conservation land for more than 40 years. Prior to joining the State Assembly in 2014, he was a teacher in the Baraboo School District. Rep. Considine serves on the Committee on Agriculture, Committee on Education, Committee on Mental Health, Committee on Rural Development, Committee on Transportation, Speaker’s Task Force on Adoption, Special Committee on State–Tribal Relations.
Representative Tony Kurtz (R-Wonewoc) has an organic grain farm in Wonewoc. Prior to joining the state assembly in 2018, he spent two decades in the U.S. Army. Rep. Kurtz is vice chair for the Committee on Health and serves on the Committee on Agriculture, Committee on Corrections, Committee on Environment, Committee on Rural Development, Committee on Veterans and Military Affairs, Speaker’s Task Force on Suicide Prevention and Speaker’s Task Force on Water Quality. Along with several other legislators, Rep. Kurtz cosponsored Senate Bill 186, which funded for the Dairy Innovation Hub.

Chad Zuleger, Dairy Business Association (moderator)

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Chad joined the DBA team in 2019 as associate director of government affairs after nearly 25 years in and around Wisconsin state government. During his career, Chad has served as legislative staff for several state Senators and Representatives and in government affairs roles for associations and trade organizations. In addition to his background in state government, Chad served in the U.S. Air Force and Wisconsin Air National Guard for 23 years, retiring in 2010 as Captain.

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