

DAIRY PIPELINE

2019 Wisconsin Master Cheesemakers

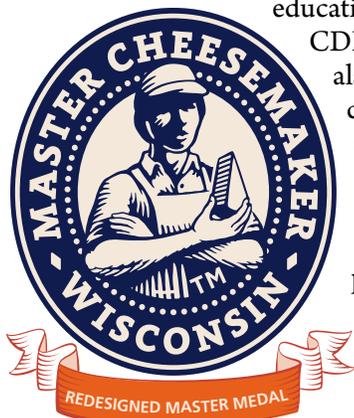
This year, the Wisconsin Master Cheesemaker® program will be honoring its 23rd graduating class of cheesemakers. Established in collaboration with the Center for Dairy Research (CDR) and the Dairy Farmers of Wisconsin (DFW), this advanced education program provides a unique learning opportunity for experienced Wisconsin cheesemakers. It is the only program of its kind in the United States.

Interested cheesemakers apply to the Wisconsin Master Cheesemaker® program, which offers experienced cheesemakers the opportunity to further their

education through courses at CDR. Participants must also participate in quality checks and complete a detailed test that takes most participants about 50-60 hours to finish. The Master certification process generally takes about three years, but in the end, the cheesemaker receives the honor and respect that comes with this

accomplishment as well as the right to use the Master Mark® on his or her products.

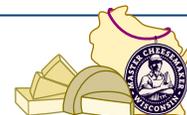
This year, the Wisconsin Master Cheesemaker® program will welcome two new members and four returning members during a ceremony at the Cheese Industry Conference in Madison, Wisconsin on April 18, 2019. Please join CDR and DFW in celebrating the graduates and their many accomplishments.



New Master Cheesemakers

JONATHAN STENDER

BelGioioso Cheese, Inc., Pulaski
Certified Master: Fontina and Parmesan



Combine a lifelong interest in dairy with the natural curiosity of an engineer and what do you get? In Jonathan Stender's case you get a Wisconsin Master Cheesemaker.

"Ever since I was a kid, I have always wanted to know how things are made," he says.

Growing up on a dairy farm, Stender says he knew he wanted to do something in dairy, he just didn't know what exactly. Then, in 2000, as a high school student, Stender got a summer job working on the floor at the BelGioioso Cheese plant in Green Bay. At first it was just a way to make a little money, but with Stender's interest in dairy as well as his interest in the craft of how things are made, he quickly got hooked.

BelGioioso offered him a full-time job after his high school graduation and he took it. However, it wasn't all smooth sailing. In 2003, he stepped away from the plant to start his own business. It didn't take Stender long to realize that he missed cheesemaking. In 2004, he came back to BelGioioso and picked up where he left off. Working along Wisconsin Master Cheesemakers like Gianni Toffolon and Josh Krause, Stender had a new-found love for his craft and made it a goal to one day become a Wisconsin Master Cheesemaker himself. He accomplished that lofty goal this year as he became certified in Parmesan and Fontina. ➔



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“Parmesan and Fontina are my favorite cheeses. They’re my two favorites to make and my two favorites to eat. Parmesan adds flavor to everything. And I have liked Fontina since I was a kid. It was joyful for me to pick that as one of my cheeses.”

When asked what drew him to the Wisconsin Master Cheesemaker® program, Stender said it was the same thing that originally attracted him to cheesemaking: a challenge.

“The longer you make cheese, the more you look for a challenge because if you don’t challenge yourself, you’re not going to keep learning,” he said.

Stender is proud to earn his Wisconsin Master Certification but at the same time is motivated to continue improving as a cheesemaker.

“There’s always something to learn. I don’t think you can ever know everything as a cheesemaker. Things are always changing. There are so many different cheeses and so many different ways to make cheese. It’s always challenging.”

Stender thanks Errico Auricchio, founder and president of BelGioioso Cheese; his co-workers and his wife Tanya for their support. Stender said the Wisconsin Master Cheesemaker® program was a lot of hard work but he’s already thinking about returning.

“Hopefully down the road I’ll add a few more cheeses.”

DAN SZCZEPANSKI

Belgioioso Cheese, Inc., Pulaski
Certified Master: Parmesan & Romano



Like many great Master cheesemakers, Dan Szczepanski grew up on a dairy farm and, from a young age, knew he wanted to work in the dairy industry. After he graduated from high school, a help wanted ad in the newspaper for a local cheese plant caught his eye.



“I went down and applied at the cheese factory and had a job the next day,” Dan said. “I remember

I was just really excited to stay in agriculture because I have always loved it. And the rest is history.”

This year, Dan joins the elite group of Wisconsin Master Cheesemakers with medals for Parmesan and Romano.

That cheese factory that originally hired Dan is now known as BelGioioso Cheese, and from very early on, Dan was working alongside experienced cheesemakers, like Mauro Rozzi and Gianni Toffolon (a Wisconsin Master Cheesemaker himself).

“I worked with Mauro and Gianni from day one and still work with them,” Dan said. “Their love and passion for cheese just drew me toward it. And I hope I can give as much as they have given to the cheese.”

Working with mentors like Mauro and Gianni made a big impact on Dan. “Gianni told me at the beginning, ‘The cheese is your boss. Listen to the cheese. Do what the cheese needs and you’ll be successful.’ Those were very good words of advice.”

That advice, along with Dan’s own hard work, has helped him earn several awards for his Parmesan, including first place best of class Gold at the 2017 U.S. Championship Cheese Contest and a first place best of class Gold at the 2010 World Cheese Championship. Dan has been making cheese for 33 years and his respect for the craft is obvious when he talks about it.

“What I like about cheesemaking is that cheese is alive and always changing,” he said. “It’s just really exciting to work with it every day and to see how a particular piece of cheese turns out based on the small changes you make.”

