

DAIRY PIPELINE

DETECTING AND PREVENTING *PSEUDOMONAS* CONTAMINATION IN DAIRY PLANTS AND PRODUCTS

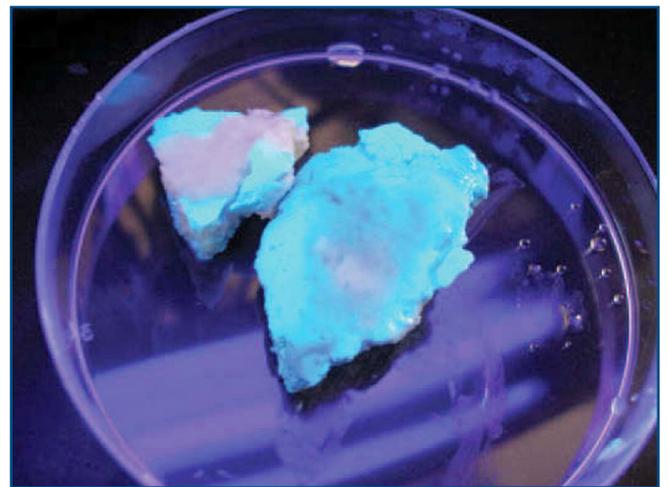
Pseudomonas bacteria are a contaminant that can spoil milk and result in discoloration and off flavors in cheese. It is a challenging bacteria to control in a dairy plant.

Pseudomonas is a Gram-negative, aerobic rod bacterium of the *Pseudomonadaceae* family. There are almost 200 identified species of *Pseudomonas*. The most common family of this bacteria found in dairy plants is the *Pseudomonas fluorescens* group, which consists of at least 52 species. It is an aerobic bacteria – it needs oxygen to grow – and it is a psychrotrophic bacteria – it can grow in cold environments.

It is not a pathogen, but it can be destructive to cheese quality; it causes defects like off flavors and discoloration. Long the bane of milk bottlers because it so frequently spoils fluid, pasteurized milk, it can cause issues in fresh cheeses as well. In fresh cheeses it can give a bluish tint and off flavors to the cheese or brine. It can also produce a phenolic taint, or disinfectant taint, which gives a strong medicinal or bandage taste. Not only is it a particularly nasty taste, it also has a very low flavor threshold, which means it can be tasted at very low concentrations, as low as 10 parts per trillion. If *Pseudomonas* shows up on the outside of a cheese, that cheese needs to be discarded because those off flavors will leach into the cheese.

By far the most common type of *Pseudomonas* bacteria found in a dairy plant is bacteria from the *Pseudomonas fluorescens* group. However, *Pseudomonas aeruginosa*, although much rarer, has also been found in dairy

plants. *P. aeruginosa* is an opportunistic pathogen – those with an existing immunodeficiency can be infected by it.



Cheese that is contaminated with *Pseudomonas fluorescens* will show bright blue or green colors under ultraviolet (UV) light.

Pasteurization and thermization kill *Pseudomonas*, however even after heat treatment, *Pseudomonas* enzymes may still be active and produce off flavors in the cheese or dairy products because *Pseudomonas* bacteria produce many thermo-tolerant lipolytic and proteolytic enzymes that survive pasteurization, which cause the defects and off flavors mentioned above.

However, studies have found that the most common way that *Pseudomonas* contaminates milk and dairy products is through post pasteurization contamination. (PPC).

How/Why it Appears in Cheese Plant

Pseudomonas is a ubiquitous organism that thrives in wet and damp conditions. It can enter the dairy plant in a number of ways including dirt, dust, milk, and water. The most common way *Pseudomonas* gets into a plant is via water or milk. When *Pseudomonas* is present in the environment of the cheese plant it can easily find its way into the milk or dairy product. ➔



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Because it grows well in wet conditions, the smear-ripened cheese environment is especially susceptible to *Pseudomonas* bacteria. As mentioned, it's an aerobic organism, it needs oxygen, therefore cheese ripened aerobically like Blue cheese and Camembert cheese are especially susceptible as well as unripened cheeses like Fresh Mozzarella, Ricotta, Queso Fresco or Panela. Any higher moisture, non-ripened cheese is at risk of harboring *Pseudomonas* bacteria.



Any higher moisture cheeses like Fresh Mozzarella are at a higher risk for *Pseudomonas* bacteria.

Pseudomonas bacteria can also be present in well water that is not treated with chlorine. Water sources can also be treated with ultraviolet (UV) light to disinfect water and eliminates several types of microorganisms.

Another method that CDR staff have seen *Pseudomonas* bacteria take hold in a plant is in the milk silos. If a plant receives a load of milk that is contaminated with *Pseudomonas* bacteria and doesn't properly wash its milk silos between each fill, the *Pseudomonas* bacteria can establish a biofilm on the interior of the silo. Unless the biofilm is removed, this will result in all milk held in the silo to become contaminated with *Pseudomonas* and its heat stable enzymes.

