



# ANNUAL REPORT 2023

**REFLECTING ACTIVITIES**  
from July 1, 2022 - June 30, 2023





*Harnessing research and development for Wisconsin's dairy community.*

**On the cover:** Xia Zhu-Barker, assistant professor in soil science at UW-Madison, takes a soil sample using a soil probe at the Arlington Agricultural Research Station. Zhu-Barker's faculty position is funded by the Dairy Innovation Hub. See story on p. 44. Photo by Maria Woldt/Dairy Innovation Hub

**Above:** Jamie Madison Matthews, left, is a spring 2023 graduate from UW-Platteville with a degree in zoology and animal biology. Together with Zifan Wan, right, assistant professor in the School of Agriculture funded by the Hub, they make Queso Fresco cheese and collect curds during a dairy product analysis and processing lab. Photo by Andy McNeill/UW-Platteville

# WELCOME TO OUR FISCAL YEAR 2023 ANNUAL REPORT

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Scan QR code to access the fully searchable "Project Showcase" database with information on all 200+ Hub-funded awards to date!

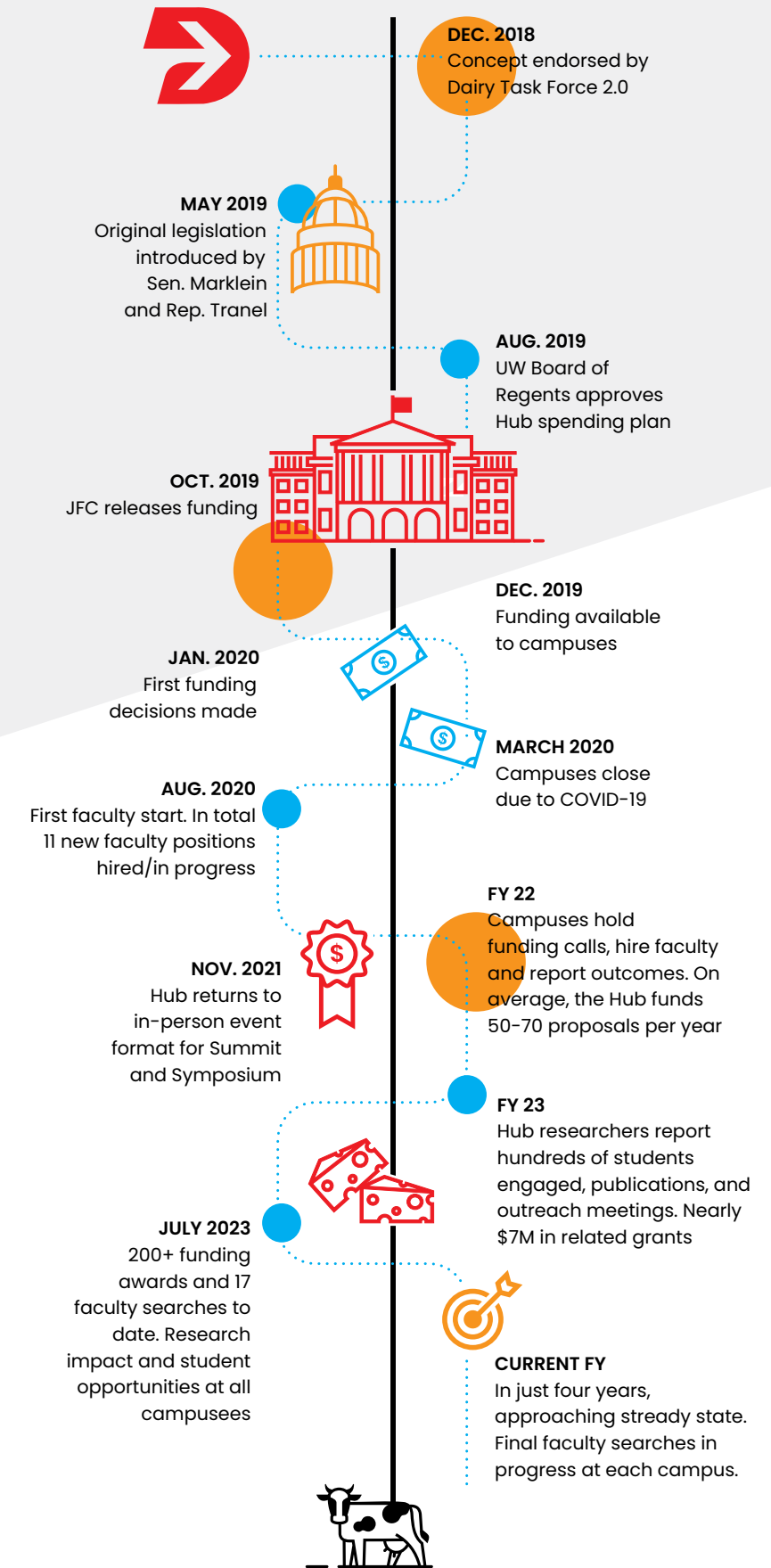
# OUR STORY

The Dairy Innovation Hub was first imagined during an informal meeting at Mitch Breunig's Mystic Valley Dairy in Sauk City. After the initial concept was developed, dairy groups and passionate dairy leaders partnered with UW System to bring this idea to reality.

The concept was brought to the State's special Dairy Taskforce 2.0 in December of 2018 and was followed by introduction of legislation by Senator Howard Marklein and Representative Travis Tranel in May 2019. The following months included approval of a spending plan set to guide the Hub's efforts and funding became available to campuses in late 2019.

In four years, the Hub has created mechanisms to manage the investment, funded more than 200 proposals, and managed 17 faculty searches. The accomplishments listed herein are the result of data collected from funding recipients to track progress and accountability.

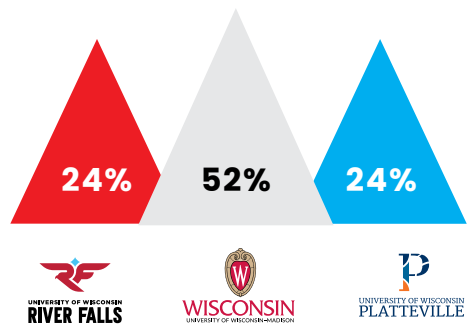
**THE DAIRY INNOVATION HUB** is supported by a \$7.8M annual state investment to drive research and development across the UW-Madison, UW-Platteville, and UW-River Falls campuses, ensuring that Wisconsin's \$45.6 billion dairy community remains a global pacesetter in producing nutritious dairy products. This is all accomplished with a keen focus on economic, environmental, and social sustainability.



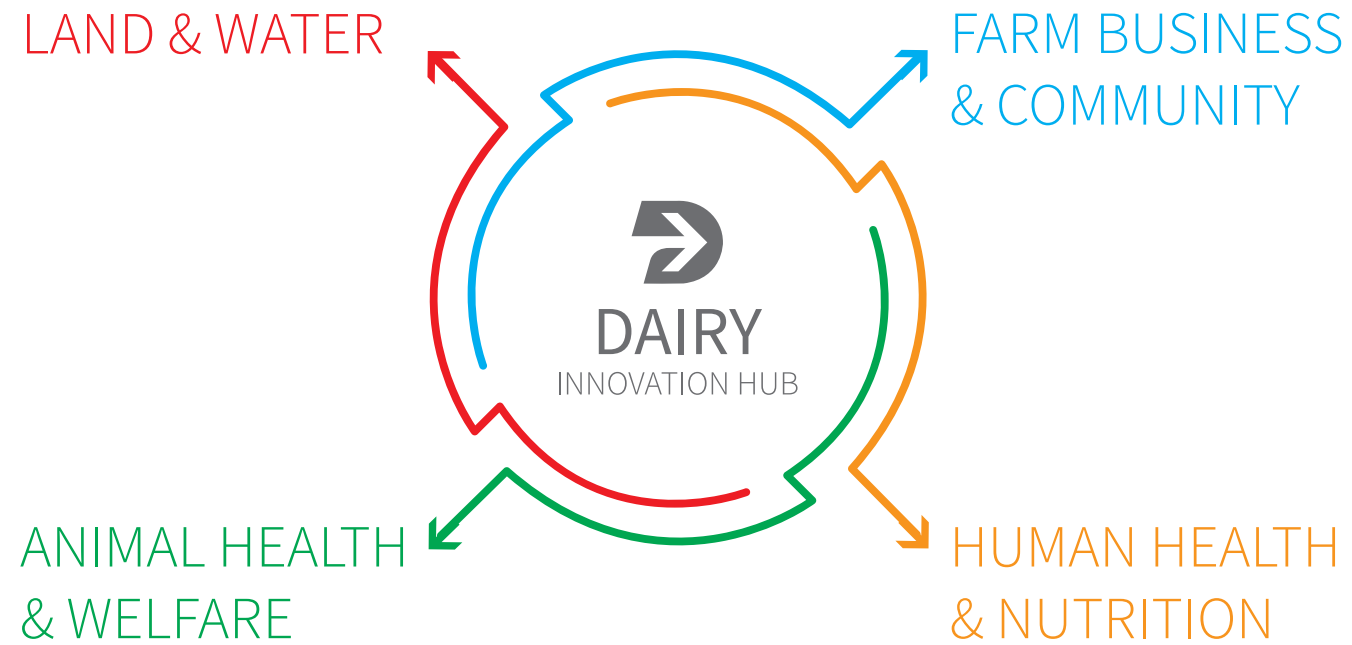
# HOW DID WE GET HERE?

Above: On April 19, 2023, the Hub hosted an informational research poster session at the State Capitol to highlight select projects funded by the initiative at UW-Madison, UW-Platteville, and UW-River Falls. Photo by Jori Skalitzy/Dairy Innovation Hub

STATE INVESTMENT  
**\$7.8M**  
PER YEAR



## FOUR KEY PRIORITY AREAS



### **Stewarding land and water resources**

Improve nutrient management and soil health; reduce greenhouse gas emissions, improve air quality; develop alternative uses and markets for manure; investigate novel cropping systems; and minimize nutrient losses to lakes and rivers.

### **Enriching human health and nutrition**

Develop value-added products to serve health needs and dietary trends; design food processing, packaging and delivery technologies to improve product quality and shelf-life; improve the safety of dairy foods; understand and address barriers and facilitators to dairy consumption.

### **Ensuring animal health and welfare**

Develop data analytics for animal management; reduce metabolic disorders and infectious diseases; improve stress biology and immune function to support animal health and productivity; improve efficiency and sustainability; deploy genomic selection and other technologies for healthy animals.

### **Growing farm businesses and communities**

Improve profitability and growth opportunities for businesses throughout the dairy economy and promote informed decision-making by consumers and policymakers; use big data to optimize dairy farms; develop skilled & tech-savvy rural workforce; improve financial literacy & return on assets.

## THINKING GLOBALLY, ACTING LOCALLY

### **MISSION:**

Position Wisconsin's dairy community for economic, environmental and social success by advancing science, developing talent and leveraging collaboration.

### **VISION:**

To be the world's preeminent source of bold new discoveries and talent development in dairy.

### **CORE VALUES:**

#### **Awareness**

We are grounded by the realities of the dairy community. We seek to be dialed-in to the needs and conditions of our stakeholders.

#### **Learning and Discovery**

We support scientific advancement and evidence-based decision-making. We want to be a platform for lifelong learning and action.

#### **Collaboration**

We actively contribute to university partners and stakeholders working together as a team. We acknowledge the power of relationships.

#### **Respect**

We embrace diverse perspectives, cultures, audiences and business philosophies. We treat everyone with dignity and respect.

#### **Accountability**

We take the stewardship of resources seriously. We will take responsibility for the success or failures of our efforts.

#### **Creativity**

We encourage looking at common problems through a different lens. We will foster the spark of innovation and find answers to tomorrow's challenges.





# WISCONSIN DAIRY STATS

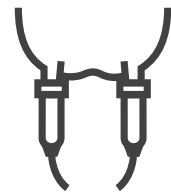
## 5,817

**DAIRY FARMS**

(as of Sept. 1, 2023)



more farms than any other state



## 31.9

**BILLION**

pounds of milk produced annually

EVERY



IN WISCONSIN GENERATES  
**\$36,000**

in economic activity per year.



## 1,269,000



**COWS**

*That's almost half as many as 1950!*



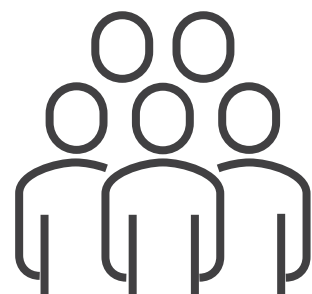
**1<sup>ST</sup> NATIONALLY**

in cheese production



**2<sup>ND</sup> NATIONALLY**

in milk production



# 157K JOBS

in Wisconsin are dairy farming or processing related

## \$45.6

**BILLION**

in economic activity to the state of Wisconsin



## FROM THE DIRECTOR

### Heather White

Faculty Director | Dairy Innovation Hub

Doing cutting edge research to provide tomorrow's solutions requires insight into today's challenges, understanding of research disciplines and interdisciplinary intersections, and creative and novel approaches. As you read through this year's annual report, we hope the breadth of research and potential impact of projects becomes apparent. The mission of the Dairy Innovation Hub is to provide research-based solutions, but that doesn't always look the same. Some research yields solutions that can be applied on-farm, in a cheese plant, or in our day-to-day lives now. Other solutions are riskier but hold potential for bigger impact and may take longer before they can be applied.

The four priority areas are a foundational guide in research selected for funding by the Hub at all three campuses. We strive for a balanced portfolio of research projects that span the priority areas. That said, research across disciplines and priority areas have different needs. While some projects require cows or field test plots, others require expansive data sets, or purchasing a key piece of equipment that was previously a limiter. Still others have been made possible by bringing new talent to the three campuses, stimulating collaborative approaches to questions that couldn't be addressed previously. Breaking down the limitations and barriers has allowed the Hub to have direct and indirect impacts on research capacity across the campuses.

Selecting which projects to fund happens on each campus in a process that is thorough and rigorous. Projects are funded through requests for proposals which are then evaluated by panels of peer researchers that have a range of expertise. This process is the standard in scientific funding and ensures that we remain true to our funding priorities and are funding projects that are scientifically robust.

Members of the external advisory council (*featured on p. 16*) review proposals and give input on projects that are highest priority from their prospective. This ensures research is relevant and addresses challenges faced by the Wisconsin dairy community.

Although the range of projects funded to date is broad, there are several thematic areas that have garnered interest by both researchers and stakeholders. An obvious one is water quality which is a priority across the state. Nutrient management, water quality, and improved agronomic practices are central to many of the projects funded and faculty hired. Some of these projects are immediately applicable by end users and often represent incremental improvements or refinements that are essential to our continued efforts.

Additionally, alternative strategies to mitigate or reduce antibiotic use have also earned recent attention. These projects tend to be more basic in nature, often exploring alternative compounds that could replace antibiotics in some scenarios. While these projects may not yield applicable solutions tomorrow, they have the potential to be transformative in how we care for animals and use antibiotics. Funding projects of both applied and transformational natures ensures that the Hub is addressing a range of current and future challenges.

Projects and faculty featured in this annual report are only a subset. For the complete database of projects funded by the Hub across the three campuses, be sure to look at our Project Showcase, social media, and sign up for our newsletter. We are excited for the results, solutions, and insights that these projects can yield!