Dan said the Wisconsin Master Cheesemaker® program was a very educational and challenging experience but one well worth the effort. “The test itself was a good challenge, but it also showed me that I had learned so much through the Master program.”

As a Wisconsin Master Cheesemaker, Dan said BelGioioso Cheese has been a good place to work because, above all else, the focus is on quality.

“We are always striving to craft the highest quality cheeses possible. It’s our number one goal here and that’s a good goal to have.”

RETURNING MASTERS

BILL HANSON

Arena Cheese Factory, Arena
Certified Master: Colby Jack



Bill Hanson has seen just about everything over the course of his long career in cheesemaking. He’s made Swiss cheese in copper kettles, run one of the state’s first whey plants, and owned and operated several cheese plants. ➔

In 2016, Bill added another set of accomplishments to his resume: Wisconsin Master Cheesemaker with certifications in Gouda and Colby. This year, he adds a certification in Colby Jack, which is a special cheese for Bill because he owns Arena Cheese – the historical home of Colby Jack.

“Arena Cheese invented Colby Jack. So, it only made sense to add that into my portfolio.”

About 20 years ago, Bill purchased Arena Cheese. Although the factory was famous for developing Colby Jack, it had changed ownership and had sat empty. Bill opened the doors and rebuilt it from the ground up.



“We had to start over. At that point, there were no customers, there were no labels, no brands.” Bill said they rebuilt Arena Cheese “vat by vat.”

“It was an interesting journey starting a business from scratch. We were in survival mode for many years, but, eventually, we recognized it was all about marketing and finding the right market niche. And, obviously, you’ve got to make a great piece of cheese – that’s number one, you can’t go anywhere without making a great piece of cheese.”

With his focus on making good, quality cheese, and his many years of experience, Bill said it only made sense that he earn his Master medals.

“I’m already a Master in my own way I just didn’t have the certificate and I owed that to myself. I waited a long time to start the Wisconsin Master Cheesemaker program but it only made sense to complete it. It’s also a great marketing tool. It’s nice to be able to say I’m a Master cheesemaker.”

GERARD KNAUS

Weyauwega Star Dairy, Weyauwega
Certified Master: Cheddar and Provolone



Gerard Knaus comes from a long family of legendary Wisconsin cheesemakers. “My father made cheese all his life, his grandfather made cheese all his life and now here we are making cheese.”

The Knaus family has owned and operated Weyauwega Star Dairy for four generations and they make more than

50 different types of cheese. Gerard is the first Knaus to become a Wisconsin Master Cheesemaker. In total, he has earned six Master certifications. In 2012, he became certified for feta and Parmesan. He then added Brick and Colby to his resume. This year, he earns Master medals for Provolone and Cheddar.

A lifelong cheesemaker, Gerard started working in his family’s cheese plant when he was 14. At 20, he earned his cheesemakers license.

Like cheesemaking, Gerard emphasized that becoming a Master takes a lot of dedication.



“You don’t just walk into the plant and make cheese. It takes a long time to learn. Likewise, there is a lot of work to become a Master.”

As an experienced cheesemaker, Gerard sees a lot of value in the Masters program. “I think it’s a great program. I’m hoping more younger cheesemakers start coming into it because it’s very educational.”

Gerard added that the Wisconsin Master Cheesemaker® program isn’t just about getting the medal, he said the knowledge that cheesemakers can take away from the program is priceless.

“It’s very educational and it means a lot. When you can figure something out in the plant when something’s wrong, that’s so important.”

Earning a Master medal is also a point of pride, not just for Gerard but for all Wisconsin Master Cheesemakers.

“It’s nice for our family to be able to say that I’m a Wisconsin Master Cheesemaker. That means a lot.”

MIKE MATUCHESKI

Sartori Cheese, Antigo
Certified Master: BellaVitano and Pastorale



With Master medals in Pastorale and BellaVitano, Mike Matucheski, cheesemaker for Sartori Cheese’s Antigo plant, is now a certified Wisconsin Master Cheesemaker for six varieties of cheese.

“I’m no Bruce Workman,” Matucheski joked (Bruce Workman, of Edelweiss Creamery, is certified in 11 cheeses). ➔

Matucheski is no slouch himself. His Reserve Black Pepper BellaVitano won the title of Grand Champion Cheese at the 2017 U.S. Championship Cheese Contest and gold medals at both the 2017 and 2018 World Cheese Awards. In addition to previously earning Master certifications for Parmesan, Romano, Asiago and Fontina, Matucheski now adds Pastorale and BellaVitano to the list.



Mike said earning Masters certifications for the Pastorale and BellaVitano cheeses was very special. “They’re like my children. They’re very different children but it means a lot to me and also means a lot for those coming behind me. These are special cheeses.”

For Matucheski, the Wisconsin Master Cheesemaker® program helps preserve and improve the quality of cheese in Wisconsin.

“Wisconsin Master Cheesemakers are important because they help guide the cheesemaking process. It’s not a process that just happens automatically. So many things can go wrong and while some people might think it’s easy, it never is.”

“I never want a situation where people do things automatically; where they get to a point where they think, ‘It’s just cheese.’ It’s not just cheese, it’s something very special.”

As a licensed cheesemaker for about 22 years, Matucheski is serving as a mentor for future cheesemakers at Sartori. Participating in the Wisconsin Master Cheesemaker® program has helped Mike put his career into perspective.

“It’s one of my greatest privileges to participate in this program. It’s an endless opportunity to make yourself better and give something back.”