Detecting/Testing Methods

It takes selective agars to test specifically for *Pseudomonas* bacteria. It is not selected by standard plate counts, coliform or Enterobacteriaceae (EB) tests. The Standard Methods for the Examination of Dairy Products (Frank and Yousef, 2004) recommends crystal violet tetrazolium agar (CVTA) for the selective enumeration of Gram-negative bacteria like *Pseudomonas*. However, this complex test is not routinely used by dairy processing facilities. Since *Pseudomonas* is not readily detected by common tests, processors may not realize they have an issue until it shows up in the product. Recently the use of 3M Petrifilm has been shown to be a reliable and selective method for the detection of *Pseudomonas* (Rojas et al., 2020). This method can be easily adopted by industry.

Another way that *Pseudomonas* bacteria can be detected

on product contact surfaces or even on the surfaces of cheese is through the use of ultraviolet (UV) light. As its name suggests, bacteria in the *Pseudomonas fluorescens* group produce fluorescent pigments that show up under UV light. Cheese that is contaminated with *Pseudomonas fluorescens* will show bright blue or green colors under UV light. Similarly, this method can be used in the dairy plant to identify areas of the plant or equipment where *Pseudomonas* is present. You can turn off the lights in the plant, walk around with a UV light and shine it on stainless steel product contact surfaces of equipment.

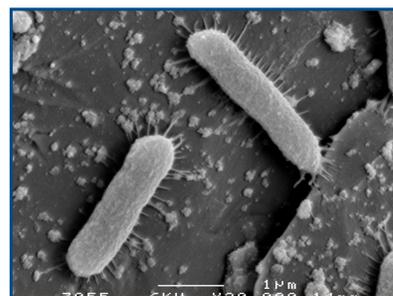


In fresh cheeses, *Pseudomonas* bacteria can give a bluish tint and off flavors to the cheese.

Prevention

Pseudomonas is challenging to control in the dairy plant given that it thrives in wet and cool conditions. The most effective strategy to control *Pseudomonas* is to keep the environment dry, properly sanitize and clean equipment and the plant and control and monitor water sources in the plant. As mentioned, *Pseudomonas* grows in wet and moist environments, so it is important to keep equipment and the plant as dry as possible. Any area that is wet or gets wet, needs to be sanitized including floors. It is important to prevent whey accumulation on dairy plant floors especially in the make room and ripening rooms where the floors seem to be constantly damp.

Research has found that effective control of *Pseudomonas* requires not only strong attention to cleaning, sanitation, and preventive maintenance, but also to specific strategies to control biofilm formation. Biofilms are difficult to remove as they evade and resist cleaning and sanitation efforts.



Pseudomonas fluorescens cells forming a biofilm on stainless steel slides.

In plain terms, a biofilm is a result of the adherence of microorganisms to a surface. More specifically, a biofilm occurs when bacteria and/or yeast begin to build up inside equipment. Microorganisms secrete a sticky

material, known as exopolysaccharide, which is →

responsible for the gooey film that makes biofilms so hard to remove. As the biofilm establishes itself, it becomes more likely that microorganisms from the original biofilm may slough off and contaminate your product or another area of the equipment. Biofilms can also cause reduced flow of liquids, corrosion of equipment, cleaning chemical resistance issues and more. It is recommended that you contact your cleaning representative for specific cleaning agents to control *Pseudomonas* bacteria and remove biofilms.

As mentioned earlier, it is recommended that dairy plants that use well water treat that water with chlorine (or UV light) to protect against bacterial growth. In addition, reclaimed water tanks like COW water or RO water tanks need to be monitored and sanitized to protect against the formation of biofilms.

Another trouble spot can be a plant's pasteurizer. Specifically, the pasteurized side of the regeneration plates in the HTST unit can harbor bacterial growth if not cleaned and sanitized properly.



Cheese ripened aerobically like Blue cheese and Camembert cheese can be susceptible to *Pseudomonas* contamination.

Packaging can also contribute to *Pseudomonas* growth. If a cheese isn't packaged correctly, for instance there is too much oxygen left in the package or it isn't sealed properly, then *Pseudomonas* may grow.

There are other little strategies that can help prevent *Pseudomonas* growth on cheese. For instance, while cheese is aging, make sure that the bottom racks are not too close to the floor. If too close to the floor, the cheese will be in a more humid or moist environment and will therefore be more susceptible to *Pseudomonas* contamination.

Overall, *Pseudomonas* bacteria continue to be challenging to control in a dairy plant. There is a need for improved methods to detect sources of post pasteurization contamination as well as improved sanitary equipment design. However, if dairy plants put an emphasis on sanitation of the plant and equipment, and have proper controls in place for its water sources, it is possible to reduce the chances of *Pseudomonas* contaminating the dairy products.

Technical reviewers: Mark Johnson and Dean Sommer, CDR

Sources:

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Additional Resources:

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Dairy Pipeline. Understanding Biofilms. 2013. Volume 25, Number 1. 🌟

CDR HELPING INTEGRATE U.S. DAIRY PERMEATE INTO CHINESE FOOD AND BEVERAGES

Technical reviewer: K.J. Burrington, CDR

On May 12, 2020, dairy permeate was approved for food use in China. This provides a tremendous opportunity for U.S. manufacturers of dairy permeate to expand export of their product to this new market.

The use of dairy permeate in food and beverages has gained traction across the globe. Milk and whey permeate are economical ingredients that can provide added flavor and nutrition to food and beverages.

