Wisconsin Center for Dairy Research

DAIRY PIPELINE

A Technical Resource for Dairy Manufacturers

December 2000, Volume 12 Number 4

Fractionating valuable peptides from whey

by Mark. R. Etzel, associate professor, Dept. of Food Science

Our recent research focused on using ion exchange membranes to develop a new and more economical method for the large-scale fractionation of glycomacropeptide, or GMP, from whey. The ion exchange method is useful since GMP has a negative net charge in whey at acidic pH, while other whey proteins are charged positive. Thus, when whey contacts anion exchange membranes at acidic pH, GMP binds as the other whey proteins remain in the fluid phase.

GMP is a casein derived peptide, cleaved from κ-casein by chymosin during cheesemaking. The concentration of GMP ranges from1.2 to 1.5 g/L in sweet whey, comprising 15 to 20% of the total protein.

GMP is a peptide with many known biological functions. For example, GMP may prevent bacterial and viral infections, and adhesion of *E. coli* to human epithelial cells is inhibited by GMP. In one experiment, rats, with and without being first fed GMP, were fed *E. coli*. Only the rats fed GMP survived. In addition, GMP inhibits: binding of cholera toxin to its inhibitor, adhesion of oral Actinomyces and Streptococci to teeth to prevent dental plaque formation, and the hemagglutination of influenza virus.

Aromatic amino acids (phenlyalanine, tryptophan and tyrosine) are absent from GMP. Thus, GMP could be very useful in the treatment of phenylketonuria (PKU), a hereditary disorder in which phenylalanine cannot be metabolized. Right now, living with PKU means following a strict low-protein diet since phenylalanine is found in so many proteins. However, GMP is the only known natural protein that does not contain phenylalanine and using it as a protein source offers the hope of a more varied and interesting diet to people with PKU. (See sidebar on pg. 2)

Work continued in this project to scale up the process and to develop an ion exchange method that can increase the purity of GMP. This project required developing a new separation process because the single anion exchanger used in past work was inadequate.

Glycosylation and charge of GMP

Widely differing extents of glycosylation of GMP, or sugar addition, exist in whey and whey products, ranging from fully-glycosylated GMP to non-glycosylated GMP. Glycosylated GMP contains substantial amounts of covalently bound sialic acids, which strongly determine its binding behavior in ion exchange separations. Because the sialic acids present in GMP have a pKa value of 2.7, they have a net negative charge at pH as low as 3 to 4. In non-glycosylated GMP, the potentially negatively-charged amino acid side chains (aspartic and glutamic acid) have a pKa of 3 to 5, and have a substantial net negative charge only at pH 5 and higher. Adsorbing GMP to an anion exchanger at pH 4 or lower will recover glycosylated GMP only. A pH of 5 or higher is needed to recover all of the GMP from whey because non-glycosylated GMP does not bind strongly to an anion exchanger until it has a net negative charge, which would occur only at pH 5 or higher. Because some of the uses for GMP are based on the absence of aromatic amino acids, a characteristic of all GMP, methods specific for the recovery of only glycosylated GMP would not be suitable for the full recovery of all GMP.

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What's Inside:

GMP—Could it be made in Wisconsin?

It shouldn't surprise us that a unique and special protein like casein is the source of glycomacropeptide, (GMP), a unique and special peptide. Caseins are the major class of protein in milk, making up 80% of the protein in cows milk. Casein is also a very specialized protein—a most efficient carrier of calcium in milk.

During the normal course of cheesemaking, the enzyme chymosin breaks peptide bonds in casein. The resulting curd formation and disruption of the peptide bond in κ casein, one of three casein subgroups, produces the peptide fragment GMP. The GMP fragment ends up in whey, where it can make up to 25% of the whey protein.