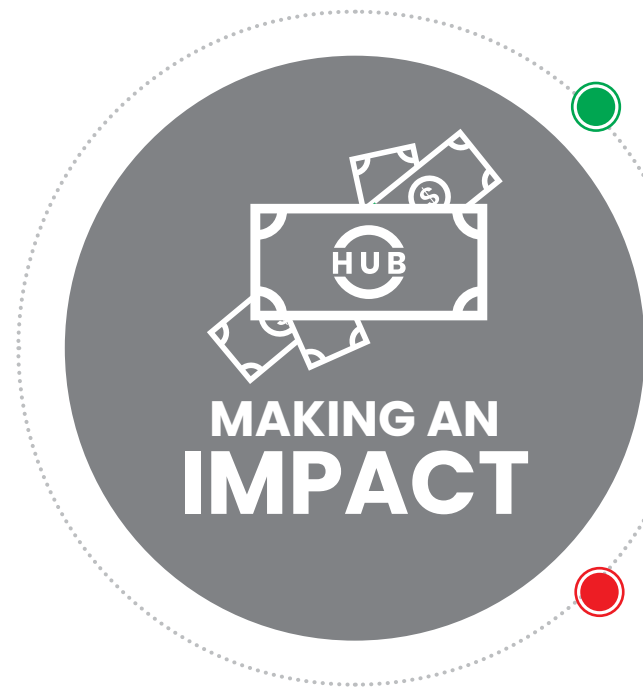
*Heather White*



“Funding projects of both applied and transformational natures ensures that the Hub is addressing a range of current and future challenges.”



# HUB DOLLARS IMPACT WISCONSIN DAIRY THROUGH:



**BUILDING** RESEARCH CAPACITY

ENGAGING IN **OUTREACH & INSTRUCTION**

INNOVATIVE **RESEARCH**

**RECRUITING** TOP TALENT

## Why is research and training so important?



- Develop tools and technologies to produce more milk with less cows, land and water
- Recruit, train and retain talent to live and work in Wisconsin
- Improve the quality of life for dairy animals and build consumer trust
- Strengthen dairy economy by developing new products and uses for milk
- Ensure a safe, abundant and nutritious food supply for ALL people
- Keeps Wisconsin dairy farms and businesses nationally competitive and rural communities strong

# ACCOMPLISHMENTS

More than **200+** **PROJECTS FUNDED** across 3 campuses and 4 priority areas since 2020

**17** Total **FACULTY SEARCHES** attracting top talent to Wisconsin

**\$6.7M** **LEVERAGED GRANT FUNDS FROM FY 23**

**217** **JOURNAL ARTICLES, ABSTRACTS, OR POSTERS** published or in progress from FY 23

**528** **STUDENTS** and trainees engaged in FY 23 Hub research & infrastructure

**259** **PRESENTATIONS** to live audiences in FY 23

# WHO BENEFITS FROM THIS RESEARCH?



## OUR LEADERSHIP



### Glenda Gillaspy

Dean, College of Agricultural and Life Sciences, UW-Madison

In my first year as dean, I appreciate the warm welcome from the many partners of the Dairy Innovation Hub. One of my first activities was to visit UW-Platteville for the Hub advisory meeting in August of 2022, where I learned about the strong and unique partnerships between industry and the three university campuses. The Hub is clearly an important driver for research innovation and success of the dairy community in our state.

We had three Hub-funded faculty join UW-Madison this year, representing different disciplines. Lautaro Rostoll Cangiano is an immunology expert and an assistant professor in animal and dairy sciences. Gulustan Ozturk is an assistant professor of food science. Xia Zhu-Barker joined soil science as an assistant professor. Each of these talented, early career scientists come to us from other countries—proving that the Hub is meeting its goal of attracting the best dairy talent in the world to come to Wisconsin.

Last fall, I visited an innovative Wisconsin dairy farm operated by the Schmidt family in Lone Rock, along with new UW-Madison Chancellor Jennifer Mnookin and Senator Howard Marklein. It was an excellent day to see the land-grant university mission to connect people and businesses to the university.

The Hub is an innovative entity in which researchers collaborate across disciplines and across campuses, in strong partnership with the state's dairy professionals. It is truly a model for how many partners can work together to move agriculture forward in our state.



Second to the right, Chancellor Jennifer Mnookin listens to Ryan Schmidt talk about cow maternal health along with (counterclockwise) Sen. Howard Marklein, Glenda Gillaspy, and Regan Schmidt in Lone Rock, Wis. on Sept. 12, 2022. Photo by Althea Dotzour / UW-Madison



### Charles Steiner

Interim Dean, College of Business, Industry, Life Science and Agriculture, UW-Platteville

The Dairy Innovation Hub continues to provide a means for collaboration, bringing stakeholders together with the common goal of strengthening the Wisconsin dairy community and moving innovation and research forward. Over the past year, the Hub has provided a wealth of opportunities to connect with dairy farmers, processors, researchers, and organizations working together to address critical issues facing the Hub's four key priority areas.

At UW-Platteville, we were excited to announce Tammy Evetovich as our 15th Chancellor in April. Chancellor Evetovich served as Provost and Vice Chancellor for Academic Affairs at UW-Platteville since May 2020. Chancellor Evetovich is passionate about initiatives that benefit rural communities and grew up on a small family farm in Nebraska.

Our School of Agriculture has new leadership with Tera Montgomery beginning her role as director on July 1, 2023. Montgomery is a professor of dairy and animal science and has served as our campus liaison for the Hub since its inception. The Hub has brought about transformational change to the School of Agriculture and university. Our increased capacity to conduct dairy research and related projects, critical to the future of dairy in the state, is unparalleled. We look forward to hosting the Dairy Summit at UW-Platteville on Nov. 15 and hope to see you there.



### Michael Orth

Dean, College of Agriculture, Food and Environmental Sciences, UW-River Falls

I started as dean on June 1st. I am thrilled to be at UW-River Falls with its reputation of providing a strong workforce for the agricultural and natural resources sectors. In my first months on the job, I've learned how the Dairy Innovation Hub serves as a platform for student career opportunities and engagement in innovative research.

Numerous students have collaborated with faculty on Hub projects at UWRF and I am looking forward to learning more about their experiences and the opportunities opened to them by the Hub. I've toured the laboratory spaces on campus that have been designed to accommodate Hub research. They are impressive and our faculty are excited about working in those spaces. We also anticipate the re-opening of our remodeled dairy plant this fall, which will lead to even more collaborative opportunities.

On the faculty side, we welcomed Maria Fuenzalida with her expertise in animal health as our final faculty hire under the Hub. Kate Creutzinger, assistant professor of animal welfare and behavior, has procured USDA funding. And Grace Lewis, assistant professor of dairy processing, coached her student team to a first-place finish in the Dairy Management Inc. New Product Competition. This is a remarkable accomplishment given it was our first time in the competition and they faced teams from across the country, including many graduate students. These are just a few examples of great things happening at UWRF because of the Dairy Innovation Hub. I look forward to meeting many of you, our dairy community partners, over the course of this next year.



# ADVISORY COUNCIL



## Dave Daniels

Mighty Grand Dairy | Wisconsin Farm Bureau Federation | chairman

### COUNCIL MEMBERS:



## Larry Baumann

UW–River Falls



## Mitch Breunig

Mystic Valley Dairy,  
Professional Dairy Producers  
of Wisconsin



## Aric Dieter

ALCIVIA,  
Dairy Business Association



## Steve Kelm

UW–River Falls



## Shelly Mayer

Professional Dairy Producers  
of Wisconsin



## Tera Montgomery

UW–Platteville



## Chuck Nicholson

UW–Madison



## Scott Rankin

UW–Madison



## Randy Romanski

Department of Agriculture,  
Trade & Consumer  
Protection



## John Umhoefer

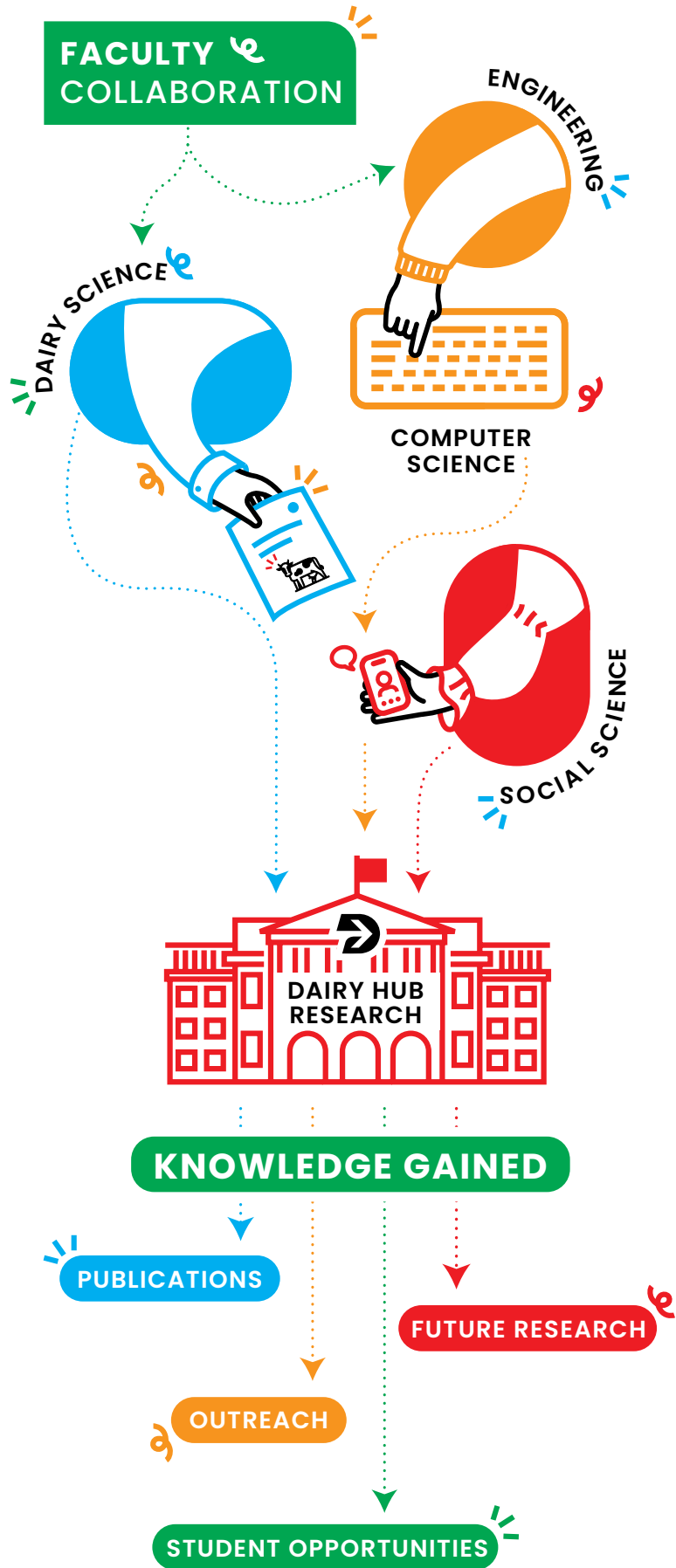
Wisconsin Cheese  
Makers Association



## Heather White

faculty director (ex officio)





## A platform to work together

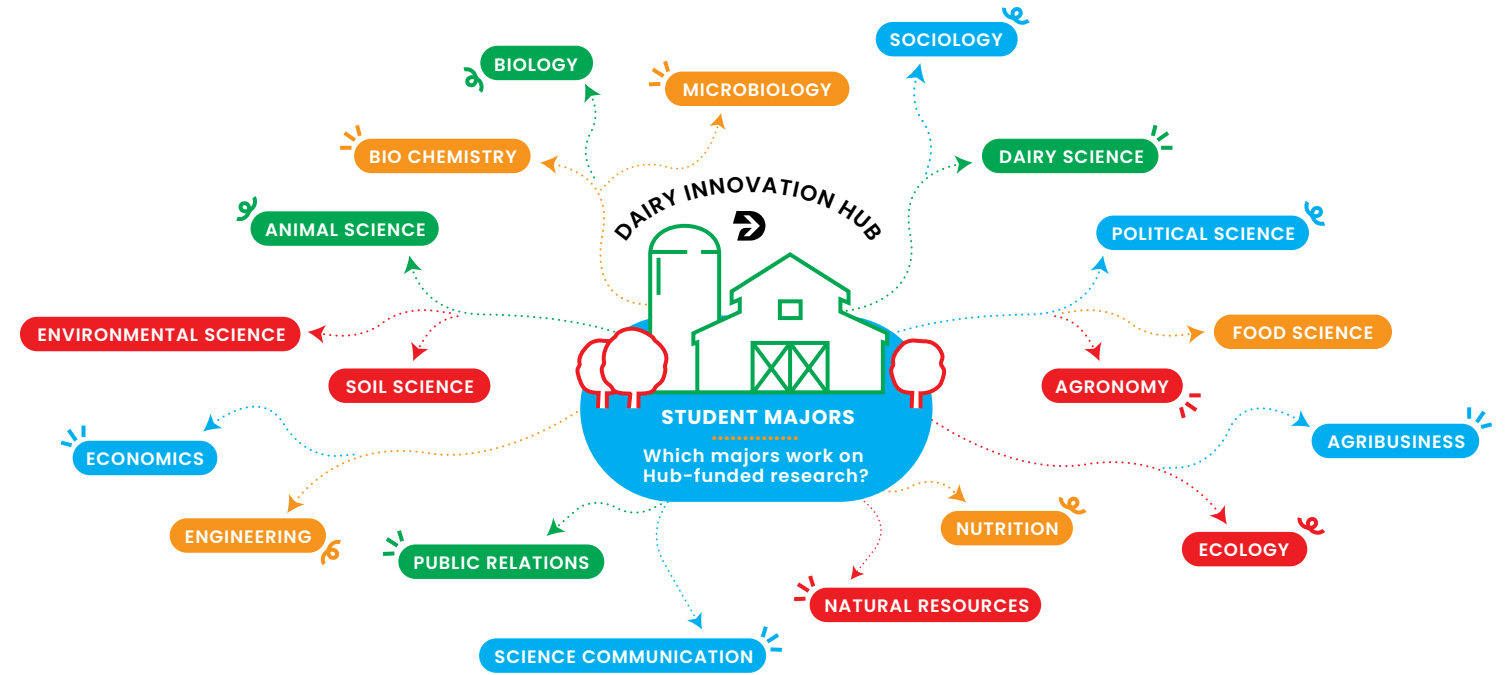
From the start, the Dairy Innovation Hub implemented systems to keep partners at UW–Madison, UW–Platteville, and UW–River Falls informed and accountable to best steward the State’s investment. As a result of this consistent communication, faculty and staff at each institution have a better idea of what’s happening at each campus and opportunities to work together.



Why is collaboration across campuses and disciplines so important?

- 📍 Multidisciplinary research approaches a topic or problem from multiple angles
- 📍 Leveraging talents and resources for a common goal reduces duplication
- 📍 Working across campuses gives faculty and staff access to opportunities and helps with retention
- 📍 Students have a deeper understanding of available careers and career pathways
- 📍 Farmers, processors, and other end-users are better served when researchers are tackling relevant topics

## DIVERSE MAJORS CONTRIBUTE TO DAIRY RESEARCH:



### It's not just dairy students working on Hub-funded research

Students of all majors, interests, and degree levels are working on Hub-funded research with opportunities for future growth. The Hub’s four priority areas are intentionally broad because research and outreach that benefits the dairy community covers a wide range of topics. Diverse talents and perspectives are a must!

### Research experience is career experience

Graduate school isn't the only reason to pursue research experience as an undergraduate. Critical thinking, following protocols, data analysis, collaborating as a team, and natural curiosity are qualities found in successful employees and leaders regardless of their field. Student researchers develop these transferable skills and employers notice.