RANDY PITMAN

Mill Creek Cheese Company, Arena
Certified Master: Brick and Queso Blanco



Growing up on a dairy farm, Randy Pitman was immersed in cheese early on. At age 17, he began making Swiss and Muenster under the guidance of expert cheesemakers Jim Curran and Ivan Gobeli.

“I was kind of familiar with what was going on at the cheese plant and I wanted to get in there and learn more. As a child, I started working at a local cheese factory and gave up on the farming.”

Today, Pitman runs Mill Creek Cheese in Arena, along with his children and wife Mary. Randy received Master certifications in Muenster and Queso Quesadilla in 2010. Now he adds Brick and Queso Blanco to the list.



Randy said the Wisconsin Master Cheesemaker® program is a good opportunity to work with the Center for Dairy Research and continue to improve and hone his craft.

“With the types of cheeses we’re making we want to be sure we have the flavor to go along with the body of the cheese. We want to make sure it all comes together as one and is consistent.”

In total, Randy has been making cheese for 43 years. Asked what he likes about it, he says, “The satisfaction at the end of the day. The satisfaction of making an excellent product.”

He also likes the science and art of cheesemaking and is always tinkering and trying to make better cheese.

“I really enjoy experimenting with the different cultures and flavors to get a better product at the end. I’m always trying to improve.”

Randy doesn’t have any intention of slowing down anytime soon. He said programs like the Wisconsin Master Cheesemaker® program keep Wisconsin cheese some of the best.

“I’m very proud to be a cheesemaker in the state of Wisconsin. The Wisconsin Master Cheesemaker® program makes us all better. In some other states you don’t even have to have a license to make cheese. Our higher standards give us a better quality cheesemaker who is handling the product. I’m really happy with the state of Wisconsin and what we’re doing in the industry.” 🌟



RECENT ADVANCES IN FOOD APPLICATIONS OF DAIRY CO-PRODUCTS

Technical Contributor: KJ Burrington, CDR

The food and beverage industry is continually changing as consumer tastes and preferences shift. This is good news for dairy co-products like milk and whey permeate and whey protein phospholipid concentrate (WPPC). The demand for these co-products is increasing as the food and beverage industry is discovering the value of these versatile and nutritious ingredients.

Whey Permeate and Milk Permeate

Since 2000, CDR has been researching and developing food applications for permeates, specifically whey and milk permeate, to provide browning and flavor development, with the unexpected discovery being the saltiness it contributed to food. In 2010, when reducing sodium became popular, CDR started more development to use permeate in foods as a sodium replacer. Today, permeate is being recognized for its other characteristics.

“Now the focus for permeate is on flavor enhancement,” said KJ Burrington, CDR’s Dairy Ingredient and Cultured Products Coordinator. “The focus is also on all of the minerals and nutrition that permeate adds.”

A growing spectrum of products and uses of permeate has pervaded the food industry. It can now be found in baked goods, beverages, drinkable yogurts, dry mixes and many other applications. Permeate is being widely utilized because it is so versatile. It can be used to enhance flavor in sweet or savory products. For instance, permeate is especially effective at improving macaroni and cheese products. “It really enhances the cheesy notes,” Burrington said.

Perhaps the most exciting characteristic of permeate is its potential to add sweetness to products. This is especially important in today’s market as consumers are becoming more aware of sugar consumption. Adding permeate

to a beverage or yogurt application, allows you to get added sweetness if you hydrolyze the lactose through the addition of lactase, which breaks down the lactose into glucose and galactose. By hydrolyzing the lactose, you get a product that is lactose-free and has a lot of natural sweetness. Burrington said CDR recently used this method when they worked with a company to develop a drinkable yogurt. By using milk permeate, they were able to give enough natural sweetness to the product that they didn’t need to add any sugar. Burrington said this is a useful tool if your target is a “no added sugar” claim.

“This year there’s going to be even more emphasis on ‘no added sugar’ as companies are gradually adding this to their nutritional panels. It’s already starting,” Burrington said. “And yogurt manufacturers are just one product category trying to reduce their sugar content.”

Permeate’s versatility is starting to be recognized by the food industry. In the early 2010s, it was primarily used in dry mixes. Recent numbers from the American Dairy Products Institute (ADPI) show that permeate is now being used by the dairy industry, hot cocoa, and a large percentage of other uses.

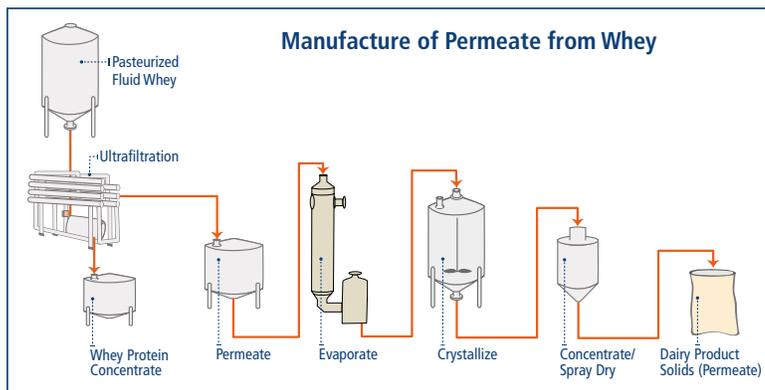
Additionally, it’s important to note that whey permeate is much more available than milk permeate. According to numbers from ADPI, in 2017, about 10 million pounds of milk permeate was produced, compared to more than 1 billion pounds of whey permeate. Given that number, CDR encourages the food industry to look to whey permeate.

WPPC

An emerging dairy co-product is whey protein phospholipid concentrate (WPPC). However, some research is still needed to help the food industry tap into the benefits and potential that exists with WPPC. “This ingredient is really underutilized,” Burrington said. “If you ask some of the manufacturers, they’re going to say that most WPPC goes into a lot of animal feed because they don’t have a lot of other ways to use it.”