Dr. James Harper (ADPI publication 2000) recently summarized researcher reviews of the biological and physiological properties attributed to GMP. It is an interesting list, suggesting that GMP may help prevent dental cavities, influence blood clotting by inhibiting platelet aggregation, interact with antibodies, and protect against bacteria and viruses. All of these claims need further research, but there is an important use for GMP that might need less research. As Dr. Mark Etzel points out, GMP is the only known natural protein that does not contain phenylalanine. The suggestion that this peptide might be useful for treating phenylketonuria, or PKU, was made twenty five years ago. (Kristiansen, 1977) Since then, thousands of children with PKU have been located through newborn screening and treated with a strict, low protein diet to prevent severe mental retardation. Although this is truly a success story, the low protein diet continues to be a problem for children, teenagers, and adults with PKU. A mainstay of the diet is a formula that both supplies protein needed for growth and development and excludes all but a small amount of the amino acid phenylalanine, which is toxic for people with PKU. If you think it's a problem getting your kids to eat vegetables then count your blessings. This formula, the treatment for PKU, smells bad, tastes worse and can only be described as unpalatable.

Phenylketonuria, or PKU, is a rare disorder but it is still one of the more common inborn errors of metabolism. The incidence varies from country to country, but in the United States, Canada, British Isles, and Western Europe between 1 in 11,000 and 1 in 15,000 newborns are born with PKU. This means they lack an enzyme, produced in the liver, that breaks down the amino acid, phenylalanine. When phenylalanine circulates at high levels in the bloodstream it is toxic to developing brain cells and causes mental retardation. Right now, treatment involves preventing the buildup of phenylalanine, and that means that people with PKU have a very restricted low-protein diet. Since phenylalanine is a common building block of protein, you can find it in meat, fish, milk, bread, cake, cookies, ice cream and the list just keeps going.

The Wisconsin story of PKU

The Waisman Center at the University of Wisconsin-Madison is one of 14 national centers dedicated to learning about human development and developmental disabilities through research and practice. The Wisconsin center was named after Harry A. Waisman, a pediatrician and biochemist who was a pioneer in mental retardation research. He was a driving force behind the enactment of legislation that mandates testing of all newborns in Wisconsin, and the nation, for PKU. Dr. Waisman was also one of the first physicians to use a restricted diet to treat children with PKU and helped establish a national center at the UW-Madison, which opened in 1973.

Why should the Wisconsin dairy industry be interested in PKU? Well, here we are, decades later, with another Wisconsin opportunity to lead the way in PKU treatment. Wisconsin just happens to be the leading producer of whey, the best source for that treatment (GMP). Wisconsin was granted a patent for the production of GMP from whey (USP 5,968,586). The technology is available, the need is clear, and you can make a profit on this value-added product, which sells for 50 times more than the WPC-34 whey powder. If you want to consider producing GMP, call Mark Etzel, he'd like to talk to you.

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As mentioned earlier, only at pH 5 or higher do both glycosylated and non-glycosylated GMP bind to an anion exchanger. However, at pH 5, adsorption of other whey proteins occurs also. Thus, to manufacture > 90% pure GMP, a second step must be added to separate contaminates from GMP.

New separation processes for GMP

Based on the ionic behavior of GMP, two new separation methods were developed to manufacture purified GMP using two ion exchangers of opposite polarity in series. Developing these new separation methods constituted a significant portion of the project, and ultimately, we received several patents for our inventions. The reader is referred to these patents for the specific details of the experiments and results (i.e. US 5,968,586, US 5,986,063, WO 9918808A1). An overview only will be given in this report.

When the first ion exchanger is a cation exchanger, whey is adjusted to a pH less than about 4 and passed through the first column (Figure 1). At this pH, whey proteins other than GMP take on a positive charge and bind to the cation exchanger. GMP does not have a positive charge at this pH, and passes through the first column without adsorption. The effluent containing GMP is adjusted to pH 5 and passed through the second anion exchange column to bind GMP and allow the lactose, minerals, fat, peptides, and other contaminates to be washed out. Protein desorbed, or removed, from the first column is whey protein isolate and can be sold to offset the cost of manufacture of the GMP.