# CAMPUS UPDATES

## UW–Madison FY 23 accomplishments:

- » Six new graduate assistantships awarded. Ongoing funding for first graduate student cohort
- » Eight new awards for short-term, high-impact research projects; Ongoing funding for 10 projects selected in FY 22
- » Nineteen new capacity-building equipment grants
- » On-boarded three new assistant professors focused on dairy food science, land and water stewardship, and immunology
- » Recruited one new assistant professor in the area of public engagement with agriculture
- » Ongoing funding for seven postdoctoral fellowships selected in FY 22

## FY 23 Steering committee:



**Paul Fricke**  
Animal and Dairy Sciences



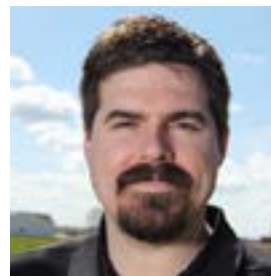
**Chuck Nicholson**  
Animal and Dairy Sciences  
Agricultural and Applied Economics



**Beth Olson**  
Nutritional Sciences



**Scott Rankin**  
Food Science



**Matt Ruark**  
Soil Science



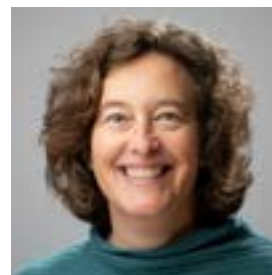
**Troy Runge**  
Associate Dean for Research



**Kent Weigel**  
Animal and Dairy Sciences



**Heather White**  
Animal and Dairy Sciences



**Heidi Zoerb**  
Associate Dean for  
External Relations

## UW–Platteville FY 23 accomplishments:

- » Five new awards for faculty research fellowships; Ongoing funding for five projects selected in FY 22
- » Six new awards for supplies and equipment
- » Support for graduate student assistantship co-mentored with UW–Madison
- » Planning for new Dairy Pilot Plant capital project
- » Developing data science postdoc position
- » Developing agribusiness faculty position

## FY 23 Steering committee:



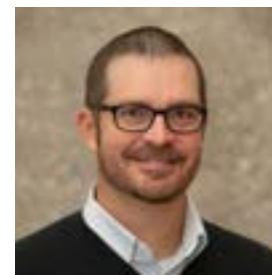
**Tera Montgomery**  
Animal Science



**Rami Reddy**  
director, School of Agriculture



**Kevin Bernhardt**  
Agribusiness; Center for Dairy  
Profitability



**Chuck Steiner**  
director, Pioneer Farm  
interim BILSA dean



**Krista Hardyman**  
Animal Science



**Austin Polebitski**  
Civil and Environmental  
Engineering

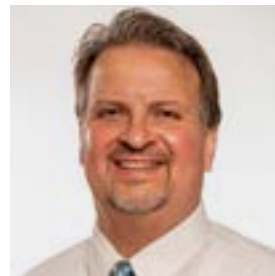


## CAMPUS UPDATES (continued)

### UW–River Falls FY 23 accomplishments:

- » Four new awards for faculty research fellowships; Ongoing funding for four projects funded in FY 22
- » On-boarded two new assistant professors in atmospheric science and climate resiliency and agricultural water management
- » Recruited one new assistant professor in the area of dairy health and management
- » Seven new awards for supplies and equipment
- » Ongoing support for graduate student assistantship co-mentored with UW–Madison
- » Implementation of dairy pilot plant capital project

### FY 23 Steering committee



**Steve Kelm**  
Animal and Food Science



**Peter Rayne**  
Animal and Food Science



**Joel Peterson**  
Agricultural Engineering  
Technology



**Holly Dolliver**  
Plant and Earth Science



**Brenda Boetel**  
Agricultural Economics



Above: Susanne Wiesner, Hub-funded faculty at UW–River Falls, flies a drone over a corn field at the Mann Valley Farm as part of her research to establish a baseline greenhouse gas budget for the farm. Read more about Wiesner on p. 42.  
Photo by Pat Deninger/UW–River Falls

## OUR PARTNERS



### Lee Kinnard

President | Dairy Business Association

“The Dairy Innovation Hub continues to showcase why Wisconsin remains a global leader in dairy innovation. As demand for Wisconsin cheese and dairy products grows, we must invest in research supporting growth in all aspects of the dairy supply chain – animal health, economics, nutrition, sustainability, and more. With this commitment, our dairy farms will further strengthen our rural communities and cement Wisconsin’s place as America’s Dairyland.”

”



### Shelly Mayer

Executive Director | Professional Dairy Producers of Wisconsin

“The Dairy Innovation Hub holds the keys for unlocking dairy’s future. As farmers representing less than 2 percent of the population and feeding 100 percent of the world’s population, we must do more with less. Taking care of our rural communities, natural resources, people, and livestock is just the start of our to-do list. The Hub not only helps farmers work more efficiently, but it also helps every single person in society by uncovering new ways to produce healthy food more sustainably.”

The work of the Hub is now a model that others around the world are seeking. Way to go Wisconsin! Thank you for having vision and for making this smart investment in everyone’s future. It is great to see UW–Madison, UW–River Falls and UW–Platteville work together seamlessly to ensure this critical work happens.”

”



### Randy Romanski

Secretary | Wisconsin Department of Agriculture, Trade and Consumer Protection

“The Dairy Innovation Hub is strengthening the connections across the three campuses, the agricultural industry, and our entire state by funding important faculty positions and completing valuable research. When we work together, the entire dairy industry is stronger. I am proud that the State of Wisconsin continues to invest in the Dairy Innovation Hub and the future of the dairy industry.”

”



### Kevin Krentz

President | Wisconsin Farm Bureau Federation

“The Dairy Innovation Hub has helped create more collaboration between our three agricultural universities which ultimately benefits farmers and rural communities across Wisconsin. The Hub is an investment to attract the best and the brightest dairy researchers to America’s Dairyland. Through areas such as innovation and sustainability, the Hub will help solidify Wisconsin’s dairy communication for generations to come.”

”



### John Umhoefer

Executive Director | Wisconsin Cheese Makers Association

“The Dairy Innovation Hub is reinvigorating dairy research at all levels, from cow care to new dairy products, with the resources to hire a host of new faculty at Wisconsin’s top three agricultural universities. It’s a game-changer because these new faculty are working with mentors on their campuses, and with researchers on other campuses, to build all-new lines of research for the industry. It’s an exciting time for dairy!”

”

## STUDENT PERSPECTIVES

### How is your undergraduate institution preparing you for a career in dairy?



#### Natalie Roe

UW–Madison

Industry professionals and researchers are always willing to guest lecture in classes, which helps you see what the industry is looking for in employees and make connections. The dairy science major also requires an internship, which helps students explore potential career options before graduating.



#### Jack Saemrow

UW–River Falls

UW–River Falls has provided me with many opportunities to network with peers, farmers, and instructors that are dedicated to the success of every student in and out of the classroom.



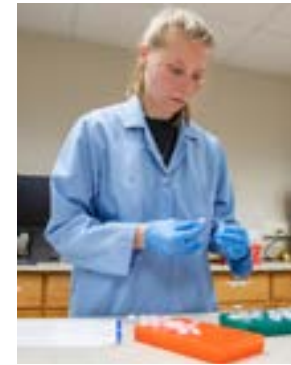
#### Halie Maier

UW–Platteville

I have had the opportunity to take advantage of many co-curricular experiences in the dairy industry that have helped me learn so much more, such as employment at Pioneer Farm and being a part of the Dairy Nutrition Experience hosted by Purina Animal Nutrition.

## ALUMNI PERSPECTIVES

### How did your undergraduate education impact your career aspirations?



#### Erin Kammann

UW–Platteville alumna, current graduate student at UW–Madison

At the start, I was not sure what area I wanted to focus on. It was with help from my advisor, Dr. Lammers, and taking more nutrition courses that I found an interest in ruminant nutrition.



#### Max Shenkenberg

UW–Madison alumnus, herdsman at Maier Farms, Waunakee, Wis.

In the beginning I just had an interest in overall animal health, but as I got into taking more major specific courses, I found a passion for reproductive physiology and genetics of dairy cows.



#### Rachel Skinner

UW–River Falls alumna, current graduate student at Kansas State

The Dairy Innovation Hub has supported many of the professors, such as Dr. Kehoe and Dr. Kelm, that made a big impact on my undergraduate studies. They're even impacting me all the way in Kansas! My major professor was supported by the Hub for his post-doc at Madison and I will be helping him on an additional research project that builds off that work.

## STUDENT SUCCESS

### Dairy Innovation Hub supports outstanding undergraduate student researchers

By Destiny Ingram, Dairy Innovation Hub

Since its inception, the Dairy Innovation Hub has created research opportunities for hundreds of undergraduate students at UW–Madison, UW–Platteville, and UW–River Falls. These experiences engage students in Hub-related research and infrastructure that foster curiosity while encouraging future careers in Wisconsin's diverse dairy community.

Student researchers take on various roles assisting with projects in the Hub's four priority areas: stewarding land and water resources; enriching human health and nutrition; ensuring animal health and welfare; and growing farm business and community. These positions help students gain experience and training in a selected research area, while working alongside an experienced faculty member.

The following students from UW–Madison, UW–Platteville, and UW–River Falls represent some of the many outstanding undergraduate student researchers who have worked on Hub-funded research:

#### Carson Keisling, UW–Platteville

Carson Keisling, a senior majoring in industrial technology management at UW–Platteville, was a member of Hal Evensen's lab. Keisling's interest in industrial technology management began as a desire to merge his creativity and critical problem-solving abilities. In the future, Keisling hopes to gain more experience in robotics and automation while working towards the goal of starting his own company. As a member of Evensen's lab, Keisling assisted in the



development of local virtual enclosures for livestock. The lab explored two approaches: moving physical fences; and moving a virtual fence using short-range wireless technologies. Additionally, beacons were utilized to monitor animals' rough location to direct them towards "acceptable" predetermined locations.

This project aimed to provide farmers with a simple, cost-effective digital solution for livestock enclosures. He recalls working alongside one team member for fourteen consecutive hours as the semester neared an end to see the project come to life. Keisling regards this day as one of his most memorable experiences as an undergraduate because of the joy and excitement he felt seeing his hard work come to fruition.

#### Collin Klaubauf, UW–Madison

Collin Klaubauf received his bachelor's degree in biological systems engineering from UW–Madison in December 2022 and has since started a master's program with the same focus. As an undergraduate, Klaubauf was a member of Francisco Arriaga's lab. His interest in biological systems engineering began as a concern for the environment and his hope to contribute to sustainable practices. His research interests are primarily related to soil health and water quality. After completing his master's degree, Klaubauf plans to pursue a career in water resources engineering.

As a member of Arriaga's lab, Klaubauf assisted in analyzing the environmental impacts of corn silage



production systems. Arriaga's team hypothesized that the canopy structure and the amount of biomass produced by a cover crop influenced environmental impacts such as erosion and nutrient losses in runoff water. This project aimed to help farmers make decisions that benefit both forage production and the environment. Klaubauf credits this experience with changing the way he frames concepts and how he asks questions, as well as improving his critical thinking abilities.

#### Emily Larsen, UW–River Falls

Emily Larsen, a junior majoring in horticulture at UW–River Falls, was a member of Sonja Maki's Lab. Larsen's interest in horticulture began in a high school plant science class which grew to become a passion for plant genetics at River Falls. Attending college cultivated her desire to understand how a plant's genetics influence its growth, development, and use in the world. Larsen believes her experience working in Maki's lab allowed her to stand out as a candidate when applying to professional internships. This summer, Larsen will complete a plant pathology internship at the Ball Helix lab in Chicago. Larsen hopes to establish a career in plant genetics.

As a member of Maki's lab, Larsen assisted in carrying out experiments that required quantitative measurement of gene expression. Larsen recalls receiving the first round of experimental data from the Quantitative PCR machine as one of her most memorable experiences working on this project. Larsen appreciated seeing how the different expression levels of individual genes varied and how the readings could be combined into answers for the questions the group posed. Maki's project aimed to increase UW–River Falls' capacity to carry out quantitative gene expression experiments and provide undergraduate students with an opportunity to develop quantification skills.



#### Luke Geist, UW–River Falls

Luke Geist, a senior majoring in agriculture economics at UW–River Falls, was a member of Arquimides Reyes's lab. Geist's interest in agriculture economics is rooted in his desire to help the dairy industry open new avenues of profitability and to keep family farms, like his own, in business. After graduation Geist plans to become an integrated solution specialist at John Deere and to take over his family farm in Sheldon, Wis.

As a member of Reyes's lab, Geist assisted in providing dairy and beef farmers with research related to dairy-beef feedlot performance and carcass composition that increase profitability. This information allows farmers to improve their genetic selection and nutrition management planning which results in increased profit margins. Geist recalls the joy he felt creating better environments for calves and watching as they expressed behavior such as diving and playing in fresh beds of straw.



Luke Geist, right, measures the height of a newborn beef cross calf. Arquimides Reyes, left, assistant professor of animal and food science at UW–River Falls, records the data as part of his research on beef and dairy cross feedlot performance. Photo by Pat Deninger/UW–River Falls



## STUDENT SUCCESS

### Students come together for dairy nutrition course

By Jori Skalitzky, Dairy Innovation Hub



In early 2023, a group of students from UW–Madison, UW–Platteville and UW–River Falls gathered for Dairy Science 375: Dairy Nutrition Experience. The course, which is sponsored by Purina Animal Nutrition LLC, a Land O’ Lakes Company, is a week-

long opportunity consisting of mentored, hands-on dairy management experiences.

“Purina provides a first-class opportunity for the students,” says Ted Halbach, the UW–Madison course coordinator and a distinguished faculty instructor in animal and dairy sciences, “there’s no other way to describe it.” The other course coordinators are Ryan Pralle, assistant professor in the School of Agriculture at UW–Platteville and Sylvia Kehoe, professor in animal and food science at UW–River Falls. Pralle’s position is funded entirely by the Dairy Innovation Hub.

To start off the week, the class met at Wessel Dairy in Mineral Point, Wis. to complete a dairy farm audit. At Wessel Dairy, students were broken up into groups and visited different areas of the farm, including the transition barn, lactation barn, calf and heifer housing, and feed center. They also collected their own data and were able to have engaging conversations with staff from Purina, Zinpro, Diamond V, VAS and the Wessel Dairy herd manager.

“It was a pretty eye-opening experience for my students,” says Pralle. “They got to work with

consultants and others that day to learn hands-on how they view every part of the process.”

After a debriefing and brainstorming session, the groups identified four areas where the farm had potential management opportunities and provided recommendations to address them. Each group prepared a presentation on the results of their audit to share with the Wessel’s during the Leading Dairy Producer Conference in Wisconsin Dells, Wis.

“I really enjoyed working collectively as a team to prepare and present the herd audit report to the farm owner,” says Kylie Konyn, a sophomore at UW–Madison majoring in dairy science, “Not only was I able to meet students from other UW campuses and learn from Purina experts, but I was also able to advance my communication skills in discussions I had with the farmer.”

Following the farm audit and the Leading Dairy Producer Conference, the class traveled to the Purina Animal Nutrition Center in Grey Summit, Mo. for two full days of tours, workshops, and presentations by Purina staff. Students learned about a variety of topics, including dairy nutrition, beef–dairy crossbreds, forage quality, milk production and sustainable agriculture. Students also got to go on multiple tours around the 1200-acre Purina campus.

“My favorite experience during the course was touring the Purina Research Farm,” says Alexis Healey, a junior at UW–Platteville majoring in agribusiness, “On the research farm, we were able to learn about other livestock beyond dairy and were able to tailor discussion sessions to what we as students wanted to learn.”



Other tours included the Beef Innovation Center, the Heifer Innovation Center and more.