Currently, due to its high fat content, WPPC is most commonly used in weight-gain products primarily targeted at athletes or others who want to add weight. While this is a useful attribute, WPPC has much more potential because of what it contains. Among other things, WPPC contains phospholipids. Phospholipids are quickly becoming very valuable in the global marketplace. New research is highlighting the crucial role that phospholipids play in brain development and health.

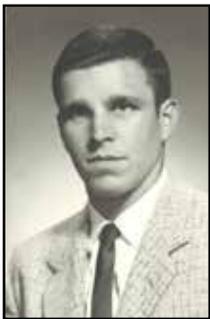
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A TRIBUTE TO DR. WILLIAM "BILL" WENDORFF – FRIEND OF CDR AND THE DAIRY INDUSTRY

William "Bill" Wendorff, Professor Emeritus of Food Science at the University of Wisconsin–Madison, passed away January 2, 2019. Dr. Wendorff played a major role in reestablishing the dairy manufacturing short course program at the University of Wisconsin–Madison/Center for Dairy Research (CDR), conducted research on sheep milk and cheese, and made many other important contributions to the dairy industry over the course of his career. The CDR is so appreciative of Dr. Wendorff's past support and visionary leadership.

Dr. William "Bill" Wendorff grew up on a Wisconsin dairy farm near Green Bay, Wisconsin. He graduated from Shawano High School in 1957 and enrolled at the University of Wisconsin–Madison where he earned a Ph.D. in food science in 1969. After graduating, Bill worked with Red Arrow Products in Manitowoc for the next 20 years. In 1989, he returned to his alma mater as a professor in food science and the program director for the Wisconsin Cheese and Dairy Manufacturing Short Courses.



Bill in 1964.

At the University of Wisconsin–Madison, Bill brought new life to the dairy short courses, worked closely with CDR and led research on sheep milk and cheese.

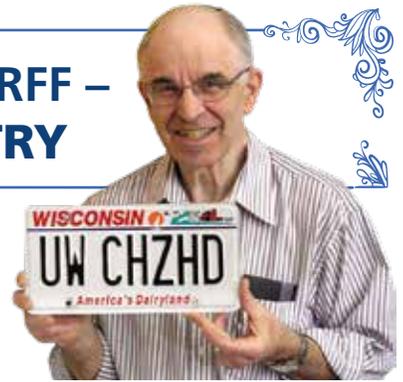
Dairy Short Courses

Bill is probably best known for re-launching the University of Wisconsin–Madison dairy short courses, a world-renowned program that got its start in the late 1800s. Dr. Wendorff revitalized the courses when he joined university faculty in 1989.

Norm Olson, the first director of CDR, remembers the dairy manufacturing extension program was in a state of flux in the 1980's with changes in personnel and substantial changes in the Wisconsin dairy processing industry.

"Bill assessed the situation, when he joined the University of Wisconsin–Madison faculty and continued some of the promising programs and initiated new ventures," Olson said. "One significant and early change made by Bill was inclusion of more experts from private industry in the short courses who brought more current and pertinent information to the students."

Bill started by reorganizing the Wisconsin Cheese Technology Short Course and quickly turned it into the one of the most highly attended and acclaimed cheese education programs in the U.S. Based on the model of this course, Bill went on to create other critically important short courses, which have served more than 15,000 dairy plant personnel and established one of the most effective marriages between applied research and practical outreach impact.



"We take great pride in the fact that more than 50% of World and 70% U.S. cheese contest winners are graduates of our short courses that Bill developed," said John Lucey, CDR Director.



Scott Rankin, Davide Toffolon, Bill Wendorff, Mark Johnson, CDR, John Lucey, CDR, celebrating the 10,000 short course student.

Wisconsin Master Cheesemaker® Program

Bill was also one of the architects of the Wisconsin Master Cheesemaker® program, which is the only program of its kind in the U.S. Started in 1994, the program was modeled after similar master programs in Europe. Interested cheesemakers apply to the program, which offers experienced cheesemakers the opportunity to further their education and learn the science behind their craft through courses at CDR.

Bill helped build the curriculum and established guidelines to ensure that Wisconsin Master Cheesemakers would be among the best in their craft. Since its inception, 79 cheesemakers have since graduated from the program (see pages 1-4 for information on this year's graduates).

Marianne Smukowski, coordinator of the Wisconsin →

Master Cheesemaker® Program, said *“Bill will always be remembered by the Wisconsin dairy industry as an icon. Bill was very passionate about educating the dairy industry and he succeeded. He was a kind gentle soul who saw the best in everyone.”*

Sheep Milk and Cheese

Bill’s work greatly contributed to the growth of the sheep milk industry in Wisconsin. Through his research and extension efforts with the Spooner Research Station and the University of Wisconsin–Madison Department of Animal Sciences the dairy sheep industry has yielded many new sheep and mixed milk cheeses, resulting in Wisconsin being the largest sheep milk and cheese producing state in the U.S.

Dave Thomas, professor emeritus of the University of Wisconsin–Madison Department of Animal Sciences, worked closely with Bill on efforts to support the dairy sheep industry.

“It was my good fortune to be able to work with Bill for over 15 years on research and development projects to serve the needs of the infant dairy sheep industry in North America. He established himself as a world authority on the storage and processing of sheep milk. He was a valued colleague and a true friend.”

One of Dr. Wendorff’s proudest achievements was a chapter on sheep milk that he co-wrote with George Haenlein, a professor emeritus of food science at the University of Delaware. The chapter, which was published in 2017 in the second edition of the “Handbook of Milk of Non-Bovine Mammals,” is almost 60 pages and provides the definitive word on sheep milk.

