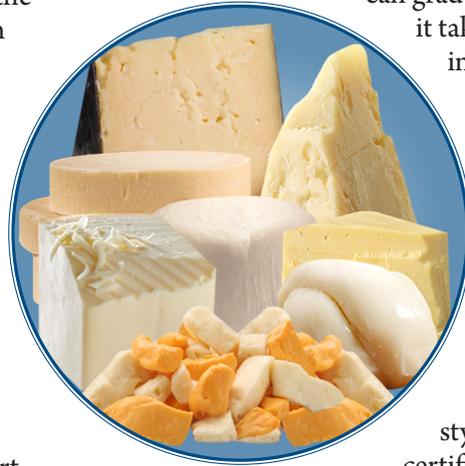


DAIRY PIPELINE

2020 WISCONSIN MASTER CHEESEMAKERS

This year, the Center for Dairy Research and Dairy Farmers of Wisconsin are celebrating the 26th graduating class of the Wisconsin Master Cheesemaker® program. This unique program gives experienced cheesemakers an opportunity to earn the title of Wisconsin Master Cheesemaker in a wide variety of cheeses.

To be eligible for the program, cheesemakers must be licensed Wisconsin cheesemakers for at least 10 years. Before applicants are accepted into the program, they must complete the Cheese Technology Short Course and one other short course. In addition, applicants must undergo a plant visit where they lead a walkthrough of their facility and are given an oral exam. Once they are accepted into the program, participants must complete a list of short courses and an intensive exam. In addition, the cheeses that they are being certified in are graded for flavor, composition



and coliforms—this is done three times before they can graduate as a Master cheesemaker. All said, it takes about three years to complete, but, in the end, the Cheesemaker receives the honor and respect of becoming a Master cheesemaker as well as the right to use the Master Mark® on their products.

To date, 91 cheesemakers have earned the title of Wisconsin Master Cheesemaker in 47 different varieties of cheeses. Many Wisconsin Master Cheesemakers have earned multiple certifications in different cheese types/styles. Bruce Workman has earned 12 certifications, Steve Stettler has seven and Mike Matucheski, Gerard Knaus, Brian Jackson and Scott Erickson have all earned six certifications.

This year, the Wisconsin Master Cheesemaker® program welcomes one new member and four returning members. Please join CDR and DFW in recognizing our Wisconsin Master Cheesemakers. ➔

COVID-19 INFORMATION AND RESOURCES

As we went to print with this issue of the Dairy Pipeline, the rapidly changing situation regarding COVID-19 was impacting every aspect of our lives including the dairy industry.

The Center for Dairy Research created a webpage with updates from Director John Lucey regarding CDR events and operations. This webpage also has links to resources and other information to help industry address issues related to COVID-19: www.cdr.wisc.edu/about/coronavirus.

In addition, the CDR TURBO Program has created a webpage with resources specifically for food and



beverage entrepreneurs and small businesses. This webpage includes links to information about loan programs and other financial assistance and support available to small businesses:

<https://turbo.cdr.wisc.edu/economic-development>.

CDR will be posting updates to these webpages as needed. The number one goal of CDR during this time will continue to be doing what is necessary to ensure the safety of staff and clients, while also trying to support industry and ongoing research. 🌻



New Master Cheesemaker

NOAH DEITELHOFF
Saputo Cheese USA Inc., Reedsburg
Certified Master: Mozzarella & Provolone

It's not often that a high school job turns into a lifelong career but that's the case with Noah Deitelhoff—the newest Wisconsin Master Cheesemaker. While still in high school, Deitelhoff started working in the packaging department at the Saputo cheese plant in Reedsburg.

"I just worked my way up," he says.



His supervisor, Steve Kaun, encouraged Deitelhoff to get into cheesemaking. "He really pushed me into learning how to make cheese and getting better at it. He pushed me into getting my cheesemaker license."

Deitelhoff got his cheesemaker license in 2001 and has been honing his craft ever since. The Saputo Reedsburg plant produces Mozzarella and Provolone, which Deitelhoff has helped to develop and fine tune.

Tinkering with make procedures and learning more about the craft is what Deitelhoff really enjoys about cheesemaking. "The starter is very intriguing—how it works and the science behind it. I still have a lot to learn about it."

Deitelhoff first learned about the Wisconsin Master Cheesemaker® program by reading about it online. In addition, Al Scott, a Wisconsin Master Cheesemaker at Saputo also encouraged him to think about applying to the program. Deitelhoff applied and successfully completed the program but admits that it wasn't easy. "It was tough. There is a lot of class time, which is kind of daunting."

He thanks his mentor and former supervisor Steve Kaun, who recently passed away, for helping him get where he is today, "I'll be forever grateful for the things that he's done for me."

One interesting fact about Deitelhoff is that he doesn't like cheese. When he was younger, he battled and overcame cancer. "Ever since I had chemotherapy, I don't like the smell cheese. It's kind of funny, some of the

classes I had to take with the cheese tastings; that was pretty rough for me."

That hasn't stopped Deitelhoff from advancing his career as a cheesemaker and now, as a Wisconsin Master Cheesemaker, Deitelhoff says anything is possible.