“I really enjoyed the entire experience – from the farm evaluation to the networking,” says Katie Yahnke, a senior at UW–River Falls majoring in dairy science and ag business, “Not only were we given the opportunity to network with students from other universities, but also industry professionals. Overall, the experience was a great learning opportunity and provided my peers and I with the chance to fully engage in a hands-on experience.”

This was the first year Dairy Science 375: Dairy Nutrition Experience was open to other campuses – originally, it was exclusively for UW–Madison students. Halbach, who has been the lead instructor for the course over the years, worked with UW–Platteville and UW–River Falls to provide this opportunity to a larger group of students.

“Overall, it was a great experience,” says River Falls instructor Kehoe, “and I’m looking forward to doing it again.”

The Dairy Innovation Hub has infused 17 new faculty (and counting) between the three campuses, which has added expertise as well as bandwidth. Having participated in the class as a student at UW–Madison, once Ryan Pralle joined the faculty, he advocated that students from UW–Platteville and UW–River Falls be included. Pralle and other new faculty have created opportunities for students to see classroom experiences play out in the real world, which is part of the Hub’s core mission of making connections between academia and industry.

As the Hub matures at UW–Madison, UW–Platteville and UW–River Falls, there will be additional opportunities for students, faculty and stakeholders alike to collaborate to grow Wisconsin’s vibrant dairy community.

*Above: Students from Madison, Platteville, and River Falls participated in a week-long experiential course designed to give them a clear view of careers in dairy management, specifically related to nutrition, in a hands-on format. As part of the class, students traveled to Grey Summit, Mo. to visit the Purina Animal Nutrition Center, including tours, presentations, and networking. Photo by Land O’ Lakes. Facing page: Ted Halbach, lead instructor for the course, retired in fall 2023, after a storied career teaching, coaching dairy judging, and mentoring students.*



## CAMPUS COLLABORATION



### Faculty trifecta tackles cost of production

Persistence pays off. Especially for one dairy farmer searching for answers about how to calculate cost of production. The case was compelling, and the Hub convened three experts to take on this important, yet complex question for Wisconsin dairy farmers.

By Jori Skalitzky, Dairy Innovation Hub

*Above: Dairy cattle are moved to a new grazing paddock at Marshfield Agricultural Research Station. Photo by Michael P. King/UW-Madison CALS. Right: Kevin Bernhardt presents initial cost of production data at the Dairy Symposium, May 2023. Photo by Nguyen Tran/Dairy Innovation Hub*

The Dairy Innovation Hub is known for collaboration — it is a key element to our mission of positioning Wisconsin's dairy community for economic, environmental, and social success. UW-Madison, UW-Platteville, and UW-River Falls are the foundation of the Hub and all three of these campuses have come together to explore a phenomenon that impacts all Wisconsin dairy farms: cost of production (COP).

Chuck Nicholson, Hub-funded faculty at UW-Madison and associate professor of agricultural and applied economics and animal and dairy sciences, is the principal investigator of a project focused on assessing and analyzing the COP of Wisconsin dairy farms. Nicholson is joined by co-principal investigators Kevin Bernhardt, professor of agribusiness at UW-Platteville and UW Extension specialist, and Luis Peña-Lévano, former Hub-funded faculty at UW-River Falls and assistant professor of agricultural economics. Mark Stephenson, emeritus director of the Center for Dairy Profitability, is an advisor to the project.

This project originated from a conversation that Heather White, faculty director for the Dairy Innovation Hub, had with a local dairy farmer. He expressed concern that current ways of calculating COP weren't sufficiently representative of what dairy farms were experiencing. White looped Nicholson into the conversation, who then looped Bernhardt in based on his previous work in the field and asked Peña-Lévano to provide an additional perspective.

Bernhardt shared some notable facts based on available data that sparked Nicholson's interest. "From top to bottom in any given year, there is this amazingly

big spread in terms of cost of production," says Nicholson. "We don't know if it's always the same farms at the bottom or at the top, but what we do know is that every year we see a pattern. That got us thinking about 'Why is there such a big spread?' and 'What underlies the differences?'"

These questions, and previous data, were the catalyst for a full, Hub-funded investigation into COP of Wisconsin dairy farms.

COP is one of the important indicators of farm business performance — but what is COP?





“Cost of production” is the dollar amount for producing a given quantity of a product, like a hundredweight of milk. Dairy farms often sell multiple products, which can make calculating COP complicated, but the most relevant management information is often the costs for producing milk. Costs are an important determinant of farm profitability, but it also depends on milk prices and productivity. “Some farms can target low costs to increase profits while others may have higher costs that also lead to higher production as a strategy for increasing profits,” says Bernhardt.

Since COP is related to a farm’s profits, understanding the factors that make up COP can provide important farm-level management information. That is the overarching goal of Nicholson and his collaborators’ project: to assess COP values of a subset of Wisconsin dairy farms and provide insight about how strategies to lower costs and improve productivity can help inform management strategies.

The team has an advantage to tackling this task. “We have different perspectives on the same problem,” says Peña-Lévano. “We’re looking into different angles, and I think that makes this a very good collaboration.”

The collaborative project has multiple moving parts and is using different data sources for a multi-pronged analysis of COP in Wisconsin.

Nicholson and Bernhardt are looking at data from the Agricultural Financial Advisor (AgFA) farm financial records system, the United States Department of Agriculture (USDA) Agricultural Resource Management Survey (ARMS), and other similar sources. Peña-Lévano is looking at data from IMPLAN, an economic modeling analysis software. The AgFA records provide farm-specific data for Wisconsin, IMPLAN provides county- and state-specific data, and the ARMS data are regional and national.

AgFA collected financial data from 178 Wisconsin farms for the years 2014 to 2018. Nicholson divided the farms into five tiers and looked closely at which farms were consistently in the lowest 20%, or who had the consistently smallest COP values. Of the 178 farms, only 15 of them were consistently in this lowest COP range. So, the team decided to compare these farms to 60% of the less-consistent farms that didn’t have the lowest 20% or highest 20% – simply put, they compared the consistently low-cost farms to those in the “middle of the pack.”

Nicholson found several differences between the two categories. The consistently lowest 20% had a smaller average herd size, lower milk per cow and milk price, owned and rented less land, and had overall lower farm operating costs. Additionally, the lowest 20% had a higher return on assets, which means a higher financial performance.

Bernhardt also divided the farms into different tiers, but by profit level instead of COP. One finding is that farms pursue profits in different ways – some target lower costs per cow while others have higher costs per cow. However, the farms that have higher costs per cow tend to produce more, resulting in an overall lower cost.

“We have some interesting initial observations. We’re going to do some more work to understand what this all means and how it can be useful,” says Nicholson. With further research, the team will be able to provide insight on better management strategies related to COP for farmers.

Peña-Lévano’s work is still in progress. “What I’m trying to do is evaluate how the cost of dairy varies,” says Peña-Lévano. “That way, we can understand the cost variations by Wisconsin counties.” To do this, he is using IMPLAN, an input-output modeling system that captures categories of input costs and labor with linkages to other agricultural industries.

The IMPLAN analysis, once complete, will provide additional insights into COP and management strategies.

In the early stages of the project, the team held a focus group with farmers, people who work in farm management, and academics who work with farm records, and they all saw value in the project – and the data that drives it. A new online farm records system, FarmBench, has replaced AgFA and has collected data from 2019 to 2021, but it is still being processed. An important project goal is to highlight the usefulness of farm records data and the need to provide support for its collection and analysis. Without resources like it, future work – such as this project – won’t be possible.

“This data is an important resource for the state’s

dairy farms, dairy companies, and state government,” says Nicholson. “If we lose access to that resource, we won’t be nearly as able to monitor the current financial health of farms and understand the management arrangements that are likely to be more successful.”

At the end of the project, the team plans on sharing their findings with relevant stakeholders and farmers through workshops. They also hope to learn about possible next steps, such as future research and educational efforts, to continue helping Wisconsin’s dairy farms.



Facing page: Luis Peña-Lévano presenting preliminary research objectives for the project at the 2022 Dairy Summit at UW-River Falls. Photo by Pat Deninger/UW-River Falls. Above: Chuck Nicholson presented ongoing progress at the 2023 Dairy Symposium at UW-Madison. Photo by Nguyen Tran/Dairy Innovation Hub

## MEET THE RESEARCH TEAM

### At UW–Madison:

- » **Chuck Nicholson**, associate professor, Department of Animal and Dairy Sciences and Agricultural and Applied Economics.
- » *Principal Investigator, “cost of production” project*

### At UW–Platteville:

- » **Kevin Bernhardt**, professor, School of Agriculture and farm management specialist, Division of Extension

### At UW–River Falls

- » **Luis Peña-Lévano**, former assistant professor, Department of Agricultural Economics at UW-RF. Current assistant professor, University of California, Davis

### Division of Extension Center for Dairy Profitability

- » **Mark Stephenson**, emeritus director of the Center for Dairy Profitability, project advisor

## NEW FACULTY PROFILE



### Bahar Hassanpour

Assistant Professor | Plant and Earth Science and  
Agricultural Engineering Technology  
UW–River Falls | start date March 2022

#### What is your hometown?

I was born and raised in Rasht, Iran, which is called the rain city because it is bound by the Caspian Sea in the north and the Alborz

Mountains in the south, which provides the perfect humid subtropical environment. It is so humid that the trees in the temperate rain forest to its south are covered with moss. Paddy (rice) is the main crop in the region that grows well in the clay soils of the area.

When talking about Rasht, it is impossible not to mention its foods and their varieties. Rasht is designated a UNESCO Creative City of Gastronomy due to its cuisine, which comprises poultry, eggs, and locally grown or wild vegetables.

#### What is your educational and professional background, including your previous position?

I obtained my PhD and a master's degree from the Department of Biological and Environmental Engineering at Cornell University, where I worked as a graduate research and teaching assistant. My graduate degrees were focused on hydrology and water quality, and I worked on cost-effective edge-of-field bioreactors to remove nitrate from agricultural waters. After graduation, I joined the Department of Civil and Environmental Engineering at Northwestern University as a postdoctoral scholar. While at Northwestern, I investigated carbon cycling in soils and streams of small agricultural watersheds.

Prior to Cornell, I completed my bachelor's degree in agricultural engineering and a master's degree in agricultural engineering-irrigation and drainage in Iran.

#### How did you get into your field of research?

I have always been interested in soil and water dynamics. I vividly remember that in my teenage years, I used to observe basin irrigation for paddies and wondered how the cracks on clay soils disappeared after irrigation! These curiosities triggered my interest, and thus, I studied agricultural engineering, which later took me to Cornell, where I worked with Tammo Steenhuis, my PhD advisor. At Cornell, my focus shifted toward how agricultural practices impact water quality. I have worked on the transport, fate, and removal of agricultural contaminants ever since.

#### What are the goals of your current research program?

My research interest is in water quality and helping with the sustainable management of soil and water. My research is at the intersection of hydrology, nutrient dynamics, and biogeochemistry. I investigate soil and water processes and how hydrology impacts the fate and transport of nutrients and contaminants through leachate and runoff. The overarching objective of my research program is to mitigate the loss of nutrients and water contamination so that our communities can benefit from clean water.

#### What attracted you to UW–River Falls and the Dairy Innovation Hub?

Working as a researcher and educator at UW–River Falls with the Dairy Innovation Hub has given me the perfect opportunity to work on the topics I am passionate about. I can conduct research on protecting our waters and agricultural production, and I also teach and interact with



students who are the future of this nation. At UW–River Falls, there are many first-generation college students that are working hard to put themselves through school. Therefore, I am proud to serve them and this community.

In addition, I work alongside fellow faculty who are enthusiastic about educating our students. We share the same values of advancing science and helping prepare our students to be productive, creative, ethical, and engaged citizens and leaders.

#### What's one thing you hope students who take a class with you will come away with?

I would like my students to develop curiosity and critical thinking skills to discover the interconnectedness of our environment. I also emphasize how decision-making at the community level could have a large-scale impact, and thus, community engagement is crucial.

#### Does your work relate to the Wisconsin Idea?

Yes! My teaching focuses on applied hydrology with many hands-on exercises, which students can implement after graduation in their water-related careers. In my courses, I teach students to pay attention to how water and contaminants move above and below ground and

relate that to the theoretical framework. Thus, my teaching extends beyond the classroom. My research also focuses on common real-world problems related to the quality of our environment, targeting improving its quality and the quality of life in our communities.



*Hassanpour is building a research program that studies the impact of groundwater levels on nutrient cycling in agricultural soils, where manure is frequently applied. Understanding and quantifying this impact is crucial in developing nutrient management strategies and predicting water quality and greenhouse gas emissions. Top: Hassanpour works with students in the lab analyzing water samples. Above: Students observe field conditions. Photos by Pat Deninger/UW–River Falls*

## NEW FACULTY PROFILE



### Gulustan Ozturk

Assistant Professor | Food Science  
UW-Madison | start date Aug. 2022

#### What is your hometown?

My hometown is Gulnar, which is a beautiful small town in the Mersin Province of Turkey. I lived in multiple places in Turkey

growing up and then moved to the U.S.

#### What is your educational and professional background?

I received my bachelor's and master's degrees in food engineering from Ankara University in Turkey. I then received my Ph.D. in food science with a designated emphasis in biotechnology from UC Davis. After my PhD, I was a postdoctoral researcher in the food science and technology department at UC Davis.

#### How did you get into your field of research?

As the child of two educators, I had an innate connection to science and education from an early age. Growing up on my grandparent's farm and helping them to prepare the food for winter, I was drawn into the question of how I could make the food system more sustainable and nourishing. So, I continued my education and earned BS, MS, and PhD degrees in food engineering/food science. During my postdoctoral research, I had an opportunity to work with a top interdisciplinary team focused on milk bioactive compounds, inspiring me to build my own research program in next-generation dairy foods that improve human health.

#### What are the goals of your current research program?

My main goals are to apply bio-guided processing to isolate bioactive compounds from milk or dairy streams, and design and develop microbiome-centered therapeutic interventions with application in personalized nutrition and precision treatments to improve human health. As a teacher and mentor, I aim to stoke my students' curiosity about dairy science and promote diversity through equity and inclusion.

#### What was your first visit to campus like?

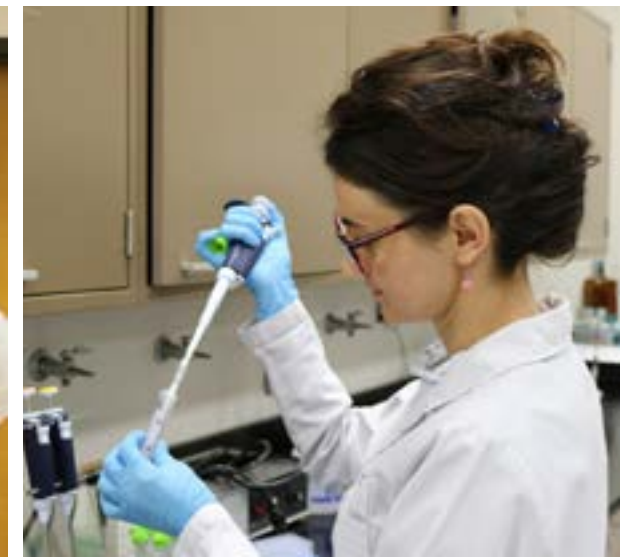
My first visit was in June 2022 for an in-person interview. At the end of the first day, I walked downtown and went to the Memorial Union Terrace. It was a beautiful summer night, and I immediately loved the campus/Madison. UW-Madison is a unique and special campus.

#### What's one thing you hope students who take a class with you will come away with?

I hope students will come away with enthusiasm and vision for scientific inquiry and critical thinking.