CDR has long been part of the U.S. Dairy Export Council's efforts to help increase the use and demand of U.S. dairy permeate in China. K.J. Burrington, CDR's Dairy Ingredients, Beverages & Cultured Products Coordinator, assisted in the process to get permeate approved for food use in China. She has provided several training seminars for Chinese food and beverage industry stakeholders and decision makers on behalf of USDEC, on trade mission trips to China and with reverse trade mission Groups visiting the U.S. In recent USDEC webinars Burrington has touted the benefits of using permeate and describes how it can be beneficial to food and beverage formulations. Permeate can help reduce sodium, add nutrition (dairy minerals), reduce cost, and contribute to a clean label.

What is Permeate?

There are two sources of permeate: milk permeate and whey permeate. Whey permeate comes from the ultrafiltration of whey, that is the result of the cheesemaking process, while milk permeate comes from the ultrafiltration of skim milk. Ultrafiltration of whey or milk concentrates the larger molecules, such as protein and fat, which becomes the retentate (the components that are retained by the ultrafiltration membrane).

The retentate becomes the protein-based ingredients, like whey protein or milk protein concentrates or isolates (WPC, WPI, MPC, MPI). Lactose, and minerals are the smaller molecules which go through or "permeate" the ultrafiltration membrane, and thus are called the permeate.

Both milk and whey permeates contain primarily lactose and minerals. Permeates contain

very little fat or protein. Whey permeate and milk permeate are very similar; the main difference being that milk permeate hasn't gone through cheesemaking process. Therefore, milk permeate has a cleaner, milkier flavor while whey permeate picks up some flavors from the cheesemaking process.

As more dairy protein ingredients are produced in the U.S., more permeate ingredients are also produced. Both milk protein concentrate (MPC), and whey protein concentrate (WPC) have been gaining popularity worldwide and production is increasing in the U.S. Permeate is now gaining popularity as a cost-effective food ingredient. In 2000, the U.S. had one manufacturer of permeate and now there are more than eight manufacturers.

Permeate Benefits

In 2000, CDR began researching and working with permeate. One of the first benefits of permeate that CDR identified was its ability to replace sodium. CDR developed a pound cake and found that when using permeate, they could take out all of the salt in the formulation. Through some research by Dr. MaryAnne Drake's group at North Carolina State University and work done at CDR, it was discovered that the potassium content in permeate gives permeate its salty characteristics. In most applications, about 10 grams of permeate will replace about 1 gram of salt.

In addition to replacing sodium, permeate also contributes nicely to baked products. Since permeate is predominantly lactose, it participates in the Maillard browning reaction, which means permeate gives a brown color to baked products like breads. The lactose in permeate also contributes a sweet, browned flavor that complements baked products.

Permeate also includes nutritionally valuable minerals including calcium, magnesium, sodium, and potassium. "There are a lot of important dairy minerals in permeate,"

Burrington said. "You can really affect the label of a product and increase those important minerals just by the addition of permeate."

Permeate can also help manufacturers produce more economical formulations. Permeate can act as a flavor enhancer and other more expensive flavorings, like cocoa powder, can be reduced when permeate is used. CDR →

CODEX Permeate Standard			
Criteria	Dairy Permeate Powder	Whey Permeate Powder	Milk Permeate Powder
Min. lactose, anhydrous (m/m) ^(a)	76.0%	76.0%	76.0%
Max. nitrogen (m/m)	1.1%	1.1%	0.8%
Max. milk fat	1.5%	1.5%	1.5%
Max. ash	14.0%	12.0%	12.0%
Max. moisture (m/m) ^(b)	5.0%	5.0%	5.0%

^(a) Although the products may contain both anhydrous lactose and lactose monohydrate

^(b) The moisture content does not include the water of crystallization of the lactose

developed a reduced sodium muffin formulation that utilized permeate and found that there was about an 11% cost reduction using permeate to reduce other more expensive ingredients.

Many consumers are more attracted to “clean label” products. Permeate can also help in this regard as it can be used to replace ingredients such as dextrose, maltodextrin and others.

CDR Formulations

Over the years, CDR has developed many formulations that feature the innovative use of dairy and dairy ingredients in food and beverages. Here are two formulations, developed by Sarah Minasian, CDR’s Research Chef, that showcase how permeate can be used to add nutrition, taste and value to products. More formulations and information about permeate can be found at www.ThinkUSAdairy.org. 🌟

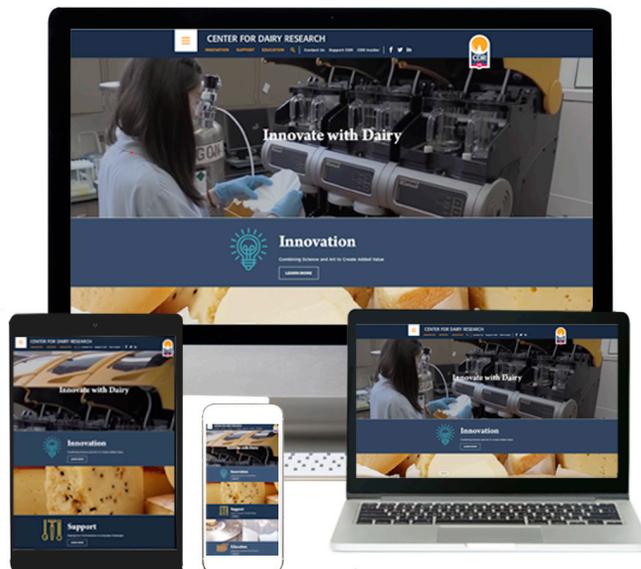
Ginger garlic brown sauce with whey permeate	
Ingredients	(%)
Reduced sodium soy sauce	34.60
Low sodium chicken broth	21.75
Rice wine	14.83
Water	10.87
Canola oil	4.74
Whey permeate	3.95
Corn starch	2.97
Sesame oil	2.57
Chopped ginger	1.82
Minced garlic	1.75
White pepper	0.15
Total	100.00