"I view it as a great accomplishment. It was a lot of hard work but I'm hoping that it's going to be rewarding in the future and open up new avenues for my career as a cheesemaker."



Returning Master Cheesemaker

PAM HODGSON
Sartori Cheese, Plymouth
Certified Master: Parmesan & Asiago

In 1991, Pam Hodgson took a job in a cheese plant to help support her family. At the time, she had no idea that she would fall in love with cheesemaking.

"I like how cheesemaking involves all of one's intellect and is challenging on multiple levels," Hodgson said. "It requires good observation skills. Strong recordkeeping and analytical skills help cheesemakers understand what is happening and how processes and products can be improved."

Pam, who is one of only two women to become a Wisconsin Master Cheesemaker, earns certifications in Parmesan and Asiago this year. Pam is a returning Wisconsin Master Cheesemaker—in 2013 she graduated with certifications in Fontina and Open Class Hard Cheese. Asked why she selected Parmesan and Asiago, Pam said, "At Sartori, Parmesan and Asiago have been important cheeses for a long time. Both are cheeses with history and flair."

In 1996, Pam became a licensed cheesemaker and since 2005 she has worked at Sartori where she views her role not only as cheesemaker but also mentor.



"At Sartori, we value innovation, which means opportunities to be creative and to work collaboratively. In addition, I enjoy teaching and mentoring the Sartori team."

While she enjoys immersing herself in the cheesemaking process at Sartori, she said that what she



likes about the Wisconsin Master Cheesemaker® program is that it makes professional development a priority.

“My favorite thing about the program is how it forced me to make time for continuing education. While I love learning, it’s very easy for the day-to-day demands to take precedence over stepping away for a class.”

With four certifications, Pam joins an impressive list of Wisconsin Master Cheesemakers.

“Being named a Wisconsin Master Cheesemaker demonstrates a long-term dedication to the craft of cheesemaking. . . With great fondness, I am reminded of the many women and men who worked side by side to solve problems, improve processes and make great cheese.”

[Returning Master Cheesemaker](#)

TIM PEHL
**Chula Vista Cheese Company (V & V Supremo),
Browntown**
Certified Master: Oaxaca and Quesadilla



Tim Pehl is a returning Wisconsin Master Cheesemaker with an extraordinary range of expertise in several different cheeses from Italian-style Mozzarella and Provolone to Mexican-style cheeses. This year, Tim becomes a Wisconsin Master Cheesemaker in Oaxaca and Quesadilla.

It all started in 1985, when, Tim admits, he just wanted a job that paid above minimum wage. He found that job at Roy’s Dairy in Monroe. Although he didn’t really intend to stay in the industry, he was soon intrigued by cheesemaking, “It was interesting to me, and there was always a next step to learn or aspire to.”

Cheesemaking continues to fascinate Tim, “I think there is more knowledge being utilized than ever before to keep improving the quality of cheese. The quest for continuous improvement is always present, and never goes away. I

think there are more advanced methods of measurement and data used today to test for quality metrics, and you can visually see those improvements, and track them, which ultimately factor into success.”

At Chula Vista Cheese, where Tim has been the plant manager for the past two years, Quesadilla



is the main product produced at the plant. However, when Tim started working at the plant in 2011, Tom Dahmen, who was then the plant manager, was working with John Jaeggi at CDR to develop Oaxaca. Through their collaboration, they developed an award-winning Oaxaca. So, it only made sense to Tim to earn Master certifications in Quesadilla and Oaxaca.

“The Masters program gave me the knowledge to understand the technical aspect of how things work, and what ingredients do, in order to make a higher quality product. Which, in turn, increases efficiency, quality, and profitability.”

As mentioned, Tim is a returning Wisconsin Master Cheesemaker—in 2011, he earned certifications in Blue Cheese and Gorgonzola, which he currently isn’t making. When asked what it means to be a Wisconsin Master Cheesemaker Tim said, “Pride. Simply put. It is a culmination of all the years, the experience, the knowledge, and the ability to steer your team to success. Behind every Master is a great team of the best people in the world.”

To Tim, the Wisconsin Master Cheesemaker® program is another way to ensure that he is producing a quality product.

“The commitment to quality has got to be instilled, and is the strongest visionary attribute held by our leadership team at V & V Supremo. The quest for quality here is outstanding and supported from the highest level. It is a true commitment.”

[Returning Master Cheesemaker](#)

STEVE STETTLER
Decatur Dairy, Brodhead
Certified Master: Cheese Curds



Steve Stettler of Decatur Dairy will be receiving his seventh certification in the Wisconsin Master Cheesemaker® program—this time for Cheese Curds. He has the distinction of being the first Master to earn a certification in Cheese Curds.

Steve is a third-generation cheesemaker who got his cheesemakers license at age 17. His father operated Decatur Dairy, which Stettler now operates with his wife, Glennette, and daughters Shaya and Sierra. In 1999, Stettler received his first certifications in the Wisconsin Master Cheesemaker® program. In total, he has earned certifications in: Muenster, Havarti, Farmer’s Cheese, Brick, Swiss, Cheddar and now Cheese Curds. ➔



As the first Wisconsin Master Cheesemaker in Cheese Curds, Steve has been getting quite a bit of attention in the media and from others in the industry. Like a lot of other Wisconsin cheese plants, Decatur Dairy produces a lot of Cheese Curds and takes pride in producing a high quality, fresh product. Steve brought the idea of adding Cheese Curds to the

Wisconsin Master Cheesemaker® program.