#### Does your work relate to the Wisconsin Idea?

Absolutely—my work aligns with the Wisconsin Idea in many ways. I am passionate about providing knowledge to guide agriculture and food through a disruptive revolution to become sustainable, nourishing, and an engine of biodiversity. UW-Madison is one of the world's great universities, and dairy-related research is particularly famous. My goal is to extend and complement dairy-related research and inspire and educate future food scientists to become future academic and industry leaders in the field.



#### The pandemic forced us all to reconsider many things we took for granted. Is there something you've learned that has helped you through these challenging times?

Relationships are an essential resource for our mental and emotional well-being. So, connecting with my family and friends—even remotely—was vital for me throughout the whole pandemic.

#### What's something interesting about your area of expertise that usually surprises the public?

Milk has unique health-promoting bioactive compounds

such as prebiotics (which promote the growth of beneficial bacteria) and antimicrobials (which can selectively eliminate pathogens).

#### What are your hobbies and other interests?

Hiking, working out, traveling, music and food. Since I am here, I would like to get into kayaking and cross-country skiing.

*This article was adapted with permission from*

*UW-Madison CALS*



Top left: Ozturk's research team (From left) Jerina Rugji, postdoctoral scholar; Mitchell Armstrong, PhD student; and Zoe Atkins, UW alumna and current MS student at Cornell University. Top right: Rugji pipettes samples. Bottom: The team pictured with several in vitro membrane elements used to work with Whey Protein Phospholipid Concentrate. Ozturk is building a research program that applies bio-guided processing to isolate bioactive compounds from milk or dairy streams and designs and develops microbiome-centered therapeutic interventions. Photos by Jori Skalitzy/Dairy Innovation Hub

## NEW FACULTY PROFILE



### Lautaro Rostoll Cangiano

Assistant Professor | Animal and Dairy Sciences  
UW-Madison | *start date March 2023*

#### What is your hometown?

I grew up in a small town called Villa Mercedes located in the central part of Argentina.

#### What is your educational and professional background, including your previous position?

My first job after graduating from my undergrad in agricultural engineering was as a nutritional consultant for beef and dairy farms. After two years in this role, I decided to pursue further education to expand my knowledge and expertise. I moved to the U.S. and did a master's degree at the University of Florida. There, I had the opportunity to conduct research on the role of weaning on inflammation, immunosuppression, and insulin resistance in beef cattle. Building on this foundation, I then moved to Canada to pursue my PhD in bovine immunology at the University of Guelph, where my research focused on understanding how several on-farm management factors impact intestinal and immune development of dairy calves.

#### How did you get into your field of research?

When I was finishing my master's, I attended a seminar on neonatal immunology that discussed about how different factors that affect early life microbial colonization impact immune development in babies, and how this is a contributing factor in the development of several allergies later on in life. This sparked my interest in trying to understand if the same

interactions are at play in cattle and what we can do to improve it.

#### What are the main goals of your current research and outreach programs?

One of the main goals is to gain a better understanding of the underlying mechanisms that shape immune development in dairy cattle during early life in order to develop novel preventative and therapeutic strategies to improve long-term health outcomes.

#### What was your first visit to campus like?

I loved it! The campus is beautiful and the proximity to lake Mendota makes it a very special place.

#### What's one thing you hope students who take a class with you will come away with?

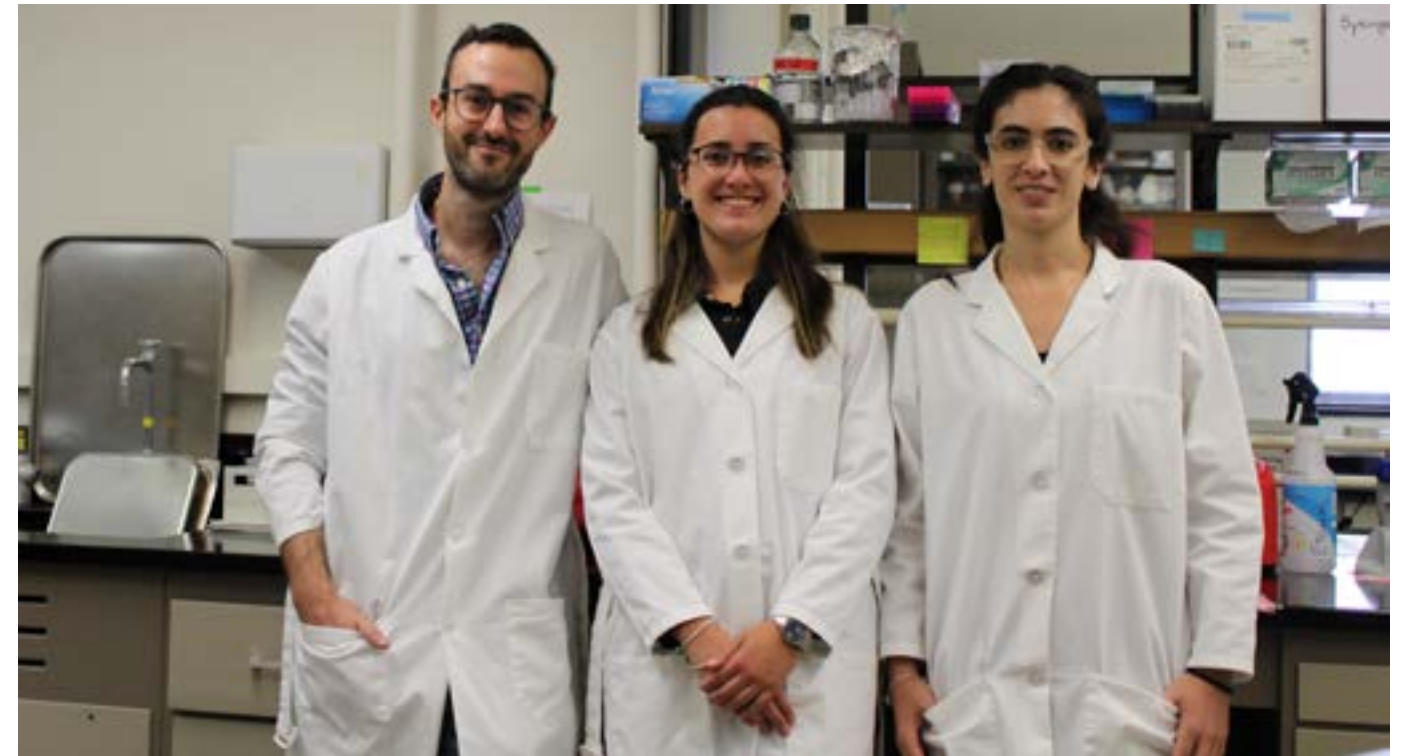
The intestinal microbiota plays a critical role in shaping the development of the immune system, especially during early life. This means that any factor that impacts microbial colonization during early life can have unexpected consequences on health later in life.

#### Do you share your expertise with the public through social media? If so, which channels do you use?

Yes, I am active on X, formerly Twitter. My account is @LRCangiano.

#### Do you feel your work relates to the Wisconsin Idea?

Absolutely! By translating my research into actionable strategies, I hope we can help dairy farmers across the state to improve cattle health while reducing antibiotic use, ultimately improving the sustainability and profitability of the Wisconsin dairy industry.



#### The pandemic forced us all to reconsider many things we took for granted. Is there something you've learned that has helped you through these challenging times, personally or professionally?

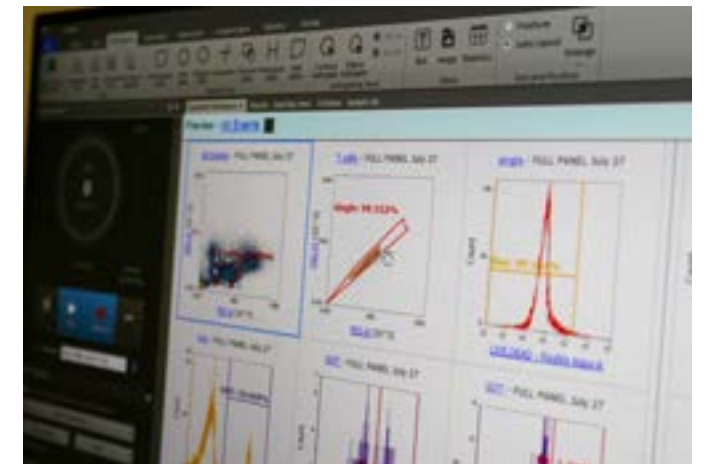
I think one of the most important lessons for me was the importance of building strong communities to help one another during strenuous times. I had to do half of my PhD during a global pandemic and having a strong community of people that supported me through this process was instrumental in my success. I hope that as a new assistant professor I can build that kind of environment for my students to thrive.

#### What's something interesting about your area of expertise that usually surprises the public?

Our intestines are colonized by trillions of microorganisms that coexist with us—helping us digest food, synthesize important vitamins and regulating our immune system. In fact, our bodies carry more microbial cells than human cells by a factor of 10.

#### What are your hobbies and other interests?

I enjoy doing mountain sports whenever I can, from skiing to biking and hiking.



*Top: (From left) Rostoll Cangiano and research interns, Trinidad Fernandez Wallace and Malena Cid De La Paz. Rostoll Cangiano is building a research program in bovine immunology. He has current projects looking at the effect of different colostrum feeding strategies on systemic immune development. Above: The Attune NxT flow cytometer, measures cell function in real time, to better understand the mechanisms that influence immune and metabolic function with the goal of developing preventative and therapeutic strategies for both cattle and humans. Photos by Jori Skalitzky and Maria Woldt/Dairy Innovation Hub. Article adapted with permission from UW-Madison CALS.*

## NEW FACULTY PROFILE



### Susanne Wiesner

Assistant Professor | Plant and Earth Science  
UW-River Falls | start date Aug. 2022

#### What is your hometown?

I grew up in Eastern Germany, behind the wall. I was four years old when it fell, but I didn't learn about it until I entered school.

disruptive for ecological systems. I knew I wanted to have a positive impact on nature. When I was looking for a PhD program, I started reaching out to professors in the United States, which led me to Dr. Greg Starr at the University of Alabama, where I worked on carbon and energy dynamics of three different longleaf pine savannas.

#### What are the goals of your current research program?

The main goal of my research program is to understand what it means to be a sustainable farm or farm cooperative. To me that implies more than just offsetting greenhouse gas emissions and sequestering carbon. My research includes a holistic view on resource conservation, including water and nutrients, but also thermodynamic and economic stability. Over the course of a few centuries agricultural practices have become more efficient, resulting in large increases in yield. However, we often forget that these local efficiency improvements did not happen in a vacuum, but were the result of external factors, such as equipment improvements, the use of fertilizer and pesticides, and decreases in agricultural crop diversity, in addition to genetic advances.

New farming technologies might seem more efficient in a local sense, but when we take all steps into account, what we often find is quite the opposite. We have learned from thousands of years of successful indigenous farming practices that crop diversity is key for climate resilience. My research seeks to implement this wisdom in modern farming practices, focusing on the natural defense mechanisms of agricultural ecosystems. This can benefit our Wisconsin dairy farmers by reducing input costs and potential climate threats.

I spent most of my childhood in a small village called Diensdorf-Radlow.

#### What is your educational and professional background, including your previous position?

I received a master's degree in Hydrology from the Technische Universität Dresden. Then I worked in Panama with the Smithsonian Tropical Research Institute and the Universität Potsdam. In 2014, I started my PhD in Biology, working on energy and carbon dynamics of drought disturbed longleaf pine ecosystems. Following my PhD, I moved to Madison to work on a postdoctoral fellowship with the US Dairy Forage Research Center and the Department of Atmospheric and Oceanic Sciences at UW-Madison. Before starting my faculty position, I was a postdoctoral fellow with the Dairy Innovation Hub at UW-Madison, working on agricultural sustainability with the Department of Biological Systems Engineering.

#### How did you get into your field of research?

I did not grow up thinking I wanted to be a scientist. Initially I wanted to be a graphic designer or artist, but I chose Hydrology as my major because I was good at math, and I had an affinity for water. However, after receiving my MS, I realized that I did not want to be an engineer because at the time, hydrological structures, like dams, were quite

#### What attracted you to UW-River Falls and the Dairy Innovation Hub?

My department and its people attracted me to UW-River Falls. I feel so lucky I can work in a healthy and supportive academic environment. I worked with the Hub during my postdoctoral fellowship and I really enjoyed the community and close relationships between farmers, consultants, stakeholders, students, and other academics and staff.

#### What was your first visit to campus like?

My first visit was in the midst of winter, so I did not get to see a lot. However, the plant and earth science faculty, staff and students made me feel welcome right away.

#### What's one thing you hope students who take a class with you will come away with?

I have a couple of things on my list that I try to weave into my classes. First, I stress how important it is to think about a problem as part of a system and not in isolation, because everything is connected. Second, I try to implement

thermodynamic laws and other basic scientific concepts. If my students truly understand the basic principles of nature, they can derive the rest themselves. Finally, I try to spark curiosity in my students, because to me if you're curious, you'll do the work to feed that urge.

#### Does your work relate to the Wisconsin Idea?

The Wisconsin Idea resonates with me in many ways. For example, in Germany college education was more accessible. To me, education should not have a price tag. More education means more ideas and innovation, which would benefit the people, governments, as well as the economies. Furthermore, as far as I understand it, part of the Wisconsin Idea has its roots in German philosophy, which really fascinates me. I feel strongly that everyone should have the same access to knowledge and innovation. I gladly assist in providing this service to the people of Wisconsin and beyond, which includes working directly with producers, and communities via public outreach events, or by taking part in engaging the youth.



One of Wiesner's current projects is working to establish a baseline greenhouse gas budget and climate resilience target for the UW-River Falls Mann Valley Farm. The goal of this project is to optimize measurement strategies for GHG accounting within fields and barns, and to compare measurements with modeled values.  
Photos by Pat Deninger/UW-River Falls

## NEW FACULTY PROFILE



### Xia Zhu-Barker

Assistant Professor | Soil Science  
UW-Madison | start date June 2022

#### What is your hometown?

I was born and grew up in a remote village in Chongqing, China.

#### What is your educational and professional background, including your previous position?

I received a master's degree in soil ecology from the Northeast Institute of Geography and Agroecology and a PhD in botany from the Chengdu Institute of Biology, both under the Chinese Academy of Sciences. After completing my doctorate, I had my postdoctoral training at UC Davis.

#### How did you get into your field of research?

During the time I grew up, I worked a lot with my parents on the farm. Back then, all field work was conducted by hand. Everyone in my family worked very hard, but we barely had enough food. So my parents' big wish for me was to leave the farm and don't come back. Years later, I learned that if someone had taught us how to manage our farm in a sustainable way, we would [have had enough to eat]. To help more people to avoid starving and protect our environment, I followed my heart and became a soil scientist.

#### What are the goals of your research program?

The ultimate goal of my work is to improve the performance of agroecosystems by integrating biogeochemical, ecological, environmental,

agronomic, economic, and social knowledge into the food, energy, and water aspects of management decisions.

#### What attracted you to UW-Madison and the Dairy Innovation Hub?

The Department of Soil Science is one of the oldest and most renowned soil science departments in the world. The first time I heard about it was when I was in college taking a soil chemistry class. My instructor told me that UW-Madison was a world known university and its soil science major was one of the best. Since then, I had UW-Madison in my mind as an ideal place to pursue my career.

#### What was your first visit to campus like?

I first came to campus for an in-person interview in June 2021. I arrived in Madison at midnight. The moment I got out of the airplane, I immediately felt that this was the place that I saw myself living, though it was dark outside. The smell in the air, the humidity, the temperature and the landscape, all made me feel I was home. The two-day campus visit later on confirmed my first impression about Madison.