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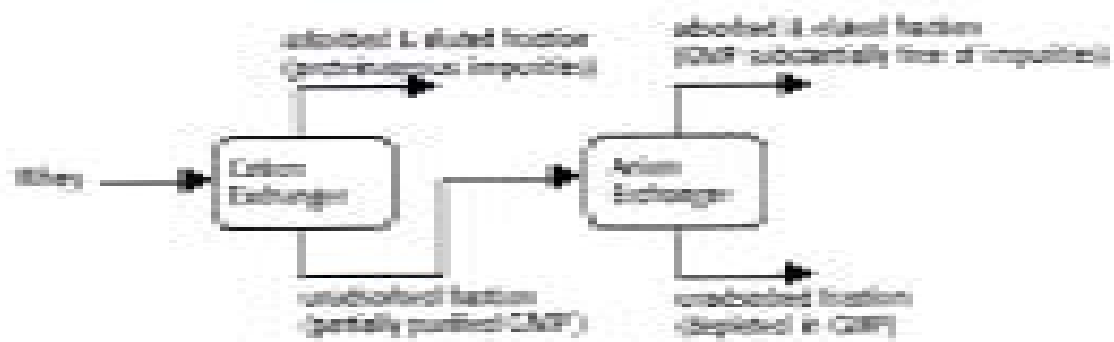

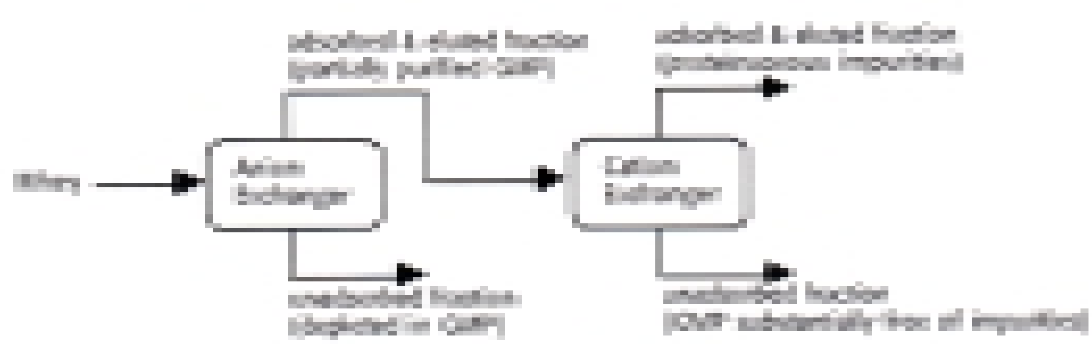

Skimming the Shelf— What's New in Print?

The Dairy Council of Wisconsin and the Wisconsin Milk Marketing Board recently debuted the second edition of the Food Labeling Resource Guide. "The guide answers basic questions about labeling requirements and their effects on dairy manufacturers and marketers," explained Emerita Alcantara, PhD, RD, vice president of Nutrition and Regulatory Services for Dairy Council of Wisconsin. Alcantara said the manual is based on the federal code regarding regulations, but presents information in a targeted manner and includes marketing advice about how to use the food label to communicate product benefits.

The guide, a well organized three ring binder that holds 14 chapters and appendices, is designed to accommodate updates and changing information. It includes a question and answer section at the end of each chapter, developed from the author's experience with answering labeling questions and an informative chart summarizing labeling requirements and exemptions.

For more information, including purchasing details, call 1-800-325-9121.

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When the first ion exchanger is an anion exchanger, whey is adjusted to pH 5 and passed through the first column (Figure 2). At this pH, GMP and a portion of the whey proteins take on a negative charge and bind to the anion exchanger. Lactose, minerals, fat, peptides, and other contaminates are washed out of the column. The desorbed fraction containing GMP is adjusted to a pH of about 4 or less and passed through the second cation exchange column to bind the other whey proteins and allow GMP to pass through without adsorption.