“I brought it to the Master Cheesemaker board and just said that Cheese Curds have such a following in Wisconsin and it’s a big part of the retail scene. I just felt, why would Cheese Curds not be a Master cheese in Wisconsin?”

The board agreed; perhaps persuaded in part by the sampling of Decatur Dairy Cheese Curds that Steve brought to the meeting. He admits that he has gotten some good-natured ribbing from fellow cheesemakers who point out that all cheese starts out as curd. Steve adds that, “When you do make Cheese Curds it’s a little different animal than making curd for Cheddar or Colby, you can play with the moisture and the end product is worthy of being a Master cheese.”

Joking aside, Steve is now certified in seven cheeses and is proud to see the Wisconsin Master Cheesemaker® program continue to grow. “It’s gained quite a bit of popularity amongst the younger cheesemakers and we have talented new people getting into the program.”

“For myself, the networking, the people you meet and just working with the Center for Dairy Research has just been invaluable... It’s a really good program for someone looking to put a little extra sparkle into their career.”



Returning Master Cheesemaker

BRUCE WORKMAN
Edelweiss Creamery, Monticello
Certified Master: Bel Paese

Bruce Workman, one of the most decorated cheesemakers in Wisconsin, got into cheesemaking when he was in high school because his car ran out of gas.

“I walked up to this guy’s house; he happened to be the local cheesemaker in town,” Bruce recalls. “The guy said,

‘If you’re looking for a job, be here Monday morning.’ And my career started.”

That cheesemaker was Bob Durtschi, who operated Northside Co-op in Monticello and made block Swiss and Muenster. Originally, Bruce planned on going to culinary school, but those plans changed as he got involved in cheesemaking.

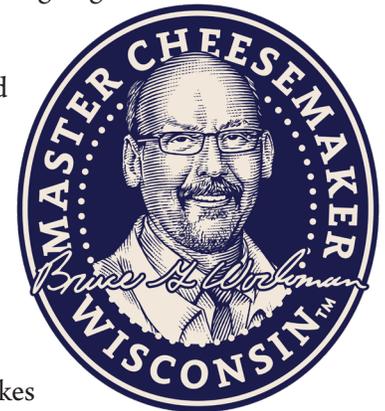
Flash forward to today and Bruce sounds pretty happy with the decision to stick with cheesemaking. “If you look at my day, I get up every morning and watch the sunrise and every sunrise is beautiful no matter where you are... and that’s the start of my day.”

Bruce, who owns Edelweiss Creamery, is proud of the cheese he makes and the fact that he gets to work with his son. “Our quality pretty much stands for itself. I have really good staff who work really hard to continue the high quality. My son, Ben, is onboard and he’s head cheesemaker and plant manager. It was a pleasure to have him join the business.”

Bruce is well known in the Wisconsin Master Cheesemaker® program—he has the most certifications (12!) of any cheesemaker. This year, Bruce earns a Master certification for Bel Paese. “It’s an Italian semi-soft cheese. I call it Mozzarella on steroids. It’s really good as both a table cheese and a sauce cheese.”

When asked if he would be going for a record 13 Master certifications, Bruce laughs, “I’ll go for 12 and be done with it. My son said he’s going to get 13 and I said, ‘Go for it.’”

However, Bruce is far from done as a cheesemaker. In addition to the wide variety of cheeses he makes at Edelweiss Creamery, he has several new projects that he is excited about. “We’re working on an Alpine-style cheese. I think it’s going to be an awesome piece of cheese.”



Overall, Bruce is proud of his Master cheese certifications and encourages others to get into the program.

“To put that little mark behind your name, it kind of opens up people’s eyes... to become a Master cheesemaker—there’s a lot of skill involved in that. It’s a commitment.” 🌟

A BEHIND THE SCENES LOOK AT DAIRY INGREDIENT JUDGING

While the judging of cheese has a long history, dairy ingredient judging is relatively new. For the past two years, the World and U.S. Championship Cheese Contests have included dairy ingredients. The Wisconsin Dairy Products Association, which hosts the World Dairy Expo Championship Dairy Product Contest, has been judging dairy ingredients for over 10 years.

In some regards, dairy ingredient judging is like cheese judging—judges use a similar scoring sheet—and are looking for some of the same flavor attributes like acid, cooked, oxidized, rancid, etc.

KJ Burrington, CDR's Dairy Ingredients, Beverages & Cultured Products Coordinator, has served as a dairy ingredient judge numerous times and helped establish the dairy ingredient judging categories at the World and U.S. Championship Cheese Contests and the World Dairy Expo Championship Dairy Product Contest. Susan Larson, CDR Associate Researcher, has been at CDR for 11 years and is also a trained judge that has judged at both contests. Typical dairy ingredient categories include permeate, whey, WPC 34, WPC 80, whey protein isolate, NFD, milk protein concentrate, and milk protein isolate.