#### What's one thing you hope students who take a class with you will come away with?

I hope my students will continue to develop curiosity, critical thinking, and open-mindedness after taking one of my classes.

#### Do you share your expertise and experiences with the public through social media?

Yes, I use X, formerly Twitter, @XiaZhuBarker.



#### Does your work relate to the Wisconsin Idea?

Absolutely. My work focuses on addressing issues of agricultural sustainability including climate change mitigation, and focuses on soil, plant, and microbial interactions that affect livestock and human health. Dairy production in Wisconsin is a vital area in which to investigate how agroecosystems respond to a changing environment. These topics align with the Wisconsin Idea by extending impact of research and education from the classroom to the wider society, from the local community to the state, and from the nation to the world.

#### What's something interesting about your area of expertise that usually surprises the public?

The laughing gas (nitrous oxide) that dental doctors normally use to manage pain and anxiety during dental treatment is a greenhouse gas. It has a global warming potential 296 times higher than carbon dioxide.

This article was adapted with permission from UW-Madison CALS



Top: Zhu-Barker spoke to a group of farmers and consultants at the Aug. 30 Agronomy/Soils Field Day at the UW-Madison Arlington Agricultural Research Station. She shared data from her research assessing manure-based products' impact on silage corn nitrogen dynamics and environmental footprint. Above: Zhu-Barker uses a soil probe to take a soil sample from a silage corn field. Soil samples help farmers and their consultants determine nutrient levels for the growing crop. While this corn looked great, note the dry soil in the sample. Photos by Maria Woldt/Dairy Innovation Hub

## EARLY FUNDING CHECK-IN

### ENSURING ANIMAL HEALTH AND WELFARE



#### Sylvia Kehoe

Professor | Animal and Food Science  
UW-River Falls

**Project title: "Improving the health and welfare of dairy calves"**  
**Funding began March 2020**

The prevention of horn growth is a necessity on dairy farms to keep both animals and humans

The objective of a second trial was to examine the effects of oral stimulation on pain behaviors in dairy calves. Researchers wanted to know if providing a nipple in the pen would allow calves to alleviate their pain after paste disbudding.

A third project evaluated the amount of paste needed for effective results, comparing two common brands of paste. The primary objective of the third project was to determine the necessary volume of two different brands of paste for effective disbudding. The secondary objective will be to determine pain and wound healing from these different paste volumes and brands.



safe. In recent years, using caustic paste to remove horn buds from calves less than one week old has gained popularity. However, the method is not always consistent or safe for the animal or employee. Kehoe has conducted several research trials related to calf disbudding, each with unique objectives, but similar goals to improve the disbudding process.

The first trial involved developing a caustic paste applicator that was reusable or disposable to make the disbudding process much more consistent. Kehoe worked collaboratively with UW-Platteville's John Obielodan, associate professor of mechanical engineering, to develop an adhesive patch for safe and effective application. A larger study was conducted on a commercial dairy farm to test effectiveness, safety and consistency. This invention earned Kehoe the 2022 WiSys Innovator of the Year award, and resulted in a filed patent.

*With the help of dedicated undergraduate researchers and willing farmer-partners, Kehoe conducted several studies to improve the paste disbudding process for calves and humans. Photo by Pat Deninger/UW-River Falls*

## STUDENT PERSPECTIVE

### Karissa Juckem: from undergraduate researcher to graduate student

*Project title: "Improving the health and welfare of dairy calves"*

#### Why did you choose UW-River Falls, and then UW-Madison?

After touring multiple schools, I chose UW-River Falls for undergrad because I loved how hands-on the school is and the one-on-one interactions with other students and professors. After River Falls, I made my way to UW-Madison because Dr. Luiz Ferraretto's research was well-suited to my interests. Both Dr. Ferraretto and his students strive to support each other. Grad school can be scary in the beginning, so it's important to find a team that will help you through it.

#### Why did you choose your field?

I chose dairy nutrition after a lot of job shadowing. When I was at River Falls, I did internships with Dr. Matt Waldron at GPS Dairy and RP Nutrients. They all had great guidance and those experiences helped lead me to my decision.

#### How did you get involved with Sylvia Kehoe's research at UW-River Falls?

I got involved with Dr. Kehoe's research by reaching out! I was interested in research because I knew I was going to continue to grad school. She offered very good guidance, and it was nice to get some experience to help prepare for my future.

#### How did you prioritize your work with classes, homework, and student organizations as an undergraduate?

When we had on-farm days, I would always prioritize going to the farm. That meant working a little harder or staying up a little later to get homework done, but I felt that getting on-farm research experience was important. When it came to analyzing the data or writing, I would work on it whenever I had time. It kept me very busy but it was all worth it.

#### Does your master's project relate to your undergrad research?

My master's project does not relate to my undergrad research. Any undergrad research experience will help broaden your horizons and encourage you to think in a new way, and is one of the most important things to learn from research.



*From top: Karissa Juckem is a first year master's student in Animal and Dairy Science at UW-Madison. Karissa is a member of Luiz Ferraretto's lab, working to improve feed efficiency and reduce methane emissions in dairy cattle. Photos by Jori Skalitzky and Maria Woldt/Dairy Innovation Hub*



## FARMER PERSPECTIVE



### On-farm research creates opportunity for students and life-long learning

Project title: "Improving the health and welfare of dairy calves"

Dan and Mary Luckwaldt own Luckwaldt Dairy, a 1,300-cow dairy near Woodville in the heart of Western Wisconsin, and 30 minutes from River Falls. Sylvia Kehoe first met the Luckwaldts when they opened their farm to students preparing for the North American Intercollegiate Dairy Challenge Contest. This competition involves students touring working dairy farms and making management recommendations based on their observations.

Fast forward a few years, and a new calf facility was built at Luckwaldt Dairy. The calf manager at the time was a former student of Kehoe's and the two often discussed the new facility as they stayed in touch.

In early 2020, Kehoe was preparing several funding

proposals about dairy calf disbudding with the Dairy Innovation Hub, which was just coming online. In all, three projects were funded, each involving a unique aspect of calf disbudding and pain behavior.

"All of my disbudding research to this point has been done on private farms because UW-River Falls' Mann Valley Farm does not have the calf numbers needed for a significant sample size," says Kehoe. "A 1,300-cow dairy like Luckwaldts was the perfect farm size for this research."

Kehoe contacted Dan and Mary Luckwaldt and asked if she could conduct her Hub-funded trials on their farm. Thankfully, they agreed.



"Most modern dairy owners want to be part of university research. From our perspective, there was no downside," says Dan Luckwaldt.

Kehoe's research involved students traveling to the farm twice per week and managing all calf disbudding for the duration of the studies. The Luckwaldts found that participating in the research didn't interrupt their workflow at all. In fact, they thought the student researchers were great to work with and were very professional.

Education is very important to the family; Dan is an alumnus of UW-Madison and Mary an alumna of UW-River Falls.

"We are always looking to improve, from reading articles to attending conferences, we know that research is important," says Mary Luckwaldt.

Having access to an expert like Kehoe was also a benefit to participating in the research studies.

"When Sylvia came out, we got to ask her questions about other things related to our calves, not just the disbudding trial. She is a great resource," says Dan Luckwaldt.

Even though data wasn't shared during the study, the Luckwaldts observed improvements with calves disbudded by the research team. "We noticed the paste was much more contained and localized. Prior to the studies, we used too much paste," says Mary Luckwaldt.

"We have really learned a lot and if Sylvia ever called again about another research project, we would gladly say yes," she added.



Facing page: Mary Luckwaldt, Dan Luckwaldt, Derek Fenner, assistant herdsman, and Patrick Kusilek, herdsman. Top: Calves at Luckwaldt dairy were used to evaluate paste brand and volume on horn growth, wound size, and healing rate. Above: Calves are observed using a trail cam to determine if they will use a pacifier to help relieve pain during the disbudding process. Photos contributed.

### FINDINGS



**Sylvia Kehoe's Hub-funded study evaluating the effectiveness of two caustic paste brands and volumes was presented as an abstract at the June 2023 American Dairy Science Association annual meetings in Ottawa, Canada.**

**In addition to Kehoe, Karissa Juckem, Jack Saemrow, Joseph Schuh and Dr. Kate Creutzinger contributed to the study.**

**Overall, this study suggests that farmers may purchase different brands of caustic paste and expect similar results in wound size however an increased volume of caustic paste applied will increase wound size.**

#### EXPLORE ONLINE

Learn more about Hub-funded research at [dairyinnovationhub.wisc.edu](http://dairyinnovationhub.wisc.edu)

## EARLY FUNDING CHECK-IN

### ENRICHING HUMAN HEALTH AND NUTRITION



#### Denise Ney

Professor | Nutritional Sciences  
UW-Madison

**Project title: "Glycomacropeptide (GMP) derived from cheese whey: treating obesity by manipulating satiety hormones and the gut microbiota"**  
**Funding began March 2020**

A major part of Denise Ney's research career has been the development of

her collaborator Karen Hansen, evaluated the effect of GMP on satiety hormones, glucose homeostasis and the gut microbiota in 13 obese, postmenopausal women in a crossover study. The goals were to obtain additional data supporting GMP as a weight loss supplement, leading to future research. The tangible outcome is the creation of a novel GMP protein supplement from sweet cheese whey that treats obesity.

This product is currently seeking a buyer and has been patented by WARF.



medical foods for people with the rare genetic disorder, phenylketonuria (PKU). Ney and her collaborators discovered added benefits of GMP, which is derived from cheese whey, during her PKU research.

Ney created a value-added 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 glycoposphopeptide isolated from cheese whey.

Initial pilot studies in humans and mice indicated that GMP had anti-obesity properties, especially in females. GMP reduced hunger hormones and inflammatory cytokines, increased fat oxidation and functioned as a prebiotic to alter the gut microbiota.

With funding from the Dairy Innovation Hub, Ney and

*Ney pictured with her GMP weight loss supplement. A 2022 human subjects trial showed increased satiety and changes to the gut microbiome. Photo contributed*

## STUDENT PERSPECTIVE



#### Ibrahim Zuniga-Chaves

PhD candidate, UW-Madison  
Microbiology Doctoral Training Program

Project title: "Glycomacropeptide (GMP) derived from cheese whey: treating obesity by manipulating satiety hormones and the gut microbiota"

#### What brought you to UW-Madison?

I was born and raised in Costa Rica and completed my undergraduate degree in clinical

microbiology and my master's degree in bacteriology at the University of Costa Rica. I started looking for opportunities to do a PhD in the US and UW-Madison has one of the best microbiology programs in the country. I met Dr. Garret Suen (my current PI) during a project in Costa Rica, and we started working together.

#### Why did you choose microbial ecology as a specialty?

I started out as a clinical microbiologist because I've always been interested in studying and understanding how people get sick from microbes and how infectious diseases work. Later, I discovered that interesting microbial ecosystems can be found everywhere and that we could use the vast biodiversity in Costa Rica for research in this area. When I moved to Madison, I decided to combine both my passion for clinical microbiology and my new understanding of how microbial communities affect their host and began working on human gut microbiomes. The focus of my work is to understand how the human microbiome relates to and is altered by health and disease.

#### How did you get involved in the GMP human subjects trial with Dr. Ney and Dr. Hansen?

The main research focus of the Suen lab is rumen microbiology and how we can improve milk production by manipulating the rumen microbiome. Dr. Suen and Dr. Ney have collaborated in the past and he

recommended me for this project. Dr. Ney needed someone to analyze the stool samples and microbiome data for the clinical trial and Garret thought I was the best person for the project given my background, which includes a minor in clinical research.

#### Did you have any prior experience with dairy foods?

This was my first time working with dairy foods. But I was excited to work on this project because it is the perfect intersection of what my lab is doing to improve dairy production and my work on the human microbiome. I would love to do similar projects in the future.

#### What are your future career goals?

My passion for research and teaching is what led me to the U.S. and get my PhD. I would like to continue doing research either at the university level or in industry. I haven't decided exactly where I'll go, however, I really appreciate my research experience in the U.S. and the excellent mentorship I've had during my time at UW-Madison, including Dr. Suen and Dr. Ney.

#### What advice do you have for other students in your field?

The use of bioinformatics to understand microbial communities has been a hot area of research for about 10 years. I would advise other students to give it a try at any point in their careers. The field is still developing, and we have a lot of resources both on campus and online. I've also helped other students at every level from high school to PhD understand and apply bioinformatics into microbial ecology research. My research background and expertise has also opened doors for me in terms of collaborations and networking, as a lot of research now has a microbiome component, such as this clinical trial.

## PARTICIPANT PERSPECTIVE



### Study participant feels compelled to contribute to science, solutions

Project title: "Glycomacropeptide (GMP) derived from cheese whey: treating obesity by manipulating satiety hormones and the gut microbiota"

Gayle Orner loves to scuba dive. "Between the equipment and traveling to all the best [scuba] spots, this hobby gets really expensive," she explains.

To earn extra money for scuba diving, Orner has developed somewhat of a side hustle participating in paid university research. This is what led her to the human subjects trial evaluating the effectiveness of Denise Ney's glycomacropeptide (GMP) supplement.

"Participating in the GMP study started with a simple recruitment email," says Orner, referring to the mass

emails sent to UW-Madison employees to recruit study participants. Orner works on campus as an administrator for the Research Animal Resources and Compliance program, which ensures the care and use of animals on campus.

"Because I work in research, I feel compelled to participate in studies. This study was important to me because like so many post-menopausal women, I struggle to lose weight," says Orner.

Recruitment for Ney's GMP study began in early 2020

but halted when the university's Clinical Research Unit pivoted to COVID-19 vaccine development. The study was allowed to re-start in the fall of 2021. "Surprisingly, everyone we recruited finished the study, despite a year and a half delay," says Ney.

Being a study participant wasn't easy. To start, Orner had to pass a screening exam to make sure she met all the criteria. For the study itself, she had to schedule four, five-hour visits to the Clinical Research Unit, where she would be administered the supplement. Prior to each visit, she needed to fast, and she also had to provide stool samples. Finally, Orner had to log everything she ate during the study.

"I was able to work on my laptop while I waited, which was nice," says Orner. "I liked the supplement—it tasted like chocolate Yoo-hoo." In addition to its good taste, Orner noticed that while taking the supplement, she didn't have to eat as much to feel full.

For Ney, the most exciting finding has been data showing a change in the fecal microbiota. "This shows that GMP impacts the gut microbiota," she says. "With more research we could learn that GMP improves conditions like colitis or inflammatory bowel disease."

There are countless weight loss supplements on the market, but Ney says that very few have done clinical research to support their claims.

"The change in fecal microbiota is why this product is different. It has an effect on satiety and glucose homeostasis. It's very novel compared to what's out there," says Ney.

"You go to stores and see walls of supplements, and consumers don't know that claims are not always proven," says Orner. "Being part of this study was enjoyable and it wasn't just about the money, I can't wait for this supplement to be on the market."



Facing page from left: Denise Ney and Gayle Orner pose for a picture in Ney's lab located in the Nutritional Sciences building at UW-Madison. Above: The duo reflect on Orner's experience participating in Ney's human subjects trial for her GMP-derived weight loss supplement. Photos by Jori Skalitzy/Dairy Innovation Hub

### FINDINGS



**This study was published in July 2023 in the Journal of Nutrition. In addition to Denise Ney, Karen Hansen, Sangita Murali, Ibrahim Z. Chaves and Garret Suen are co-authors on the paper.**

**The team found that ingestion of GMP supplements reduced Streptococcus and increased amylin concentrations, improved glucose homeostasis, and altered the fecal**

**microbiome. GMP can be a helpful nutritional supplement in obese postmenopausal women at risk for metabolic syndrome. Further investigation is warranted.**

**READ THE PAPER**  
This paper is published in a free, open access format. Go to [sciencedirect.com](https://www.sciencedirect.com) and enter "Denise Ney" in the author search function.