“Bill’s contributions to applied dairy foods research and outreach are as valued and cited today as they were when he was an active faculty member,” said Scott Rankin, chair of the University of Wisconsin–Madison Department of Food Science.

Wastewater Management

A true friend of the dairy industry, Bill stepped up to the plate when, in the 1990s, the Wisconsin Department of Natural Resources released new, stricter regulations regarding wastewater. Bill helped guide the cheese industry through the difficult process of improving its practices.

With financial support from the Wisconsin Cheese Makers Association, Bill conducted a series of in-depth surveys to find out how cheese plants were treating and disposing of their wastewater. Among other things,



John Jaeggi, CDR, Bill Wendorff & Mark Johnson, CDR

the new regulations limited the amount of chloride and phosphorus that could be present. Bill’s surveys found that while chloride wasn’t an issue for many cheese plants, phosphorus provided a challenge. Findings from Bill’s wastewater surveys were used by the Wisconsin cheese industry to update and improve their processes and find solutions. This was important work that may not have been completed if it wasn’t for Bill’s leadership.

CDR/Dairy Pipeline

Throughout his career, Bill worked closely with CDR. “His partnership with the Center for Dairy Research resulted in a significant expansion of outreach efforts,” said Olson.

Even in retirement, Bill’s passion for the dairy industry kept him active as he continued his research work through various projects, drawing on his prolific writing ability by authoring helpful resource articles for the CDR’s Dairy Pipeline newsletter as well as providing invaluable assistance.

“Bill was a great listener,” said Deb Wendorf Boyke, CDR Communications Coordinator. *“As he interacted with so many cheesemakers, he always had excellent ideas for timely, solution-oriented articles for the Dairy Pipeline that would benefit cheesemakers.”*

Thank You Dr. Wendorff

Dr. Wendorff’s impact on the dairy industry is evident not only in the numerous awards and honors that he received, but also in the positive ways in which his former colleagues and students remember him.

Dr. Leyda Ponce de Leon, a professor of animal science at the University of Puerto Rico, was Dr. Wendorff’s only Ph.D. student. She worked with him from 1995-1999. *“He was the most accessible advisor you could have,”* she said. *“Every day I’d go to him and show him my data and research and he was always there to help. He was wonderful. I was so lucky to meet him and work with him.”*

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BACK TO THE BASICS: THE ROLE OF pH IN CHEESEMAKING

Technical Contributor: Mark Johnson, Ph.D., CDR

Most people understand that a lower pH means more acidic. But what, exactly, does that mean?

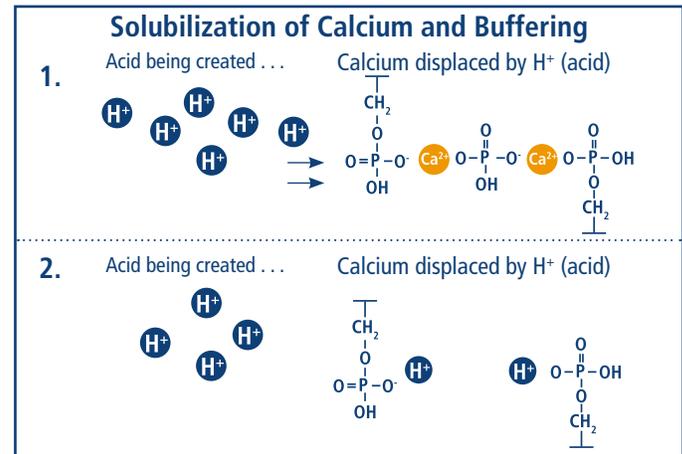
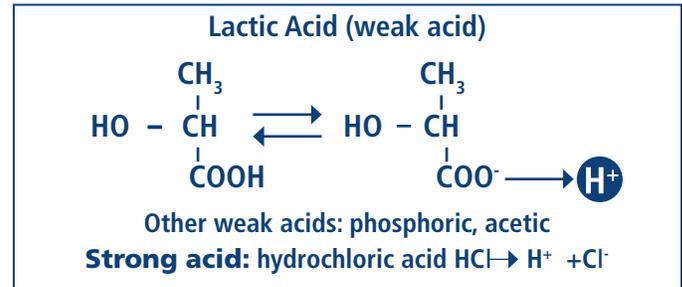
The short answer is that acidification is the process of hydrogen ions being released from molecules. Hydrogen ions, or protons, “jump” from one water molecule to another. Since the hydrogen ion or proton is positively charged, one water molecule becomes H_3O^+ and another becomes OH^- . In fact, these hydrogen ions are constantly jumping back and forth between water molecules.

So, acids are chemicals that release hydrogen ions and bases are chemicals that pick-up hydrogen ions. However, not all acids are created equal, their tendency to release hydrogen ions varies greatly. For example, a strong acid, such as hydrochloric acid (HCl) will rapidly and completely dissociate into H^+ and Cl^- ions in water. Conversely, weak acids, such as lactic, acetic, amino, fatty or phosphoric acids, release hydrogen ions sparingly. The activity of these “jumping” hydrogen ions is used to measure pH. A pH electrode measures proton activity and converts it to pH. The greater the concentration of hydrogen ions, or H_3O^+ molecules, the lower the pH (more acidic).

What does this mean for cheesemaking?

In cheesemaking, acid development is very important to the final product and acid development is started at the very beginning of the cheesemaking process. Some cheesemakers will use a preacidification method such as adding acid directly to milk prior to rennet addition. Acetic and lactic acids are commonly used. Diluted acid is added cold to the cheese milk in the vat or on the way to the vat to lower the pH prior to rennet addition. Fortification of milk with ultrafiltered milk is a common practice today. The levels of protein and insoluble calcium are raised and thus more acid is needed to solubilize sufficient calcium to obtain the desired cheese characteristics. This may require that the pH at rennet addition will have to be even lower than with non- fortified milk. Preacidification or the use of non-neutralized starter or addition of carbon dioxide has become routine practice when milk is fortified.