Judging Dairy Ingredients

Burrington said the first step is to prepare the dairy ingredient powders for judging. To do so, the powders are mixed into a 10% solution with filtered water. The solution is mixed with an immersion blender and then placed in a cooler overnight to ensure that the powders get properly hydrated. On the day of the contest, the solution is removed from the cooler and allowed to come to room temperature. Judging the solution at room temperature helps judges detect subtle flavors and attributes that might be hard to detect if the solution is cold.

“When you’re tasting something cold your taste buds don’t work as well—you can’t taste all of the intricate

flavors that might be there,” Burrington said.

At a contest, judges are presented with a bottle of the 10% dairy ingredient solution and a small container with a sample of the dry powder. Before tasting the solution, judges evaluate the powder. “We’re looking for the appearance attributes,” Burrington said. These include caked (moisture issues), dark particles (scorching from dryer), lumpy and unnatural color (milk powders should be white, whey powders can be a little darker). After looking at the appearance of the powder, judges are ready to sip the solution and evaluate its flavor attributes.

Judges taste the sample and spit it out when done. Between samples, judges rinse and/or drink water.

Like cheese judging, dairy ingredients are judged using a defect evaluation key: very slight, slight, definite, and pronounced. “It’s pretty unusual that a product scores in the definite and pronounced range—that usually means they didn’t taste their product before they submitted it,” Burrington said. “Most products will be in the very slight or slight range. There usually aren’t a lot of defects that you can identify in a fresh sample.”

Common Flavor Defects

There is list of flavor attributes that judges evaluate for dairy ingredients. Among the list of different attributes, Burrington said cooked and oxidized flavors are two of the more common defects for dairy ingredients. Since all dairy ingredients are pasteurized (sometimes more than once), they can develop cooked flavors. In some cases, the flavor can be a sweet caramelized taste. The cooked flavor can be more prominent in milk powders, which have varying levels of pasteurization

(low, medium, and high). The probability of a cooked flavor with these products is more likely.

Oxidization is the other attribute that is common with dairy ingredients. The oxidized taste comes from the oxidization of fat compounds in the milk and results in unwanted flavors like “cardboardy.” There are a number of different chemical reactions that can occur that produce an oxidized taste as the powder ages. The high protein

Continued on page 10 ➔

Dairy Ingredient Score Sheet				
Sample A				
Flavor	vs	s	d	p
80 points				
Acid				
Astringent				
Bitter				
Chalky				
Cooked				
Flat				
Foreign				
Metallic				
Oxidized				
Rancid				
Salty				
Scorched				
Stale				
Unclean				
Total				

Appearance	vs	s	d	p
20 points				
Caked				
Dark Particles				
Lumpy				
Unnatural color				
Total				

Very Slight (vs) | Slight (s) | Definite (d) | Pronounced (p)

CRITICALLY EVALUATING THE SUSTAINABILITY AND CONTRIBUTION OF DAIRY TO A HEALTHY DIET

In recent years, new plant-based food products have come on the market with various claims, and several published reports like EAT-Lancet (2019) are suggesting that plant-based diets are healthier and more sustainable. Amid all of this debate, we thought it is important to ask some key questions and attempt to answer them using solid scientific data.

Question: Is there strong evidence that switching to a nearly vegan or plant-based diet is more healthy for humans?

Over the past couple of decades there has been much confusion about what constitutes a healthy diet. The near-vegan diet recommend by the EAT-Lancet report has been controversial. Several doctors (e.g. Harcombe, 2019) pointed out that the diet does not supply all of the essential nutrients. A major issue is that plant-based proteins are often of inferior quality compared to milk proteins (Mathi, 2017). Most nutritional advice, as well as the guidelines by the U.S. government, continue to recommend that individuals consume multiple servings of low-fat dairy a day; due to dairy being a rich source of nutrients like protein, calcium, and potassium. Traditionally, one of the biggest dietary criticisms made against dairy products was that dairy fats may contribute to cardiovascular disease—that claim has recently been debunked by multiple studies (e.g., Rice, 2014).

Question: Is there evidence that plant-based diets are more sustainable?

If the global population were to switch to a diet of predominantly plant-based foods, this would require more food production and greater calorie consumption in order to obtain key nutrients (White and Hall, 2017).

This is neither healthy nor environmentally sustainable. Animal-based foods like meat and dairy are nutrient dense but not calorically dense (unlike some plant-derived foods like grains). A recent analysis indicated that the EAT-Lancet diet was also unaffordable for about 1.6 billion of the world's population (Hirvonen et al., 2020). Increasing the consumption of dairy foods improves the intake of many nutrients of concern (Cifelli et al., 2016).