## EARLY FUNDING CHECK-IN

### GROWING FARM BUSINESSES AND COMMUNITIES



#### Austin Polebitski

Associate Professor | Civil and Environmental Engineering  
UW-Platteville

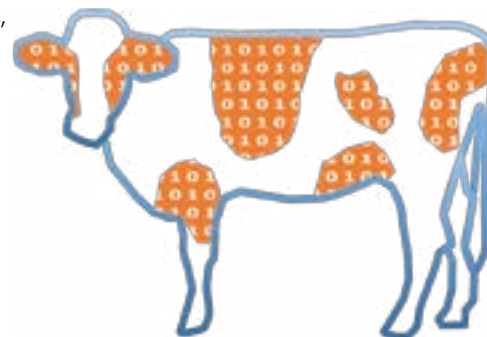
**Project title: “Decision making using DAIRI (Data Automation Interface and Real-Time Interaction): a platform for connecting farmers to their data”**  
**Funding began July 2021**

The dairy community is undergoing rapid growth and change in data management

to understand current use of on-farm data and the collection of historical data, creation of the DAIRI farmer platform, use of DAIRI in daily operations and decision making, and comparative analysis of important metrics related to herd health and revenue.

The expected outcome of this project is to have farmers more engaged with their data and to provide undergraduate researchers with a real-life project with tangible outcomes. Day-to-day operations of farms are complicated, time consuming, and hands-on, with many decisions having to be made daily that could impact revenue or herd health over the next week or longer.

DAIRI provides near real time assistance with decision making as feed adjustments, grouping strategies, lactation rotations, and health of each animal can be tracked and visualized, providing a single-point shared resource that the farmer can discuss with nutritionists, feed consultants, and farm technicians, keeping all eyes focused on the same data and situation.



and analytics. With sensing becoming increasingly accessible and inexpensive, dairies are finding new ways to optimize feed, milk production and bovine health that were not possible less than a decade ago.

More technology means more data generated from different sources. This project is focused on understanding how farmers currently use their data to make decisions and analyzing how a decision support framework could influence daily operations to increase herd health and revenue. To accomplish this, a light and efficient web-based platform was developed based on discussion with partner farmers and their consultants.

In addition to faculty, the research team includes local farmers and nutritionists to guide platform development and focus on ease of use, essentially getting data to a place where it is more easily stored, analyzed, and used to make decisions about farm management.

This project consists of four phases: farmer engagement

## STUDENT PERSPECTIVE



#### Nolan James

Software Engineer, Belcan  
UW-Platteville, BS'23 computer science, data science minor

Project title: “Decision making using DAIRI (Data Automation Interface and Real-Time Interaction): a platform for connecting farmers to their data”

#### Why did you choose your major?

I chose my major after I learned about programming in high school. I started by creating small math

programs on my TI-84 calculator. In college, I started in software engineering, but I liked a lot more of the computer sciences classes, so I changed majors after my freshman year. I like probability and stats, so I also minored in data science when UW-Platteville started to offer it.

#### How did you get involved in the DAIRI project with Dr. Polebitski?

While at UW-Platteville, I joined the Pioneer Makers Club, which is a club for people that like to make things. During my time as a club member, Dr. Polebitski asked if anyone in the club would be willing to help him design and manufacture a custom automatic door for his chicken coop. That sounded like a fun project to me, so I offered to help. While discussing that project with Dr. Polebitski, I mentioned I was enrolled in the data science program. He asked if I would be interested in helping with the DAIRI project since I already had experience coding in R (the coding language used in the DAIRI project).

#### Did you have any prior experience with agriculture, and did you ever think that you would apply your skills to the agriculture or data space?

I am from Dodgeville, Wisconsin and I grew up with my grandparents and uncles all farming. I also worked as a machine operator for a farm in high school, so I had quite a bit of experience with agriculture. My uncles own

a dairy farm, and my dad is a delivery driver and service technician for a farm supply company, but I didn't think I would ever use my computer skills for agriculture. I was surprised when I had the opportunity to work in agriculture, and glad I took it.

#### How did this research experience impact your career path?

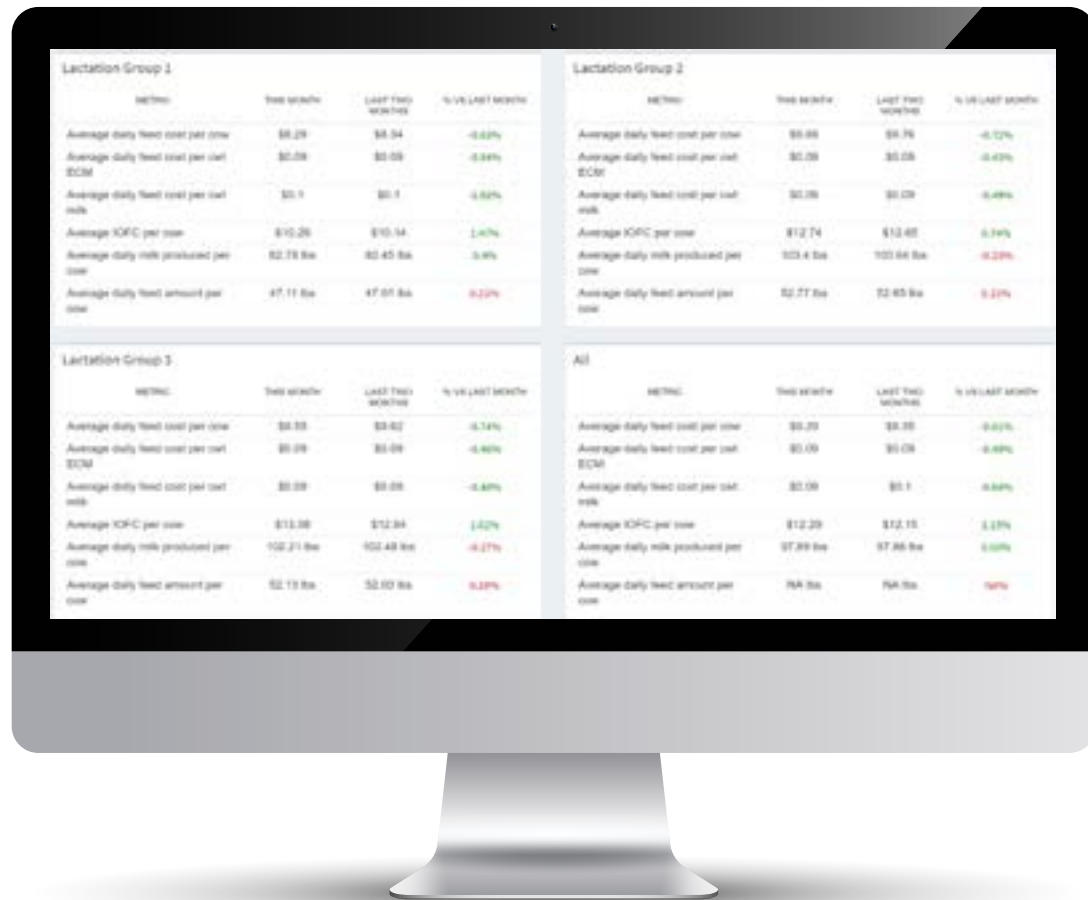
I learned that I really enjoy writing automation scripts and want to continue in the future. I also want to get back in the agriculture field in the future, hopefully writing code for self-driving tractors for companies like John Deere. Working on the automatic chicken coop door taught me how much I enjoy solving problems and writing code, as those were my favorite parts of the project.

#### What advice do you have for other data science students in terms of skills to develop or opportunities to pursue?

My advice for data science students is to try to take advantage of every opportunity they get, even if it seems over their head. “Data science” jobs are still new and can mean drastically different things from company to company. Don't be afraid to apply somewhere and apply to multiple places. Also, learning coding languages is also a great idea. R and Python are especially useful, and C++ is also good. But just learning any language is good because it teaches you another way to learn and think.

*During his senior year at UW-Platteville, Nolan James was a student researcher on the DAIRI project led by Austin Polebitski and Andy Bohnhoff. Nolan leveraged his computer science skills to write code for the platform and analyze preliminary data during the development stages of the project. In addition to the DAIRI project, Nolan helped Polebitski design and manufacture an automated chicken coop door.*

## BUSINESS PERSPECTIVE



Left: A screen shot from the DAIRI platform taken July 2023 shows how four lactation groups perform from a milk production and feed standpoint. Farmers and consultants will use this platform, which uses data from multiple sources, to make informed management decisions. Bottom right: The idea for DAIRI came from a real-life challenge faced by Andy Bohnhoff when working with farmers. Images contributed.

### Big data made easy: dairy nutritionist sparks idea for data platform

Project title: "Decision making using DAIRI (Data Automation Interface and Real-Time Interaction): a platform for connecting farmers to their data"

The research partnership between Austin Polebitski and Andy Bohnhoff began in an unconventional way. They met at their kids' sporting events, and like so many parents, struck up conversation to pass the time.

In between baseball games, the two quickly learned that they had a lot in common and started talking about some challenges Bohnhoff saw related to data, farming, and decision making.

Bohnhoff is a veterinarian by training and has worked

both in veterinary medicine and dairy nutrition consulting. Currently, he's the director of nutrition for Prairie Estates Genetics, A family-owned, dairy-specific, seed company.

When he was in the field consulting with farmers, he noticed a deficit of information to help farmers make decisions using milk, feed, and economic data. Bohnhoff says those data sources exist, but they are not accessible in one dashboard, and the data sets are not easy to use.

"My biggest issue was how to take these big data sets and make them useful," he says. "Farmers have so many sources of data on their farms now, but they can't make decisions if the data isn't formatted in a way that's helpful."

With Ron Rogers, owner of Prairie Estates Genetics on board, Bohnhoff and Polebitski got to work on a project to create a more user-friendly data interface to help dairy farmers and their consultants make better decisions.

"With help from Professional Dairy Producers (PDPW), we started by surveying a group of farmers to help focus our efforts," Bohnhoff says. "Feed cost is illusive, and it's often hard to pinpoint, so we decided to focus mostly in this area."

Once they decided on the appropriate data sets, Polebitski recruited two data-science students to refine the online dashboard and work on backend development. DAIRI uses open-source data science products (think "templates") that are available for researchers. Multiple Hub-funded projects at both UW-Madison and UW-Platteville use these tools.

"It's been great to learn about what data matters to dairy farmers. Data-driven decision making is a shift for sure, and we hope this tool helps farmers have a broader view of their business," says Polebitski.

With an operational dashboard and platform, Bohnhoff has beta tested DAIRI with a few of his Prairie Estates Genetics customers. Over the next year, the company will use the tool with a group of 12 farms as a value-added service and to stay connected to customers all year long. Wider availability of DAIRI could be available as early as 2025.

Bohnhoff is careful to explain who is best suited to use DAIRI. "This platform needs to come to farmers through a service provider like a seed company or a nutrition consultant. For it to work, there needs to be a dedicated staff person inputting the data," he says. "It's not realistic for a farmer to do it themselves."

"I really like what we developed, and I would have utilized it myself if Prairie Estates Genetics wasn't interested, but thankfully, they are," says Bohnhoff.



### FINDINGS



Austin Polebitski's Hub-funded project "Decision making using DAIRI: a platform for connecting farmers to their data" was developed in partnership with Arghya Das, former faculty at UW-Platteville and current assistant professor of computer science at the University of Alaska Fairbanks.

UW-Platteville data science students Nolan James and Adam Welch were student researchers on the project.

Polebitski is consulting with WiSys for patent opportunities, and the platform is currently being tested by farmers.

#### EXPLORE ONLINE

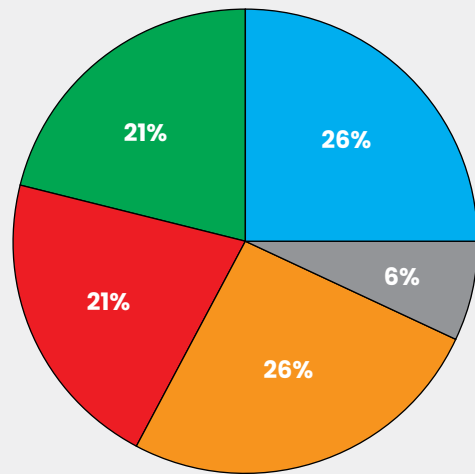
Learn more about DAIRI at [dairionline.com](http://dairionline.com)

# FINANCIAL OVERVIEW

Fiscal Year 23: July 1, 2022 – June 30, 2023

## By expense type

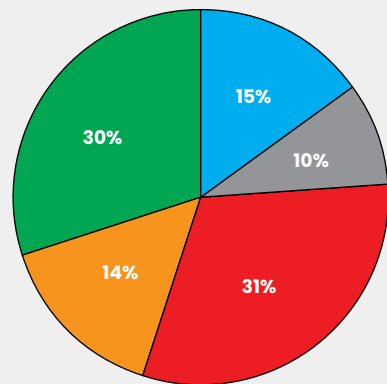
- Research expenditures
- Equipment
- Trainees and other salary
- Faculty salary
- Farm support and outreach



FY 23 projections from the approved spending plan mirror, almost exactly, actual expenses for the year. Funding was approved in October 2019, and the initial investments of \$1M in FY 20 and \$7.8M per year thereafter have already seeded recruitment of new talent, equipment investments and research projects in just four short years.

With more than 200 awards to date, projects are in various stages of progress and awards often span multiple years and are tracked according to their approved budgets, resulting in partial spending in a given fiscal year. Funds have naturally distributed evenly over the Hub's four priority areas, leading to maximum impact for the dairy community.

## By priority area



- Farm business and community
- Human health and nutrition
- Animal health and welfare
- Land and water
- Administrative

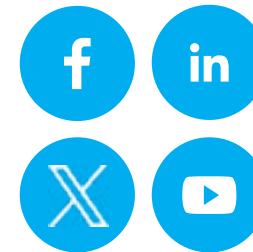
### FY 23 FINANCIAL HIGHLIGHTS:

**More than \$3.1M**  
for faculty, trainees and staff  
**NEW DAIRY TALENT**

**Total \$7.8M**  
**FUNDS ALLOCATED**  
for dairy initiatives

# COMMUNICATIONS STRATEGY

## SOCIAL MEDIA



- » 2,608 followers across four social platforms, a 70% increase over FY 22
- » Top Facebook post: "Kate Creutzinger and her friends are excited to see you next week", UW-River Falls, 6,878 reach
- » LinkedIn continues to be the top performing platform
- » 127,000 impressions on X, formerly Twitter, up 60% in FY 23
- » 84,247 impressions on LinkedIn in FY 23, posts consistently achieve 5% engagement rate
- » 6,536 views on YouTube. A 70% increase year over year.

## MEDIA RELATIONS

- » 428 popular press mentions. 3x increase over FY 22
- » Eleven press releases distributed to media promoting funding decisions at UW-Madison, UW-Platteville, and UW-River Falls
- » Regular media interviews with Hub staff and researchers

## OUTREACH IMPACT

- » 23 public and stakeholder presentations given by Hub staff. Including campus centers, conferences, information sessions for public audiences, trade groups, agencies and legislators
- » 11 in-kind articles, authored by Hub staff (not including researchers), contributed to dairy association publications

## E-NEWSLETTER

From its onset, maintaining close communication has been a priority for the Hub. The Hub maintains a quarterly e-newsletter that sends to more than 1,100 (and growing) unique Hub stakeholders, funded researchers, dairy leaders, state agencies and key legislators.