For most cheesemakers, the process of acid development begins with the addition of the starter culture. Starter culture ferments the lactose in the milk and turns it into lactic acid. Lactic acid releases the hydrogen ions or protons, which are absorbed by the calcium phosphate molecules in the milk. These protons displace calcium and the calcium is released (becomes soluble).



It should also be noted that lactic acid is a “weak” acid and therefore not all calcium is dissociated from phosphate. This is good because calcium phosphate is a key cross-linking agent or “glue” that binds casein proteins together to form casein micelles. Likewise, there needs to be some soluble calcium (detached from casein) for cheese curds to knit together, cheese to melt or stretch and even eventually for entrapped whey to be reabsorbed by the casein network. Acid development is partially about reaching the right balance between soluble and insoluble calcium.

Role of calcium

So, when there is a drop in pH there is also a loss of calcium in the cheese. This demineralization of casein by removal of calcium is important for cheesemaking. As mentioned above, calcium phosphate serves as a crosslinking agent between caseins. Without this action (the binding together of caseins) it wouldn't be possible to make cheese. However, if there is too much calcium binding to the proteins there won't be sufficient calcium loss (pH drop). This will produce cheese that doesn't stretch appropriately or the curds won't knit together properly. Likewise, if too much calcium (pH drops too much) is lost there can be a number of negative consequences to the cheese like a soft or pasty, gummy body. Or the cheese body can become very short and brittle and will have splits if gas is formed. The cheese also may not stretch appropriately. For these reasons, pH needs to be closely monitored during the cheesemaking process. ➔

There are a couple key steps of the cheesemaking process where the cheesemaker can influence pH and, thus calcium loss. For instance, if the rennet or coagulant is added too soon (before pH has reached its desirable level) there will not be enough calcium loss. The milk pH at renneting is an important determinant in cheese textural development, machineability, and functional performance, such as melting and blister formation on a pizza. Or if you have faster acidification after cutting the curds you will have more calcium loss.

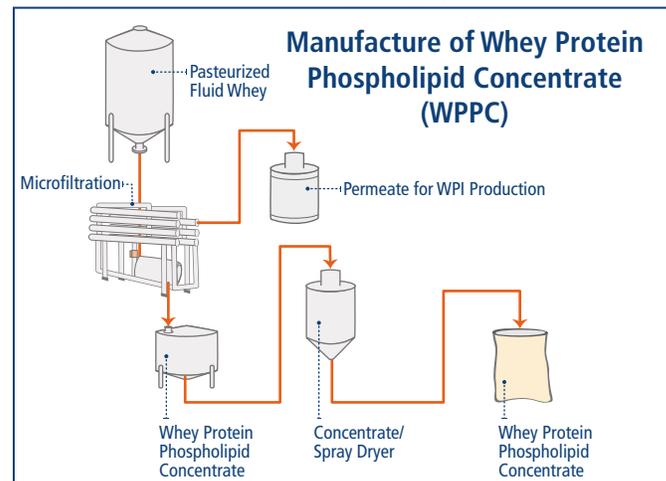
Acid development continues after manufacture

Another important factor to keep in mind is that buffering, the movement of hydrogen ions replacing calcium ions in calcium phosphate, can take several days. This is one reason why the pH of cheese can drop during ripening. Therefore, it's important to monitor cheese pH during and after manufacture.

When monitoring cheese pH, keep in mind that the lowest pH that the cheese attains during manufacture and ripening determines the amount of insoluble calcium in the cheese. The pH history of cheese is very important. This means that even if the cheese pH gets too low but then returns to acceptable levels, the damage has already been done. For instance, you can have two different cheeses at the same pH 24 hours after manufacture and one of the cheeses can have splits and cracks and a grainy texture and the other cheese can be perfectly fine. If you go back and look at the pH history of the two cheeses, you will find that the cheese that developed defects had a pH that dropped too low. Even if the pH returns to normal levels, the cheese is impacted by its lowest pH.

pH and acid content also play a major role in flavor perception and development. They also influence the growth and types of bacteria that will survive in cheese. Some pathogenic bacteria, and strains that potentially cause defects, do not survive in an acid environment and will actually die in cheese over time if the pH is low enough (below 5.4). In surface and mold ripened cheeses the pH increases rapidly to over pH 6.0. Thus, there is a risk that bacteria once held in check with the initial low pH of the cheese may now grow when the pH increases.

For more information on acid development and related topics, view these past articles in the Dairy Pipeline: "Importance of Acid Development in Cheese Milk Prior to Renneting" (Vol. 25, #3), "Cheese pH—What's Behind the Rise and Fall?" (Vol. 14, #4), "Successful Cheesemaking: Getting Back to Basics" (Vol. 27, #2), and "pH Control in Cheese" (Vol. 27, #1). Past issues of the Dairy Pipeline are available online at www.cdr.wisc.edu.



"The infant formula companies have recognized the benefit of phospholipids," Burrington said. "So, they're the first ones within the food industry to really utilize WPPCs and this just happened within the last couple of years."

The potential for this ingredient doesn't end with infant formula. Given the focus on brain health, the potential uses are endless. This ingredient could also be used in products to benefit seniors and others concerned with brain health and well-being.

CDR is currently collaborating with two research projects focused on WPPC. One of the projects, which is being funded by the National Dairy Council, is being conducted by two graduate students. One of the students is focused on developing an efficient method to extract the phospholipids from WPPC. The second student is researching the functionality of phospholipids and how they can be best used in food applications.