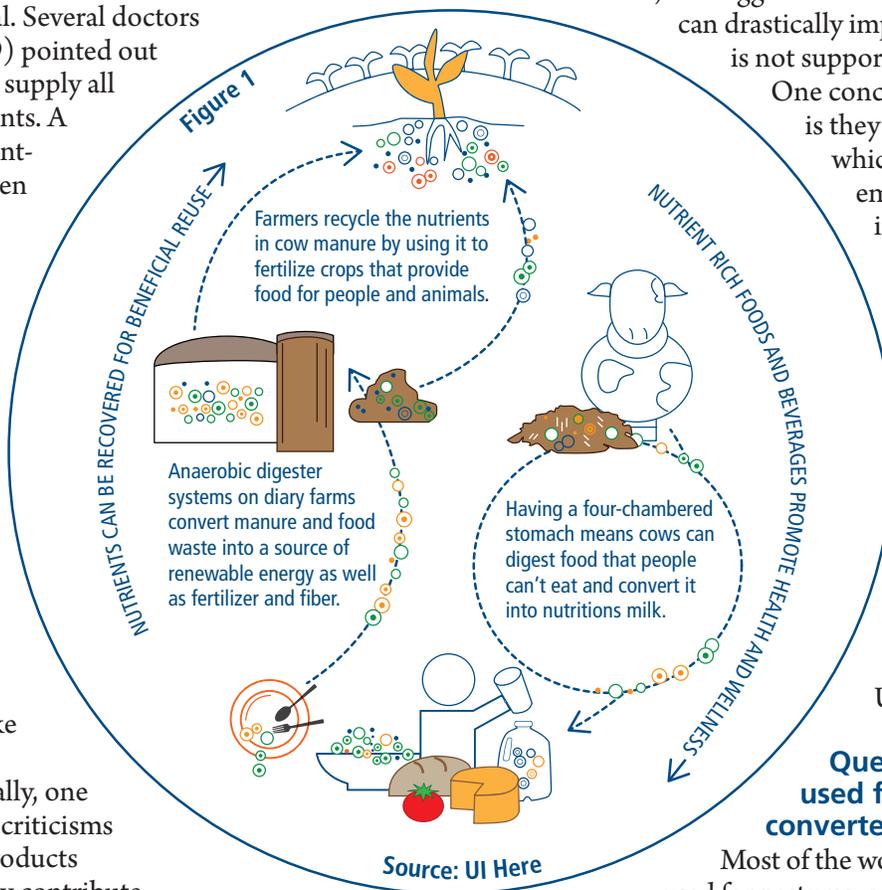
A recent study found that removing all animals from the food supply and replacing all of those calories with plant crops would only reduce total U.S. greenhouse gas (GHG) emissions by 2.6% (White and Hall, 2017).

Thus, the suggestion that changing what we eat can drastically impact the environment is not supported by current science.

One concern raised about cattle is they generate methane, which contributes to GHG emissions. We should bear in mind that prior to the Europeans arriving in the U.S. that there was between 30 to 50 million bison roaming the continent (U.S. Fish & Wildlife Service, 2014); bison presumably generate similar levels of methane to dairy cows, although there are now only around 9 million dairy cows in the U.S.

Question: Should land used for pasture be converted to crops?

Most of the world's agricultural land used for pastures, or grazing, is often marginal land that has poor soil or water availability and thus cannot be used for intensive crop production like fruits, vegetables, nuts or grains (FAO, 1999). Dairy cattle consume products that are inedible to humans, like grass, and convert it to highly nutritious human food. Dairy cows also produce a nutrient-rich manure that is applied back into the soil to keep it fertile for future use (see figure 1). Each day, one U.S. dairy cow produces 64 liters (17 gallons) of manure. That's enough fertilizer to grow 20 kilograms (46 pounds) of corn based upon an average



soil content and a lactating dairy cow in Illinois (USDEC, 2018).

A look at Wisconsin's agricultural history tells a cautionary story about the dangers of solely relying on intensive plant crops. In the mid-1800s, Wisconsin farmers were predominantly growing wheat. Wheat was fairly easy to grow, required little initial investment and offered a high rate of return for farmers. However, it soon became apparent that large-scale, intensive wheat farming wasn't sustainable in Wisconsin. Insects, such as chinch bugs, ravaged the crop and, more importantly, Wisconsin's soil couldn't handle the strain of producing wheat year after year. The soil soon became depleted of nitrogen and instead the state adopted dairy farming and a more diverse agricultural system.

Question: Is the dairy industry efficient or globally sustainable?

Through technological advances and the expertise of our dairy farmers, Wisconsin dairy farms are more efficient and sustainable than ever before. In 1930, the average dairy cow in Wisconsin produced 15.5 pounds of milk a day. In 2018, that average improved to an impressive 64 pounds per cow. The dairy industry in Wisconsin also uses less resources than in past years. Today, dairy farms need only 35% of the water, 21% of the animals and 10% of the land area to produce the same amount of milk as in 1944; using a similar milk production volume for comparison purposes, the carbon footprint in 2007 was only 37% of the value in 1944 (Capper et al., 2009). It's important to note that in the U.S., dairy cattle only contribute 1.3% of total GHG emissions (Rotz, 2018), in contrast, burning fossil fuels contribute around 80% of total GHG emissions (EPA, 2017).

Question: Can dairy be replaced with lab-grown alternatives?

Milk is an extremely complex food containing thousands of different types of molecules. In particular, the casein micelles and milk fat globules are unique and very complex biological structures that will be extremely difficult to replicate outside of the mammary cells found in lactating mammals. It is possible to re-create simple proteins in the lab. However, the caseins undergo modifications in the mammary cells that involve unique enzymes that add phosphates and sugar groups to the caseins that completely change the properties of these proteins. It's not clear if we will ever have the ability to perform these protein modifications or successfully assemble lab-grown caseins into the complex casein micelle structures produced by the cow. Without these casein micelle structures, we cannot clot milk by the renneting process normally used for cheesemaking.