Bubble tea with whey permeate	
Ingredients	(%)
Brewed black tea	53.90
Tapioca pearls	21.00
Honey	16.14
Whey Permeate	3.05
Nonfat Dry Milk	3.05
Sweetened condensed milk	2.86
Total	100.00



NEW CDR WEBSITE BOOSTS MODERN LOOK, ENHANCED FEATURES



The Center for Dairy Research Communications staff recently launched a new CDR website. The updated website features a modern look with dynamic and interactive webpages and is now also compatible with all devices (phones, laptops, tablets, etc.).

We hope you take time to explore the new website, which focuses on CDR’s Innovation, Support Services, and Education expertise. The site also includes a new focus on “How to Work with CDR.”

To help you navigate, we recommend you click on the navigation menu or ‘hamburger’ (top left corner) and there you will see an outline of the website with links to the pages.

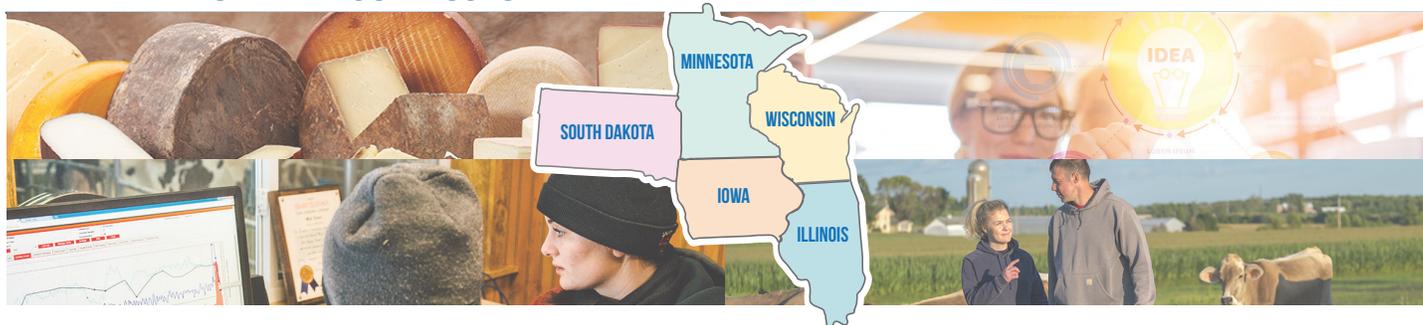
CDR Insider access: If you are a member of the CDR Industry Team or a Wisconsin dairy manufacturer, you can get access to the CDR Insider; a members-only section of the CDR website that hosts research papers, presentations, and exclusive industry resources.

If you are an existing CDR Insider user, you will need to set up a new password. Click on “CDR Insider” and then “Forgot your password?” and you will receive an email to set up your new account.

If you would like to apply for a CDR Insider account, click on “CDR Insider” and then “Create Account” and your submission will be reviewed for approval.

View the new CDR website: www.cdr.wisc.edu. 🌟

DBIA RECEIVES SECOND ROUND OF FUNDING AND AWARDS 2020 GRANTS TO MIDWEST DAIRY FARMS AND BUSINESSES



The Dairy Business Innovation Alliance (DBIA), coordinated by the Center for Dairy Research and Wisconsin Cheese Makers Association (WCMA), was launched earlier this year to support Midwest dairy farmers and businesses.

Specifically, DBIA provides technical support and grants to dairy farmers, artisanal cheesemakers and other dairy businesses in Illinois, Iowa, Minnesota, South Dakota and Wisconsin who are interested in dairy farm diversification, developing new value-added products, such as specialty cheeses or beverages, or exporting their products.

The 2018 US Farm Bill created a new program called the Dairy Business Innovation Initiatives that is administered by the USDA. This new federal program sought to create several regional dairy business support initiatives across the U.S. USDA accepted applications for this program and, in 2019, the CDR and WCMA were informed that its proposal had been accepted and the DBIA was born. The DBIA proposal had overwhelming support from the dairy industry throughout the region with over 30 letters of support from dairy groups and organizations.

Although DBIA is just getting started there have already been several successes.

DBIA Receives Second Round of Funding

In August, DBIA staff were notified by USDA that the DBIA would be receiving \$6.13 million in a second round of funding from USDA to continue its work for the next three years. In this next funding period, running through 2023, the DBIA will provide funding to help with market research, product development, technical assistance, and accessing consultative services. In addition, DBIA will also distribute approximately \$3.4 million in grants to Midwest dairy farm and processing businesses.