GMP made by the process in Figure 2 was submitted for amino acid analysis (Figure 3). Purity was 95%. Shown for comparison in the figure is the theoretical amino acid analysis of the two genetic variants of GMP (GMP A and GMP B). GMP made using the newly developed ion exchange process nearly matched the theoretical purity.

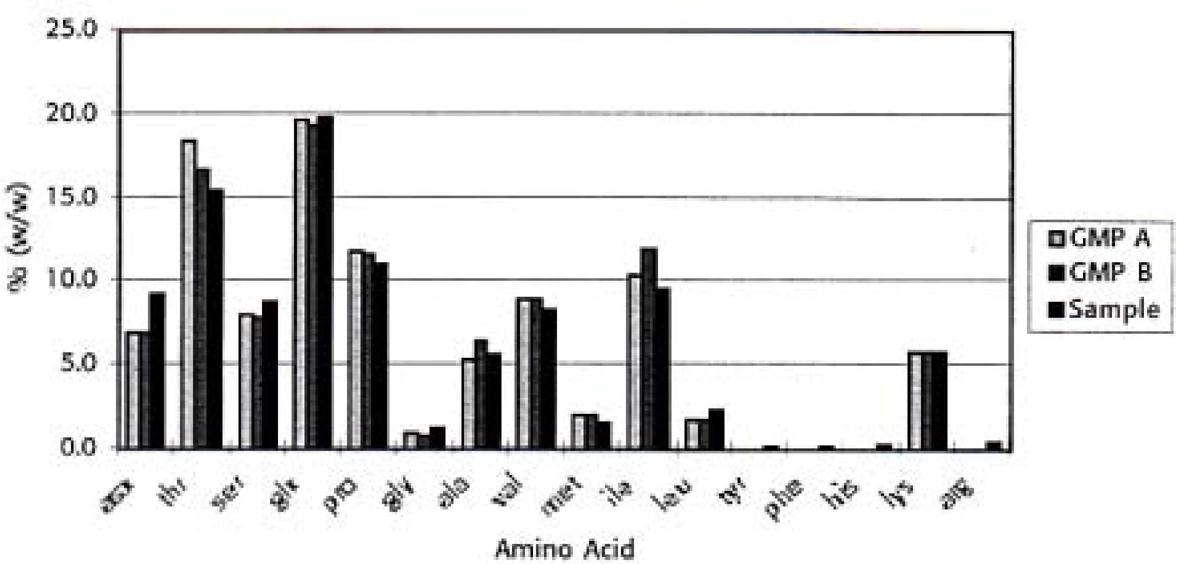

Figure 3. Amino acid analysis of the GMP made when the first ion exchanger is an anion exchanger and the second ion exchanger is a cation exchanger.

A review of factors influencing salt retention

By Rae Dawn Rippchen, Dept of Food Science

"Where would we be without salt?"

James Beard (1903 - 1985) US chef, author

Most cheesemakers would agree wholeheartedly with James Beard—salt plays a critical role in cheese flavor and body. In fact, correct salting levels in cheese are essential for a clean flavored product. Undersalting your cheese can produce a pasty and weak bodied cheese with an open texture, abnormal ripening, and bitter flavor. On the other hand, oversalting cheese leads to harsh bodied cheeses with close texture or cracked rinds (Fox, 1993). Slower ripening and off-flavors described as cooked or slightly burnt can also be caused by over-salted cheese (O'Connor, 1973).

Although the amount of salt added to cheese varies by type of cheese, most ripened cheeses range from one to twelve percent salt (Fox, *et al*., 1985). Many factors in cheese manufacturing affect the amount of salt retained in the final product, particularly variations in the salting step. In recent years, concerns about ground water quality have lead to restrictions in the chloride content of wastewater and landspread whey. One way to control both chloride (and phosphorus) levels is to prevent these minerals from entering the waste stream in the first place. Since the level of salt retained in curd is inversely proportional to the level of chloride found in the whey, it makes sense that increasing the level of salt retained in curd will decrease the chloride in whey.