A second research project on WPPC is being funded by the CDR Industry Team (CIT). This project is being led by graduate students in conjunction with a manufacturing plant. The student is working to develop methods to use WPPC in process cheese.

CDR will keep industry up to date on the outcomes of these projects. In the meantime, CDR encourages the food and dairy industry to continue to expand and explore uses for dairy co-products. These versatile ingredients can enhance the taste and nutritional value of food and beverage products.

For more information on dairy co-products, visit ThinkUSDairy.org and search for "Coproducts of Milk and Whey Processing" and "Permeate for Sodium Reduction." Or contact KJ Burrington at CDR – burrington@cdr.wisc.edu or 608-265-9297. 

DON'T MISS THESE CDR SESSIONS AT THE CHEESE INDUSTRY CONFERENCE

From principles of cheesemaking to a deep dive in Swiss cheese production, staff from the Center for Dairy Research (CDR) will be sharing their knowledge and research on a whole host of topics during technical sessions at the Cheese Industry Conference (CIC), April 17-18 at the Alliant Energy Center in Madison, Wisconsin.

Hosted by Wisconsin Cheese Makers Association and CDR, CIC is a gathering of more than 2,400 cheese industry leaders, suppliers, and marketers. You will find information about the latest in cheese technology, exports, whey opportunities, product safety, workforce development, marketing and additional issues impacting the dairy industry.

CDR staff will also be holding “Ask the Cheese Expert” one-on-one sessions from 1:30-3:30 pm on April 18. During this time, CDR staff will be available for 30-minute one-on-one sessions where you can receive technical help on a specific topic or question. Come with a question and we’ll match you up with our most qualified staff. Be sure to sign up when you register! Check out the following list of scheduled CDR sessions.

For more information visit www.cheeseconference.org



Wednesday, April 17

9-10:30 am – Essential Principles of Cheesemaking

- ◆ How to Establish and Maintain a Starter Culture Program, Andy Johnson, CDR
- ◆ Controlling Moisture and Acidity During the Cheesemaking Process, Gina Mode, CDR
- ◆ How and When to Measure Moisture and Acidity, Juan Romero, CDR

9-10:30 am – Delving into Quality Swiss Cheese Production

- ◆ Swiss Cheese Quality Challenges We’re Seeing, Dr. Mark Johnson, CDR
- ◆ Latest Research on Swiss Cheese Properties, Dr. Walter Bisig, Senior Scientist, Agroscope – Food Microbial Systems, Bern, Switzerland
- ◆ Steps of Swiss Cheese Making: Chemical and Biochemical Key Indicators, Marc Druart, Vice President, Research & Development/Innovation, Emmi Roth

Thursday, April 18

9:30-10:30 am – Quality Improvements for 640-lb Block Cheddar

- ◆ Strategies to Minimize Moisture Migration in 640s, Claire Collins, UW–Madison Food Science graduate student

Wendorff, Continued from page 7

He was also well-respected in the dairy industry. Terry Lensmire of Agropur worked closely with Bill for many years “Bill was the type of man who could talk to anyone: be it a cheesemaker or a person on the street,” Lensmire said. “He was a professor, but he could talk the language of a cheesemaker. He was just so genuine and helpful and accommodating to everyone he worked with. He also listened intently. He was just a very good person and a good friend to the industry.”

Over the course of his career, Dr. Wendorff was often recognized for his many contributions to the dairy industry, including a lifetime membership award from the Eastern Wisconsin Cheesemakers Association as well as association with many respected food/dairy science organizations. One of his greatest recognitions came in 2011 when the Wisconsin Cheese Makers Association (WCMA) honored Bill with its Distinguished Service Award. This award is a testament to Bill’s outreach work and the respect that he earned in the dairy industry as this award is rarely given to an academician.

“I have never met a man who accomplished so much for our cheese industry, but yet was so humble,” said John Jaeggi, CDR Cheese Industry and Applications Coordinator. “CDR is what it is today because of Bill Wendorff and his tireless efforts helping cheesemakers small and large. Bill’s knowledge will be sorely missed; but not as much as his friendship. We will miss him.” 🌻

◆ Use of Concentrated Milks – Problems, Best Practices, Solutions, John Jaeggi, CDR

◆ If Not Cheddar 640s, Then What are Your Options?, Dean Sommer, CDR

9:30-10:30 am – Best Practices in Sanitary Plant Design

- ◆ Top 10 Issues We’re Seeing in Plants Today, Dean Sommer, CDR
- ◆ Here’s What You Don’t Want to Do in Your Plant, Steve Stoner, Environmental Health Services Supervisors, DATCP
- ◆ Proper Plant Layout for Best Food Safety Practices, Mike Green, Senior Project Manager, GFS Resource Group

10:45-11:45 am – Application of New Cheesemaking Technologies

- ◆ What are the Impacts of Using Microfiltered Milk on Yield, Quality, etc., Dr. Rani Govindasamy-Lucey, CDR
- ◆ Waterless Cookers, and Other Ongoing Projects at CDR, David Montgomery, CDR and Erin Aversa, UW–Madison graduate student

1:30-3:30 pm – Ask the Cheese Expert

CDR staff will meet individually with cheesemakers for 30-minute one-on-one sessions. CDR requests that attendees indicate their topic when signing up so they can be matched up with the appropriate expert (e.g. Artisan; Processing; Whey/Ingredients; Food Safety; Cheese). 🌻

CDR WELCOMES NEW STAFF MEMBERS

Donna Christen, Financial Specialist Senior

Donna has more than 13 years of experience working as a financial specialist for the University of Wisconsin–Madison. She started her UW career at the College of Agriculture and Life Sciences (CAL S) Dean’s office in business services, then went on to work with the Great Lakes Bioenergy Research Center in Engineering and then a few other departments in the School of Medicine and Public Health and CAL S. In her role at CDR, she assists with billing, purchasing and helps monitor and track CDR’s financials. Donna enjoys working with the staff in CDR and is happy to be part of a department that works closely with industry. When she is not working with numbers at CDR, she can be found doing crossword puzzles, playing softball, walking the dog, or spending time with family and friends.