“Now more than ever, dairy businesses must work quickly to adapt to changes in consumer demands and market opportunities,” said John Lucey, CDR Director. “We are pleased to be able to put USDA funds to work, building upon the tremendous interest in the first initiative, to help dairy farmers and processors survive and thrive amid challenging conditions.”

2020 Grant Program Recipients

This summer the DBIA accepted grant applications from Midwest dairy farms and businesses that are interested in diversifying their operations or developing new dairy products. The response was very positive: the DBIA received 77 applications. In September, DBIA selected the winners and awarded \$230,000 in grants to 13 dairy farms and businesses in all five states: Illinois, Iowa, Minnesota, South Dakota and Wisconsin. 2020 DBIA grant recipients, listed alphabetically by company name, are:

Bennett Valley Cheese, Gilmanston, Wisconsin | Award: \$16,489

Bennett Valley Cheese is building an artisan cheese plant and on-site storefront near a small Jersey dairy farm where they are sourcing their milk. They will make cheese curds for sale in their store, as well as in local restaurants, taverns and convenience stores.

Carr Valley Cheese Company, La Valle, Wisconsin | Award: \$16,489

Carr Valley Cheese Company is an established, fourth-generation artisan cheese plant purchasing equipment and designing a production area to create a new product line of flavored, pasteurized cheese using local sheep's milk. This endeavor will also create new jobs in their Fennimore, Wisconsin processing facility.

Country View Dairy LLC, Hawkeye, Iowa | Award: \$20,000

In response to COVID, Country View Dairy LLC, a small farmstead, family operated dairy plant, has developed individual-serving frozen yogurt treats that are sold at retail stores and from food trucks. They plan to expand the production, sales and distribution of their frozen yogurt treats through new cooperative agreements with partners and will purchase a delivery cooler and design and purchase branded packaging. ➔

Crave Brothers Farmstead Cheese, Waterloo, Wisconsin | Award: \$12,500

Crave Brothers Farmstead Cheese will install an innovative water use and circulation system that uses less water to initially cool cheese and uses recirculated cold water and cold air to finish the cooling process to save money and resources.



George Crave, Crave Brothers

Ellsworth Cooperative Creamery, Ellsworth, Wisconsin | Award: \$16,489

Ellsworth Cooperative Creamery plans to research and develop a new shelf-stable dairy product to diversify its value-added offerings for export markets.



Laura Klock, FARM LIFE Creamery

Farm Life Creamery LLC, Ethan, South Dakota | Award: \$16,514

Farm Life Creamery will use grant monies to purchase and install a vertical cheese press and manual cutter that will support an expansion of its product line, expand cheese sales volume, and allow them to manufacture a new ethnic cheese type.

Marcoot Jersey Creamery, Greenville, Illinois | Award: \$20,000

Marcoot Jersey Creamery, a seventh-generation family-farm creamery, will purchase new equipment needed to use the whey from making cheese to produce a new, high-protein, frozen sports recovery product.

McCluskey Brothers, Hillpoint, Wisconsin | Award: \$15,031

McCluskey Brothers will purchase and install equipment to produce and package a new value-added dairy product – shredded cheese from their grass-fed herd– in its farmstead cheese plant and custom cheese conversion facility.

Metz's Hart-Land Creamery LLC, Rushford, Minnesota | Award: \$20,000

Metz's Hart-Land Creamery will use the grant to purchase a new cheese vat so it can expand its cheese curd production and sales to meet growing markets.

Redhead Creamery LLC, Brooten, Minnesota | Award: \$20,000

In response to the COVID-19 crisis and subsequent loss of markets for cheese, Redhead Creamery began working with area cheesemakers to collect Minnesota-made cheeses for direct distribution, with hopes to someday help area makers form full pallets to export at lower cost to outside the Midwest. Redhead Creamery will use grant monies to update its facilities with construction of storage space, a cheese cave, covered concrete delivery ramp, and to purchase a larger cooler.



Alise Sjostrom, Redhead Creamery

Royal Guernsey Creamery LLC, Columbus, Wisconsin | Award: \$20,000

Gurn-Z Meadow Farm, a seventh-generation dairy farm, will diversify their business as they launch a new processing venture, Royal Guernsey Creamery, making butter with milk from their farm at nearby Sassy Cow Creamery.

Taste and See Creamery, Boyceville, Wisconsin | Award: \$20,000

Taste and See Creamery will use grant monies to purchase a vat pasteurizer for the new on-farm creamery it is building on its grass-fed grazing dairy farm. Taste and See Creamery also plans to host tour groups.

Yodelay Yogurt, LLC, Madison, Wisconsin | Award: \$16,489

Yodelay Yogurt will design and build a custom case packer, eliminating the need for hand-making boxes. This change will accommodate business growth, as demand for their value-added yogurt continues to increase.

As mentioned earlier, DBIA received 77 applications for the 2020 grant program. Not all applicants received grants. However, DBIA will be putting out another call for applications in spring 2021 and encourages those applicants not awarded grants in 2020 to apply again next year.

Technical and Business Support

This fall and winter, DBIA is focusing on technical education and business support by hosting a series of eight webinars to help dairy farms and businesses get started in their new ventures.