Question: How can we sustainably feed a growing global population?

To feed the world's growing population, food producers need to produce more food and consumers need to reduce food waste. To accomplish this, we need to utilize all food sources: plant and animal. This is a massive challenge for the agricultural sector. We need to increase overall productivity of food production through improved genetics/breeding strategies as well as the application of new technologies.

In conclusion, our planet is facing massive challenges like climate change and a growing world population to feed. We need to focus on producing nutritious food that is both affordable and with the least environmental impact. Dairy products, along with plant-based foods, will both be required to meet these challenges.

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WHAT YOU NEED TO KNOW: NITROGEN TO PROTEIN CONVERSION FACTORS AND INFANT FORMULA

Contributed by Juan Romero, CDR

Protein analysis is a subject of great economic and nutritional interest. The economic value of major agricultural commodities is determined, to some degree, by their protein content. Protein quantitative analysis is necessary for quality control and is a prerequisite for accurate food labeling.

The protein content in commodities is estimated by multiplying the determined nitrogen content by a nitrogen-to-protein conversion factor (NCF). Currently, these NCFs are highly dependent on the amino acid composition of the commodity or food product. An incorrect NCF can result in economic and environmental problems. For example, if a protein source is given an incorrect NPF this will skew the protein content causing a number of issues such as the customer paying for protein that they are not receiving.

Accurate NCFs are paramount for infant formula producers and customers. When infants and children are fed with breast-milk substitutes (infant formula, follow-up formula and formula products for young children), it is important that these products comply with the relevant standards for composition and quality. Overall, protein analysis has legal, nutritional, health, safety, and economic implications for the food and dairy industries.

FAO and WHO Addressing NCFs

The Food and Agriculture Organization of the United Nations (FAO) and World Health Organization (WHO) established the Joint FAO/WHO Expert Meetings on Nutrition (JEMNU) in 2009 to provide scientific advice to the Codex Alimentarius Commission (CAC) and its subsidiary bodies, as well as member countries. JEMNU aims to provide relevant scientific advice in an independent, timely and cost-effective manner, and is convened in response to requests from specific Codex committees or member countries.

As part of its work on updating the Codex standards for infant formula and follow-up formula, the Codex Committee on Nutrition and Foods for Special Dietary Uses (CCNFSDU) is currently discussing the most appropriate NCFs to use in estimating protein content of soy-based and milk-based ingredients used in infant formula and follow-up formula. In 2017, the CCNFSDU requested that JEMNU be convened to review the evidence presented in a systematic literature review commissioned by FAO/WHO and develop evidence-informed guidance on this topic.

Thus, the requested work by JEMNU was initiated and a meeting was convened by FAO and WHO in Geneva, Switzerland from July 16-17, 2019. I was fortunate to have been invited, along with 12 other experts, to participate in the meeting, which included an external resource person, and representatives of the Codex Secretariat.

The objectives of the JEMNU meeting were to:

- ▶ Review and interpret the systematic review commissioned by FAO and WHO (<https://www.who.int/publications-detail/9789241516983>) on the data on NCFs for foods containing soy-based or milk-based ingredients.
- ▶ Determine appropriate conversion factors for soy-based and milk-based ingredients used in infant formulas.
- ▶ Provide any additional information to be included in the report to be submitted to the 41st Session of CCNFSDU, held in Düsseldorf, Germany from November 24-29, 2019.

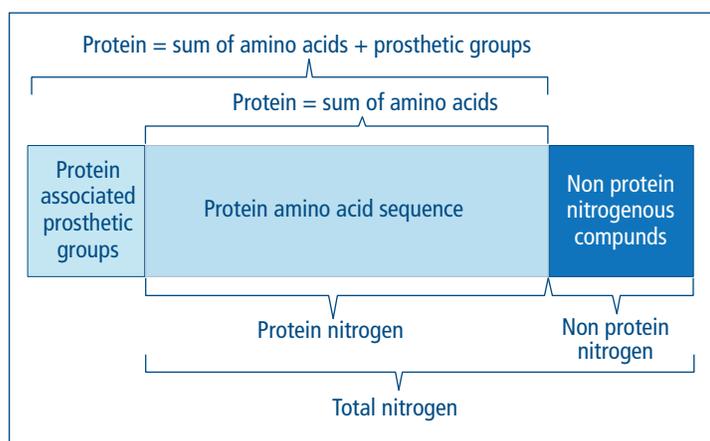
The systematic review summarized relevant analytical methods and compiled and calculated pooled estimates for different types of conversion factors from published sources and from unpublished sources (via a call for data). The JEMNU expert panel discussed the findings of the systematic review and then applied the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) framework to assess the certainty in the of evidence for each of the pooled conversion factor estimates.

In discussing the findings of the FAO/WHO systemic review, three major themes were raised by the JEMNU expert panel.