Contacts are invested in some way with the Hub, and have "opted in" to receive content. Mass or purchased email lists are not used, and all content



is original. Increasingly, citizens and related public groups are interested in Hub initiatives and have subscribed to the e-newsletter.

Anyone interested in receiving updates from the Hub can sign up at [dairyinnovationhub.wisc.edu](http://dairyinnovationhub.wisc.edu). All content is free and publicly available.

# CONFERENCES AND EVENTS

## DAIRY SUMMIT

The Hub held its third annual Dairy Summit on Nov. 16, 2022. The event was hosted by UW–River Falls in a hybrid format. There were 315 registrations: majority attendance was in-person, but there was significant virtual engagement both live and on-demand after the event.

The Summit included welcome remarks, progress reports on Hub-funded research projects, as well as panel sessions featuring dairy farmers, and dairy processors. In-person attendees enjoyed three facility tours impacted by the Hub, including the Mann Valley dairy farm and several new lab spaces in the Agricultural Sciences building.

The Dairy Summit highlights the Hub's newest research and is formatted for a public audience.

## DAIRY SYMPOSIUM

The Hub held its second annual Dairy Symposium on May 18, 2023 at the Pyle Center on the UW–Madison campus. More than 150 researchers, students, academic colleagues, and campus affiliates attended the day-long event.

Through poster sessions, keynote presentations, breakout discussions, and student flash talks, the Dairy Symposium highlighted examples of the Hub's most advanced research and facilitated discussions about how this work can help meet the challenges facing today's dairy community.

Symposium is the academic-focused companion to the public-focused Dairy Summit held each November.

"The value with the Hub and the research that is being produced is that we can look at it and apply it to what our farms are going to look like in the future," says Dave Daniels, chair of the Dairy Innovation Hub advisory council and owner of Mighty Grand Dairy, as he reflected on the day's talks. "Some of the things that we heard today will be possible in the future, but there are a lot of things that we can take back to our farm and implement today."



From top: Then UW–River Falls undergraduate, Karissa Juckem, networks during the poster session at Dairy Summit. Pictured with her lab mates, UW–Madison Hub-funded graduate student, Ana Moreira, won the Dairy Symposium flash talk competition. João Dórea, assistant professor at UW–Madison, gave the closing plenary at the Dairy Symposium. Photos by Pat Deninger/UW–River Falls and Nguyen Tran/Dairy Innovation Hub

## TAKING RESEARCH ON THE ROAD

Outreach and education are core tenets of the Dairy Innovation Hub. One of the best ways to share outcomes from Hub-funded research is by having a presence at meetings, conferences and events. This year, the Hub team hit the road and shared project outcomes, in person, from researchers at UW–Madison, UW–Platteville and UW–River Falls with the public.

This winter, the Hub hosted booths at the Dairy Strong conference and the PDPW Business Conference. In addition to a trade show presence at the Business Conference, PDPW invited four Hub-funded faculty to present on the Preview Stage. For the second year, 30 research posters were displayed in the Nexus Innovation Lane area. This space is dedicated to inventors, creators and idea-generators sharing their most novel ideas.

In April, the Hub hosted an informational research poster session on the iconic rotunda of the State Capitol to highlight select projects funded by the initiative at each participating campus. Legislators, staff and the public browsed research posters and engaged with students and faculty affiliated with Hub-funded projects. The poster session was co-located with Dairy Business Association's Dairy Day at the Capitol.

In late May, Heather White, faculty director for the Hub, traveled to the beautiful Northcentral Technical College campus to speak to the Wisconsin Agricultural Education and Workforce Development Council (WAEWDC), which is a function of the Department of Workforce Development. She highlighted examples of outstanding undergraduate and graduate students working on Hub-funded research. Many of whom had no previous dairy or research experience.

During the summer months, the Hub had the unique opportunity to showcase funded research on-farm and in-field. Several industry groups enjoyed guided tours and demonstrations, seeing first hand the added capacity made possible by the Hub.



From top: Jason Cavadini, UW–Madison Division of Extension, talks with Rep. Donna Rozar at the Hub's information poster session at the State Capitol. Hilario Mantovani, Hub-funded faculty at UW–Madison spoke at the PDPW Business Conference. UW–Platteville undergraduates Jeffrey Smolinski and Miranda Manley presented a poster at the North American Manure Expo. Photos by Jori Skalizky/Dairy Innovation Hub

## AWARD LISTING

### FY 23 funding decisions by priority area

Awards in this section were selected by panels of faculty colleagues through a competitive proposal process where faculty and staff submitted a research idea, budget, and justification.

#### Stewarding land and water resources

##### UW–Madison

###### Short term, high impact grants

- Manure application recommendations for alfalfa inter-seeded into corn silage – Marta Moura-Kohmann, Department of Plant and Agroecosystems Sciences
- The use of a modified acrylic fiber for removal of copper and antibiotics from manure amended soils – Inna Popova, Department of Soil Science

###### Graduate student assistantships

- Improving anaerobic digester performance through micro aeration – Neslihan Akdeniz-Onuki, Department of Biological Systems Engineering. Student: Ellie Froelich
- Pyrolyzing dairy manure solids to recover manure nutrients – Rebecca Larson, Nelson Institute for Environmental Studies and Joseph Sanford, School of Agriculture. Student: Jane Halloran
- Evaluating the effects of manure-based products on silage corn nitrogen uptake, fertilizer nitrogen use efficiency, soil nitrogen transformations, and nitrous oxide emissions – Xia Zhu-Barker, Department of Soil Science. Student: Joshua Mirabella

###### Equipment

- Increasing research capacity in enteric methane emissions and sustainable dairy farming: acquisition of a GreenFeed unit – Francisco Peñagaricano, Department of Animal and Dairy Sciences
- A greenhouse gas measurement system for dairy agroecosystems – Paul Stoy, Department of Biological Systems Engineering
- Soil science discrete analyzer for water and soil and plant extract ion analysis – Geoffrey Siemering, Department of Soil Science
- Cold season hydrology and frozen soils laboratory capacity building – Anita Thompson, Department of Biological Systems Engineering
- Dairy water quality research station: a campus-wide long-term lysimeter network in Wisconsin – Xia Zhu-Barker, Department of Soil Science

##### UW–Platteville

###### Equipment

- Equipment needs for the evaluation of dairy management practices on soil health and water quality – Christopher Baxter, School of Agriculture
- Evaluation of dairy fiber as an organic addendum to horticultural media used for growing native plants – Michael Compton, School of Agriculture

##### UW–River Falls

###### Faculty research fellowships

- Groundwater fluctuations-related nutrient cycling and stream water quality in agricultural headwater areas – Bahareh Hassanpour, Department of Plant and Earth Science
- Optimizing forage cover crop systems for agronomic production and environmental stewardship – Veronica Justen, Department of Plant and Earth Science
- Effect of in-field prairie strips on nutrient cycling and biodiversity in crop production systems: a preliminary study – Natasha Rayne, Department of Plant and Earth Science
- Establishing a baseline greenhouse gas budget and climate resilience target for the Mann Valley Dairy Farm – Susanne Wiesner, Department of Plant and Earth Science
- Efficient manure land application through innovative tillage systems: feasibility and environmental impacts – Bob Zhiwei Zeng, Department of Agricultural Engineering Technology

###### Equipment

- Developing capacity for chromatography techniques at the College of Agriculture, Food and Environmental Sciences, UW–River Falls – Bahareh Hassanpour, Department of Plant and Earth Science
- Precision row crop planter with GPS capabilities to enhance Mann Valley Farm Research Capacity – Veronica Justen, Department of Plant and Earth Science
- Benchtop Centrifuge – Heather Sumner-Davis, Department of Plant and Earth Science
- A multipurpose measurement system to assess the environmental sustainability and productivity of dairy farms – Susanne Wiesner, Department of Plant and Earth Science

#### Growing farm business and community

##### UW–Madison

###### Short term, high impact grants

- Toward net-zero dairy: Designing and operating a novel catalytic reactor for valorization of acid whey – Scott Rankin, Department of Food Science
- Intramammary infusion of tannin-chitosan hydrogels for prevention or treatment of bovine mastitis – Christian Krueger, Department of Animal and Dairy Sciences

###### Graduate student assistantships

- Gaining value from post-anaerobic digestion dairy manure fibers – Krishnapuram Karthikeyan, Department of Biological Systems Engineering. Student: Brayan Riascos



- A systematic review of the economics of nutritional interventions to reduce enteric methane production in dairy cows – Charles Nicholson, Department of Animal and Dairy Sciences and Department of Agricultural and Applied Economics. Student: Matheus Rebouças Pupo
- Profitability of Automated Milking Systems and labor implications for Wisconsin dairy farmers – Charles Nicholson, Department of Animal and Dairy Sciences and Department of Agricultural and Applied Economics; Shaheer Burney, Department of Agricultural Economics, UW–River Falls. Student: Jalyssa Beaudry, collaboratively mentored and funded with UW–River Falls

#### **Equipment**

- Expanding calf housing options into underutilized UW animal research facilities – Jessica Cederquist, Department of Animal and Dairy Sciences
- High temperature rapid viscoanalyzer to analyze dairy beverages, cheese, and competing products – Audrey Girard, Department of Food Science
- A small batch multi-purpose membrane filtration unit to isolate bioactive compounds from milk or dairy streams – Gulustan Ozturk, Department of Food Science
- Purchase of a no-till drill to enhance dairy conservation cropping system research at Peninsular Agriculture Research Station – Rebecca Wiepz, Peninsular Agriculture Research Station

### **UW–Platteville**

#### **Faculty research fellowships**

- Towards optimized usage of the milking robot using data analytics – Mohammad Ashrafuzzaman, Computer Science
- Evaluating trends in female to male ratios in dairy science and related programs throughout Wisconsin and the Midwest region and the translation into post-secondary employment – Krista Eiseman, School of Agriculture
- Dairy protein bio composites development using selective laser sintering 3D printing process – John Obielodan, Mechanical Engineering

### **UW–River Falls**

#### **Faculty research fellowships**

- Rural economic development in Wisconsin: analysis of intergenerational mobility and community-centered case studies – James White, Department of Agricultural Economics



### **UW–Madison**

#### **Short term, high impact grants**

- Deciphering ecological interactions in the ruminant gastrointestinal tract microbiota that affect methane formation and the efficacy of mitigation strategies – Hilario Mantovani, Department of Animal and Dairy Sciences
- Mooving cows: an innovative tool for diverse audiences to learn dairy cow handling practices – Jennifer Van Os, Department of Animal and Dairy Sciences

#### **Graduate student assistantships**

- Capacity of flies to acquire and transmit pathogenic bacteria to dairy cows – Kerri Coon, Department of Bacteriology. Student: Andrew Sommer
- A novel approach to understand the impact of dry-off on dairy cow welfare in Automatic Milking Systems – Kate Creutzinger, Department of Animal and Food Science, UW–River Falls; Jennifer Van Os, Jimena Laporta, and Joao Dorea, Department of Animal and Dairy Sciences, UW–Madison; Ryan Pralle, School of Agriculture, UW–Platteville. Student: Liz McGuire, collaboratively mentored and funded with UW–River Falls
- Beyond immunoglobulin concentrations: Exploring the potential of fresh colostrum on immune development and health in dairy calves – Lautaro Rostoll-Cangiano, Department of Animal and Dairy Sciences. Student: Malena Cid de la Paz

#### **Equipment**

- Calan feeding gates in Marshfield ARS lactating cow barn – Nancy Esser, Marshfield Agricultural Research Station
- Increasing research capacity in energy partitioning and feed efficiency walk on scales and expansion of electronic intake gate feeders – Luiz Ferraretto, Department of Animal and Dairy Sciences
- Acquisition of an automated platform (OmniLog ID Plus system) for identification and functional characterization of microbial isolates and phenotyping of livestock microbiomes – Hilario Mantovani, Department of Animal and Dairy Sciences
- Multi-barn high-resolution camera system for behavioral monitoring of dairy heifers – Jennifer Van Os, Department of Animal and Dairy Sciences

### **UW–Platteville**

#### **Faculty research fellowships**

- Exploring high liver triglyceride content heritability and genetic architecture in early lactation Holstein cows – Ryan Pralle, School of Agriculture
- Enhancing the safety and growth of alfalfa by the utilization of novel non-thermal technology – high voltage atmospheric cold plasma – Zifan Wan, School of Agriculture

#### **Equipment**

- Building capacity for dairy nutrition research: equipment to measure in-vitro digestibility and rumen gas production – Peter Lammers, School of Agriculture
- Testing the efficacy of plant essential oils in the management of Aphanomyces root rot of alfalfa – Muthu Venkateshwaran, School of Agriculture

### **UW–River Falls**

#### **Faculty research fellowships**

- Effects of using calf jackets on performance and health of purebred and crossbred dairy calves in different rearing environments – Sylvia Kehoe, Department of Animal and Food Science

#### **Equipment**

- Improvement of video recording systems at the Mann Valley Farm Dairy Learning Center, Phase 2 – Kurt Vogel, Department of Animal and Food Sciences

## Enriching human health and nutrition

### UW–Madison

#### Short term, high impact grants

- Demonstrating the value of dairy ingredients in protein and fiber based enriched snack foods – Audrey Girard, Department of Food Science
- The characterization of bovine milk fat lipids in surgical nutrition support – Joseph Pierre, Department of Nutritional Sciences

#### Graduate student assistantships

- Exploiting the food-grade organism *Aspergillus oryzae* as a biocontrol agent against *Listeria monocytogenes* in dairy products and cattle – Tu-Anh Huynh, Department of Food Science. Student: Zepeng Tu

#### Equipment

- Analysis of amino acids in milk and dairy products will enhance research from a biochemical, nutritional, bioactive and safety perspective – Rodrigo Ibáñez Alfaro, Center for Dairy Research
- Heavy metal assessment of soil, manure, feed, and dairy products using energydispersive X-ray fluorescence spectroscopy (EDXRF) – Alfred Hartemink, Department of Soil Science
- Tracking longitudinal bovine mammary gland development via ultrasound technology – Jimena Laporta, Department of Animal and Dairy Sciences
- Building capacity to perform cow-side measurements of cellular metabolism via the mobile Seahorse XF HS mini analyzer – Vanessa Leone, Department of Animal and Dairy Sciences
- Upgrading the shared campus use small animal metabolic phenotyping facility – Joseph Pierre, Department of Nutritional Sciences
- Acquisition of high parameter flow cytometer to disentangle complex microbe–host interactions that drive neonatal development in dairy cows – Lautaro Rostoll Cangiano, Department of Animal and Dairy Sciences

### UW–Platteville

#### Equipment

- Quality assessment of dairy products after cold plasma treatments through texture, color, and microbial analysis – Zifan Wan, School of Agriculture

### UW–River Falls

No awards in this priority area selected for funding

Right: Grace Lewis (left), Hub funded faculty at UW–River Falls, works in the dairy processing lab with then-student, Kate Peterson (right). Upon graduation in May 2023, Kate was hired by Kerry Ingredients. Photo by Pat Deninger/UW–River Falls.



Olivia Adams, right, is a sophomore majoring in animal science at UW–Platteville. She began working with Ryan Pralle, left, on research funded by the Hub investigating the impact of fatty liver disease on dairy cows. Leveraging this opportunity, she has been awarded \$6,750 in local scholarships to investigate the association between diet variability and metabolic health, as well as value-added blood chemistry analysis for fresh cows. Photo by Andy McNeill/UW–Platteville



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*Collaboration is key  
and communication  
is paramount.*

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