The “Let’s Get Started” webinars introduce the DBIA program and provide advice and local, state and federal resources to assist participants in starting or expanding their business. These resources can help them create a business plan, develop a product, address regulatory issues, market their product, address food safety and quality or start or expand an export program. Overall, the webinars will help connect dairy farmers and businesses to local resources available in the five-state region and expertise and technical assistance to support them as they work to diversify their enterprise, develop new products or seek new export markets.



The DBIA webinars will be a combination of general information, presentations, breakout sessions and interviews with dairy farmers and processors sharing their experiences and lessons learned. The webinar series began on October 20 and continues through January 2021. Registration is free; visit the DBIA website for more information: www.cdr.wisc.edu/dbia

If you are interested in learning more about DBIA or registering for an upcoming webinar, visit the DBIA website (listed above) or you can contact Karen Nielsen, DBIA Program Coordinator, at kn Nielsen@cdr.wisc.edu or 608-265-1491. 🌻

CHEESE EXPO

GLOBAL ONLINE

ANNOUNCED FOR APRIL 6-8, 2021

For the welfare and benefit of dairy industry personnel, a new event, CheeseExpo Global Online, will offer industry innovations, world-class technical and marketing seminars, and supplier connections April 6-8, 2021.

CheeseExpo, the popular in-person technology exposition, will be postponed until April 12-14, 2022 in Milwaukee.

The need for timely information, technology transfer, and market insights never stops, and CheeseExpo Global Online will deliver by tapping the industry's finest technical experts, industry leaders and solutions from the supplier sector.

CheeseExpo Global Online will be co-hosted by Wisconsin Cheese Makers Association and the dairy experts at Center for Dairy Research. "If there's a silver lining in these unusual times, it's the opportunity for an online event to bring ideas, new technology and networking to every PC, and every conference room and training room in the dairy industry," said John Lucey, Director of the Center for Dairy Research.

CheeseExpo Global Online will deliver compact, focused seminars, exclusive showcases from exhibitors, and easy-to-use connections to chat or meet by video with fellow attendees.

"We've spoken with processors and exhibitors and we know our industry wants concise information and free access to supplier partners," said John Umhoefer, Executive Director of the Wisconsin Cheese Makers Association. "And this is CheeseExpo, the show that puts people first, so you'll see a celebration of industry honorees and the spotlight on cheesemakers and award-winning products at the heart of our Championship Cheese Contests."

CheeseExpo will return live and in person April 12-14, 2022 at the Wisconsin Center in Milwaukee, a move that reflects the "safety-first" culture within the U.S. and international dairy industry.

For more information on CheeseExpo Global Online, visit www.CheeseExpo.org. 🌻

CDR RESEARCH COULD HELP INCREASE ANTIHYPERTENSIVE PROPERTIES OF CHEESE

The Center for Dairy Research will be studying how to manufacture natural cheeses so that they contain increased amounts of bioactive peptides with antihypertensive properties. Rodrigo Ibanez Alfaro, CDR Associate Scientist, was recently awarded a grant from the Dairy Innovation Hub to support CDR's work in this area.

During cheese manufacture and aging, proteins are hydrolyzed, or broken down, by action of the rennet and enzymes from the bacteria into smaller fractions called peptides. In some cases, peptides from dairy products have regulatory functions in the human body with beneficial health effects, such as reduced hypertension, anti-inflammatory activity, antioxidant activity, and improved immune system activity.

CDR research is working to develop cheese manufacturing and aging methods to increase the amount of the bioactive peptides in cheese that have antihypertensive properties.

"Besides their nutritional properties, cheeses can also contain bioactive compounds that may have a positive impact on human health, and we want to improve their 'functional' properties by evaluating different approaches on cheesemaking," Ibanez Alfaro said.

CDR will be making trial cheeses to test what cheesemaking techniques and/or ingredients can be



Rodrigo Ibanez Alfaro, CDR

utilized to increase the bioactive peptides in the cheese. Once the trial cheeses are made, CDR, in collaboration with Brad Bolling, a

professor in the University of Wisconsin Food Science Department, will put the cheeses into a simulated gastrointestinal digestion model to see what happens with the peptides during digestion. In many cases, peptides breakdown when consumed or they are formed after digestion. The simulated gastrointestinal digestion model, which uses intestinal cells, will test if the peptides are able to cross the cell membranes, which will indicate that they are absorbed and utilized by the body. The objective will

be to evaluate the bioavailability of the bioactive peptides in cheese.

In addition to Ibanez Alfaro, CDR Director John Lucey is also a collaborator, who published a research study in 2016 on bioactive peptides in commercially produced Cheddar cheese.

“Most people think of cheese as tasty but don’t really think of the nutritional side of cheese even though it contains lots of nutrients like proteins, vitamins, and minerals,” Lucey said. “This work has the potential to really help enhance cheese’s image as a healthy food.”

Cheese is a natural food that has been consumed for many thousands of years and there is no doubt that cheese has a very high nutrient density and is a valuable source of protein, calcium, phosphorus and magnesium, with most cheeses being good sources of vitamin A, riboflavin, vitamin B12 and folate. Most aged cheeses contain only negligible amounts of carbohydrate (lactose). Research continues to demonstrate that the consumption of cheese contributes to a balanced, healthy diet. This work would help further elevate cheese as a healthy, nutritious food.