1. It is difficult to accurately estimate the protein content of foods because the most commonly used methods have numerous shortcomings. However, correction of the crude protein content of a food (based on analysis of total nitrogen) for measured non-protein nitrogen content allows an accurate determination of proteins.
2. The shortcomings of the commonly used protein estimation methods, together with a relative paucity of data for formulas and formula ingredients should be the impetus for a call to action by industry and other relevant stakeholders to generate relevant conversion factors for formulas using best available methods, possibly as part of a multinational consortium. ➔

3. Selecting the appropriate conversion factor for a particular food or ingredient depends greatly on the nature of the protein and nitrogen in the sample, and how the two elements are defined and characterized.

Defining protein in the context of the derivation and use of conversion factors is particularly important because the relevance of a particular conversion factor in estimating the protein content of a food or ingredient varies, depending on whether the intention is to estimate the amount of amino acids in a food or the crude protein content. For the purposes of deriving and using conversion factors, protein can be considered in terms of amino acid content only or of amino acids plus prosthetic groups that may also be present. Prosthetic groups commonly include phosphoryl groups (from phosphorylation of amino acids) and oligosaccharides (from glycosylation of amino acids).



Phosphorylation, is present primarily on the caseins, and is crucial for the key biological function of caseins, in all mammalian milks, including human milk, as a carrier of calcium, magnesium and phosphate. Due to this mineral binding capacity of caseins sufficiently high levels of these minerals can be transported in bioavailable form from the mother to the neonate to sustain growth of the latter.

Glycosylation, which is present on both the caseins and the whey proteins, also in human milk, has several important biological functions. First of all, protein glycosylation affects protein folding and thereby biological function. Secondly, glycosylation is important for specific recognition of proteins by other molecules or mimicking host glycans, thereby playing important roles for e.g., antibodies and modulating adhesion.

Prosthetic Groups are an Integral Part of Dairy Proteins

Consideration of protein as the sum of amino acids (without the prosthetic groups) keeps the focus on delivery of amino acids; in contrast, inclusion of prosthetic groups considers the whole protein, but may

provide a higher estimate of protein content for the same amino acid content. A more holistic view of protein acknowledges that prosthetic groups are part of protein, and contends that focusing on amino acids alone ignores the other components of protein that could provide nutrition or other health benefits, even if their roles are not yet fully understood. Dairy proteins usually contain prosthetic groups, whereas any such groups associated with soy proteins are generally stripped off during the processing used to inhibit anti-nutritional activity. Prosthetic groups are an integral part of dairy proteins when used as ingredients in formulas.

It was unclear whether the recommended ranges of protein provided in the relevant Codex standards are intended to ensure adequate delivery of amino acids or of total protein (including prosthetic groups). Thus, it was agreed that two sets of conversion factors would be provided for consideration by CCNFSU.

Option 1: When protein is defined as being only the sum of the constituent amino acids (i.e. ensuring delivery of amino acids is the primary aim), the recommended conversion factor for dairy-based ingredients is 6.1 and for soy-based ingredients is 5.7. There was moderate certainty in the evidence underlying the conversion factor for dairy and low certainty in the evidence underlying the conversion factor for soy.

Option 2: When protein is defined as being the sum of amino acids and prosthetic groups (i.e. ensuring nutrition and potential health effects of the total protein is the primary aim), the recommended conversion factor for dairy-based ingredients is 6.3 and for soy-based ingredients is 5.7. There was moderate certainty in the evidence underlying the conversion factor for dairy and very low certainty in the evidence underlying the conversion factor for soy.

Importantly, the recommended conversion factors in Option 1 are based on conversion factors derived from amino acid composition analyses in which prosthetic groups were not included, and those in Option 2 on conversion factors derived from various analyses in which prosthetic groups were either implicitly or explicitly included. The factors recommended above are based solely on data from dairy and soy products.

The JEMNU expert panel stressed that the proposed conversion factors may be used specifically for infant formulas and not for other dairy-based or soy-based ingredients or foods.

Delivery of Amino Acids or of Total Protein?

The selection of conversion factors (i.e. deciding on Option 1 or Option 2) ultimately depends on whether the primary aim of determining protein content is to →

ensure adequate delivery of amino acids or delivery of total protein. However, the expert panel considered Option 1 a viable option because there are more data available for Option 1. It was further noted that if CCNFSDU decides to use Option 2, further work will probably be needed to improve the accuracy of the estimates of the conversion factors.

The JEMNU considered it critical that CCNFSDU select only one of the two options to disseminate. They are not intended as options to be presented to and decided on by manufacturers. It was felt that disseminating two different sets of factors and providing the option of picking one or the other for different applications, or otherwise mixing or swapping factors, would create considerable confusion and uncertainty.

It was also noted that the conversion factor of 6.25 currently used in the standards for infant formula and follow-up formula has not been empirically determined and the JEMNU expert panel agreed that its application to a wide variety of proteins is highly inappropriate. Therefore, the proposed conversion factors represent a considerable improvement over the current situation.

Update: In their latest meeting, the CCNFSDU did not select from the options given by the JEMNU but rather an electronic working group (eWG) was convened to make recommendation for the selection of one of the options. Perhaps at the time of publication of this report, the eWG conclusions will be available for comment.

Next Steps

The JEMNU agreed that there is a very strong case for the relevant industries to invest in further collaborative efforts to improve the accuracy of the conversion factor estimates, using the best available methods to conduct amino acid analysis, and focusing on ingredients that are specifically used in infant formula products. As mentioned earlier in this article, it is important for industry and other stakeholders to share data that may be helpful in generating relevant and accurate conversion factors.