Tom Guerin, Research Program Manager

With two decades of experience in the research and development of food ingredients with the Kerry Group, Tom has worked with manufacturers on different applications in countries and markets across the globe. As a research program manager at CDR, Tom works with staff to build on current CDR successes and helping the organization become more aligned with the changing demands and trends of the food industry.



He is a native of Ireland and has a Ph.D. in Biochemistry from the National University of Ireland, Galway. For the past 14 years Tom has been happy to call Wisconsin home where he put down roots and started a family. He is excited to be a part of the CDR team and looks forward to helping the organization move forward in its next stage of development.

Charlie Harrison, Processing Researcher

As part of the processing team, Charlie will be assisting in operations of CDR’s pilot plant. Charlie’s background is primarily in flavor research and chemical analysis. He has performed flavor/volatile analysis of chewing gums, confections, cereals, snack bars, beverages and packaging. He also has experience in developing functional food technologies to be used in various food and beverage applications. Charlie has a B.S. and Master’s in chemistry. He looks forward to applying his food and



chemistry knowledge to the world of dairy research and learning more about all the beneficial ingredients that can be derived from dairy.

Mellisa Houfe, Cheesemaker

Mellisa is a licensed buttermaker, cheesemaker and actively involved as the 5th generation on her family’s dairy farm in southern Wisconsin. She also has years of experience in the dairy industry as well as an associate of science degree from MATC in the biotechnology laboratory technician program. Mellisa earned an undergraduate degree in dairy science from UW–Madison and, as a student, worked as a cheese processing technician in Babcock Hall. At CDR, Mellisa assists with the operations of the pilot plant, guiding research and helping with special projects. She is excited to use her diverse skills to assist and grow the dairy industry. 🌻

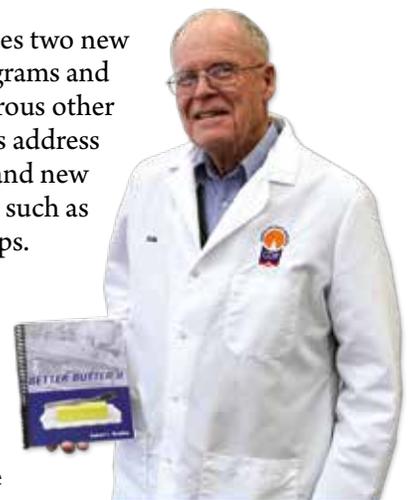


DR. BRADLEY RELEASES BETTER BUTTER II

In 2012, Robert Bradley, Ph.D, an Emeritus Professor in the UW-Madison Department of Food Science, wrote Better Butter, a handbook that covered buttermaking history and all aspects of butter manufacture. Earlier this year, Dr. Bradley released Better Butter II, which builds upon the first volume and provides updated and expanded information on buttermaking.

Better Butter II includes two new chapters, detailed diagrams and schematics and numerous other updates. New chapters address product safety issues and new butter-based products such as butter blends and whips.

As a leading expert on butter and a long-time educator, Dr. Bradley is passionate about sharing his knowledge and guidance regarding butter manufacture and urges all buttermakers, large and small, to focus on quality. 🌻



To purchase Better Butter II, visit www.cdr.wisc.edu/about/cdr_store

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JOHN JAEGLI HONORED WITH ASCHEBROCK AWARD

John Jaeggi, CDR's Cheese Industry and Applications Coordinator, received the Bob Aschebrock Award at the 2019 U.S. Championship Cheese Contest. Bob Aschebrock is the long-time chief judge at the Contest and the award, named in his honor, is given to an outstanding contest judge.



Jaeggi has served as a judge at the U.S. Championship Cheese Contest for 12 years. He has judged a wide variety of cheeses. "I was blessed to have been

asked by Bob Aschebrock to be a contest judge," Jaeggi said. "Bob and Bill Schlinsog have been tremendous mentors to me on how to properly judge cheese. The WCMA staff runs a world class cheese contest that I am fortunate to be a part of every year."

The judges at this year's contest were especially busy as they evaluated a record-setting 2,555 cheese entries from 35 states over the course of the two-day competition in Green Bay, Wisconsin. CDR staff were well represented at the contest. In addition to Jaeggi, CDR's Marianne Smukowski, KJ Burrington, Susan Larson, Gina Mode, and Dean Sommer also served as judges.

For more information on the contest, as well as complete results for all entry classes and contest photos, visit www.uschampioncheese.org.

DAIRY PIPELINE

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Short Course Calendar:

- ▶ World of Cheese from Pasture to Plate, April 22-26
- ▶ CIP, April 30
- ▶ HACCP, May 1
- ▶ Certificate in Dairy Processing, May 2-July 25
- ▶ Applied Dairy Chemistry, May 7-8
- ▶ Cheese Grading, June 4-6
- ▶ Milk Pasteurization, August 6-7

For detailed information on each CDR short course:
www.cdr.wisc.edu/shortcourses

Events

ANNUAL CONFERENCE
Sun, May 06, 2019 @ 08:00 AM -- Tue, May 07, 2019 @ 06:00 PM

To sign up for a hard copy of the Dairy Pipeline newsletter e-mail fax, or call your mailing information. Change of address? **Please help us keep our mailing list current!**

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