Hypertension, or high blood pressure, impacts millions of Americans each year. According to the Centers for Disease Control, blood pressure normally rises and falls throughout the day, but it can damage a person’s heart and cause health problems if it stays high for a long time. Nearly half of adults in the United States have hypertension defined as a systolic blood pressure ≥ 130 mm Hg or a diastolic blood pressure ≥ 80 mm Hg or are taking medication for hypertension. In 2018, nearly half a million deaths in the United States included hypertension as a primary or contributing cause. Hypertension contributes to many health issues and developing a cheese with demonstrated antihypertensive properties would be very beneficial to many people.

The Dairy Innovation Hub is helping support this work at CDR by providing a grant that is funding a graduate student assistantship for a Masters student. One of the priorities of the Dairy Innovation Hub is to enrich human health and nutrition. The Hub, formed in 2019, supports research and development at UW–Madison, UW–Platteville and UW–River Falls campuses to keep Wisconsin’s \$45.6 billion dairy community at the global forefront in producing nutritious dairy products in an economically, environmentally and socially sustainable manner. Learn more at www.dairyinnovationhub.wisc.edu. 🌟

DATES SET FOR WISCONSIN PROCESS CHEESE ONLINE SHORT COURSE

The Center for Dairy Research will be holding its Wisconsin Process Cheese Short Course as an “on-demand” online course starting February 23, 2021. Each participant will learn the material at their own pace. CDR staff and industry experts will be available to answer questions and participate in discussions.

This short course will cover the basics of formulation and manufacture of pasteurized process and cold-pack cheese products. It is intended for all dairy and food processors interested in the manufacture and use of process cheese products. The course will begin with basic theories and chemistry of process cheese manufacture and will include the practical aspects of process cheese making.



Agenda items include:

- ▶ Basic Theories of Process Cheese Manufacture
- ▶ Processed Cheeses from Around the World
- ▶ Assessing Rheological Properties Of Processed Cheese
- ▶ Manufacture of Shelf Stable Processed Cheese

For more information or to register, visit www.cdr.wisc.edu/short-courses. Watch the CDR website for updates on other upcoming CDR short courses. 🌟

CDR WELCOMES NEW SAFETY & QUALITY COORDINATOR



Alex O'Brien CDR

Alex O'Brien has been hired as CDR's Safety & Quality Program Coordinator. Alex has worked in the food industry for the past 5 years, serving as a quality assurance supervisor and quality assurance manager. He has worked at Kerry Ingredients and Maple Leaf Cheese

Company. Alex graduated from the University of Wisconsin-Madison in 2014 with a Food Science degree. He is a Wisconsin native with long family ties to the dairy industry. His grandparents and parents previously dairy farmed in east-central Wisconsin and his father-in-law is a current dairy farmer.

As CDR Safety & Quality Program Coordinator, he will assist dairy plants with food safety plans, quality issues, and perform third party audits. Alex takes over for recently retired Marianne Smukowski who established the CDR Safety & Quality Program in 1997. 🌟

JOHNSON LEADS WISCONSIN MASTER CHEESEMAKER® PROGRAM AS SMUKOWSKI RETIRES

Andy Johnson, Outreach Specialist/Assistant Coordinator for the CDR Cheese Group, has been named Program Coordinator for the Wisconsin Master Cheesemaker® Program. Long-time Program Coordinator Marianne Smukowski retired in September. In this new role, Johnson will be coordinating plant visits, cheese grading and assisting the Master candidates as they participate in the program.

“I am thrilled by this opportunity to help lead the Wisconsin Master Cheesemaker® Program,” Johnson said. “Attaining the level of Master Cheesemaker is the pinnacle of cheesemaking and I am delighted to be a part of recognizing the talents and commitments of this group of professionals. I am also honored to follow in the path Marianne and Jim Path helped to forge. I look forward to meeting current and future Master Cheesemakers and working with the



Andy Johnson, CDR

Master Cheesemaker Board and other program staff to support this important program.”

Joanne Gauthier will continue as Administrative Coordinator for the Wisconsin Master Cheesemaker® Program and will assist Johnson with the program.



Joanne Gauthier, CDR

“I want to give a huge thanks to Marianne Smukowski, for her leadership of the Wisconsin Master Cheesemaker® Program. Her guidance and commitment allowed the program to flourish and grow,” Gauthier said. “We now welcome Andy Johnson, we know

his experience as a cheesemaker, researcher and an educator will only enhance the strong foundation of the Wisconsin Master Cheesemaker® Program.”

Smukowski served as Program Coordinator for the Wisconsin Master Cheesemaker® Program for 15 years, taking over from founder Jim Path. CDR is grateful to Smukowski who upheld the integrity and high standards of the program. Under her leadership, the program added many new master cheesemakers and cheese types.

“I have had the opportunity to meet many amazing cheesemakers and I am thankful for their friendship,” Smukowski said. “I have had the pleasure of visiting

with each cheesemaker and learning about their personal journeys to becoming a Master cheesemaker. Andy, I wish you well and I hope the passion and enthusiasm continues for the Wisconsin Master Cheesemaker® Program.”