The panel also felt that it was important to retain the option for manufacturers to propose different conversion factors for particular ingredients where scientifically justified, as per footnote 2 in the Codex Alimentarius infant formula standard (CODEX STAN 72–1981). Such conversion factors should be determined using a prespecified, standardized amino acid methodology.

For more information, visit, <http://www.fao.org/nutrition/requirements/proteins/en/> 🌟

dairy ingredients and whole milk powders are especially susceptible to developing oxidized flavors. Even a WPC 80 will often develop these off flavors because they still contain high levels of fat (typically about 6-7% fat).

Burrington said that companies can try to avoid or slow the development of oxidization by storing their powders in a temperature-controlled environment. “Fresher is always better with powders, unlike cheese,” she said. “Powders always taste the best when they’re fresh.”

Other Flavor Defects

In addition to oxidized and cooked, there are some other flavor attributes that dairy ingredients can be susceptible to developing. Burrington said that acid is not very common but can be tasted in sweet whey products. An acid taste is typically found in products made from whey that had too much acid development—perhaps the cheesemaker didn’t pasteurize or cool the whey.

Chalky is another attribute that can sometimes impact dairy ingredients. “Chalky is more of a mouthfeel,” Burrington said. “We do taste it occasionally with whey ingredients if they don’t have very good solubility. You feel like you have this coating in your mouth and that’s a defect.”

Bitter is not experienced very often but Burrington said it can sometimes develop in high protein products and is typically associated with issues related to protein hydrolysis.

Other attributes like foreign, metallic, and unclean are very rare. “Something went really wrong if you’re tasting those,” Burrington said.

Ideally, dairy ingredients should taste rather neutral. Whey ingredients are expected to have some flavors because they come from the cheesemaking process and will inherit some of the flavor from the starter culture, etc. Burrington said that non-fat dry milk (NFDM) is typically viewed as the gold standard in the dairy ingredient world when it comes to taste.

“Non-fat dry milk, when you rehydrate it, is supposed to taste like fresh skim milk,” she said. “You want the rehydrated powder to taste like the product when it was fresh and in a fluid form.”

Instantized Powders

Because of how instantized products are produced, Burrington said they will not place as well as a non-instantized ingredient at a contest. Instantized powders ➔

contain soy or sunflower lecithin, which is added to help the powder dissolve in solution. While lecithin helps the powder hydrate more quickly it also gives off flavors to the powder, which judges will mark down.

Future Contests

At this year's World Championship Cheese Contest, judges evaluated a record number of entries in the dairy ingredient categories. Dairy ingredient judging should continue to grow as more companies look to bolster their products.

The next scheduled contest open to dairy ingredients is the 2020 World Dairy Expo Championship Dairy Product Contest, taking place August 18-20 in Madison, Wisconsin. For more information, visit www.wdpc.net (contest entry forms and fees are due July 17).

Next Spring, the 2021 United States Championship Cheese Contest will take place. There are also dairy ingredient categories in this contest and more information can be found at www.uschampionshipcheese.org. 🌟

SOMMER AND JAECCI INDUCTED INTO LES GUILDE INTERNATIONALE DES FROMAGERS

On March 2, CDR's Dean Sommer and John Jaeggi were inducted into the New World Chapter of Les Guilde Internationale des Fromagers. The organization, has more than 6,000 members across the world. The guild is open to professional cheesemakers, growers, processors, refiners, commercial and cheese retailers.

CDR's John Lucey (2018), Marianne Smukowski (2016) and Mark Johnson (2016) have also been inducted. The guild is "responsible for promoting women and men in their work related to the dairy world whatever their nationality." 🌟



CDR's Mark Johnson, Marianne Smukowski, Dean Sommer & John Jaeggi.



CONGRATULATIONS

To All 2020 World Championship Cheese Contest Winners!

CDR is proud to have worked with so many of this year's contest winners who have used CDR for their training, education, technical support or research efforts.

WE'RE HERE TO HELP MAKE YOU A WINNER

59% of all Contest Winners Have Worked with CDR

CHEESE	BUTTER	YOGURT	DAIRY INGREDIENTS
56%	67%	81%	83%

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CDR STAFF JUDGE AT WORLD CHAMPIONSHIP CHEESE CONTEST

A group of CDR staff members served as judges at the 2020 World Championship Cheese Contest on March 3-5 in Madison, Wisconsin. This year's contest had the largest ever lineup of internationally renowned judges. The 2020 judging team consisted of 55 experienced cheese graders, cheese buyers, dairy science professors, and researchers, hailing from 19 countries and 14 American states.

CDR staff members included: Luis Jiménez-Maroto, Kimberlee Burrington, John Jaeggi, Dr. Mark Johnson, Andy Johnson, Dr. Susan Larson, Marianne Smukowski and Dean Sommer. For more information about this year's contest, including results, visit www.WorldChampionCheese.org. 🌟



Andy Johnson, CDR & Miguel Rolo, Etapa Improvável, Portugal.

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Milwaukee, Wisconsin | www.cheeseexpo.org



2020 ADPI/ABI Joint Annual Conference

American Dairy Products Institute

July 26 – 28, 2020

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