The Wisconsin Master Cheesemaker® Program is operated collaboratively between CDR and the Dairy Farmers of Wisconsin. The program is the only one of its kind in the U.S. and is modelled after prestigious master cheesemaker programs in Europe. To apply to the Wisconsin Master Cheesemaker® Program, cheesemakers must have 10 years of experience as a licensed Wisconsin cheesemaker (among other requirements). The rigorous program takes about three years to complete but, upon graduation, cheesemakers gain the title of “Wisconsin Master Cheesemaker” and earn the right to use the Master Mark® on the label of their cheese. To date, 91 cheesemakers have earned the title of Wisconsin Master Cheesemaker in 47 different varieties of cheeses.

Johnson has 12 years of cheesemaking experience. For the past 3 years, he has worked with CDR clients looking to develop and refine their cheeses. From his experience running cheese trials, conducting plant visits and leading short courses and presentations, Johnson's education in business, as well as his previous experience as a specialty cheesemaker in three states, gives him the knowledge and experience necessary to lead the nation's only master cheesemaker program.

The Wisconsin Master Cheesemaker® Program was established as an advanced education program for experienced cheesemakers through a joint sponsorship between CDR, UW-Extension, and the Dairy Farmers of Wisconsin. This program helps enhance the quality image of what is already the nation's premier cheesemaking state and the unparalleled standards of Wisconsin cheesemaking. 🌻



CDR RECOGNIZES RETIREES FOR THEIR POSITIVE IMPACT ON THE DAIRY INDUSTRY



Sarah Minasian, Research Specialist/Research Chef

Sarah Minasian has been with CDR for the past 10 years and brought an extensive culinary experience to CDR. She developed countless food applications using a wide range of dairy ingredients such as cheese, whey and permeate. She has worked on projects for key DMI partners like Dominos, McDonalds and Taco Bell. Sarah also helped prepare cheese samples for many of the cheese sensory tasting labs in the CDR short courses.

In addition, she provided her expertise for research projects that needed to evaluate prototype ingredients in finished products such as cream cheese cheesecakes and Gouda in macaroni pies. Each year she worked with the U.S. Dairy Export Council (USDEC) to develop new prototypes of food applications that showcased dairy ingredients at the annual Institute of Food Technologists meeting. She produced a number of original concepts and uses for dairy ingredients that can be found on the USDEC website (thinkusadairy.com).



Karen Smith, Dairy Processing Technologist

Karen Smith has had a long career in the dairy industry, the last 22 years of which were working at the Center. Throughout her time at CDR, Karen supported the dairy industry with her wealth of knowledge in both a practical and educational manner. Her practical experience was tremendous in assisting companies across the country with their technical inquiries and issues.

Karen has also been heavily involved in the educational mission of CDR. More recently she took over and upgraded the Certificate in Dairy Processing Course. She helped lay the groundwork as CDR moves other courses online.

In addition, Karen has produced a wide range of dairy ingredient technical manuals and bulletins for the industry. These have made their way around the globe and continue to be in demand today. They are an important consolidated source of key technical information, targeted towards specific topics.



Marianne Smukowski, Dairy & Safety Coordinator, Wisconsin Master® Cheesemaker Program Coordinator

Marianne Smukowski retired in September after a 35+ year career serving the dairy industry. After graduating from the University of Wisconsin-Madison with a Food Science degree, Marianne started working for the U.S. Department of Agriculture and then moved on to Land O' Lakes where she worked in Corporate QC. Marianne arrived at CDR in 1994 where she worked on a HACCP project with CDR Assistant Director Mark Johnson. In 1997, she created the position of Dairy Safety & Quality Coordinator.

In addition, Marianne served as Program Coordinator for the Wisconsin Master® Cheesemaker Program. Working alongside Joanne Gauthier, Marianne helped a number of Wisconsin Master cheesemakers become certified in a variety of cheeses and upheld the integrity and high standards of the program.

Marianne was also very active with the American Cheese Society for which she served as 2019-20 President. Earlier this year, ACS awarded Marianne with its Lifetime Achievement Award. Marianne also served as a judge in many ACS cheese competitions as well as the U.S. and World Cheese Championships. In addition, she served as a judge at the Wisconsin State Fair and World Dairy Expo Championship Dairy Products Contest.

In her role as Dairy Safety & Quality Coordinator at CDR, Marianne fulfilled many roles, working with the Wisconsin Department of Agriculture Trade and Consumer Protection and regulatory officials, helping draft important food safety policies and regulations, and leading and presenting food safety workshops. One of the most important roles Marianne served was that of safety and quality liaison to the dairy industry. Marianne conducted safety and quality audits at dairy plants and provided guidance and feedback to those plants, helping them produce safe, high-quality dairy products.

CDR wishes Marianne, Sarah and Karen well in their retirement and sincerely thanks them for all their efforts over the years. 🌻

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MORE CDR SHORT COURSES TO BE ANNOUNCED

The Center for Dairy Research is here to help you with dairy product training for your employees. With today's changing environment, investment in employee training is as important as ever.

Our team of experts are continuing to evolve our short courses to deliver the same science-based learning and training resources to meet your needs, online and through virtual instruction. Short course listings for the beginning of 2021 will be available soon.

For the latest course offerings, visit www.cdr.wisc.edu/short-courses.



DAIRY PIPELINE

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