Factors influencing salt retention

There are three principle methods for salting cheese curd, and each has a different effect on salt retention. First, there is immersion of molded cheese in brine solution. A second method is directly adding and mixing the dry salt crystals to individual curd grains or milled curd at the end of manufacturing. The final method is applying dry salt, or a salt slurry, on the surface of the molded curds.

Brine salting

Brine salting of cheese is common in varieties such as Edam, Gouda, or Provolone. In this method, a molded cheese soaks in a salt water solution (brine) for one half to five days. During this process cheese absorbs the necessary salt using the osmotic pressure difference between the brine and cheese moisture which prompts sodium and chloride ion movement into the cheese (Fox, 1993). Salt absorption begins immediately through all surfaces in brine salting. Equilibrium is achieved through the diffusion of water from cheese. The concentration gradient present between the brine and cheese is partially responsible for molecular movement of water and NaCl.

Direct mixing with milled curd

When directly mixing salt with curd grains or milled curd, salt dissolves into the surface moisture of cheese and slowly diffuses inward. As the whey is released, the curd volume is reduced and this released whey dissolves more salt. A supersaturated brine solution is then created around every curd particle (Breene *et al*, 1965). Because of the increased surface area to volume ratio in dry salting of milled curd, less time is required to reach the proper salt level than in brining of whole cheeses. The ratio is increased from the smaller cheese particle size. The more area the salt can penetrate through, the more salt will be absorbed. However, in a direct comparison of these methods, Breene *et al* (1965) found that milled curd salted through brining had higher salt absorption and salt-in-moisture levels than dry-salted milled curd.

Dry surface salting

Dry surface salting of molded pressed cheese curd has a lower rate of salt uptake than brining. This is explained by contraction of the curd surface, which leads to extensive moisture loss from the surface region of the cheese (Fox, 1993). The decrease in surface moisture greatly impedes the inward mobility of NaCl.

Rate of salt addition

Aside from the salting method, the rate of salt addition has a pronounced effect on salt retention in cheese. As the rate of salt addition increases, the salt and salt-in-moisture levels of cheese correspondingly increase (O'Connor, 1974). This increase is not proportional to the level of salt added since higher salt losses are experienced at higher rates of salt addition. Moisture in the cheese decreases because of increased salt addition. A study conducted by Sutherland (1974) found the volume of whey released and the percent of added salt lost, increased linearly with the level of salt added. As the level of salt applied increased from

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Functionality of Salt

Salt, a necessary and multifunctional component in cheese, has five principle effects on cheese:

- Salt serves a preservative. Using salt to preserve cheese dates from pre-historic times.

- The salt level in cheese profoundly affects the water activity of cheese—which influences microorganisms in cheese and thus extends the shelf life of cheese.

- Salt controls various enzymatic activities in cheese.

- Syneresis of curd occurs as a direct result of salting. Syneresis allows for whey expulsion and reduces cheese moisture.

- Salt causes physical changes in cheese proteins, thus influencing cheese texture, protein solubility, and conformation (Fox, 1993).

1.5% to 3.5% of the total cheese weight, the proportion of the salt lost into the whey rose from 33% to 50%. However, the percent moisture, percent salt, percent salt-in-moisture, and pH increased in a curvilinear manner as the level of added salt is increased. O'Connor (1974) looked at this issue and found that salting at 0.5% of total cheese weight gave 100% retention of salt, while at a much higher level, 6% of total cheese weight, the retention level decreased to 42%. Overall, increasing the rate of salt addition increases the total percentage of salt in the cheese but the percentage of salt retained decreases. Salt absorption increases with increased salting time. Fox (1993) found that the quantity of salt taken up is proportional to the square root of the brining time in brine salted cheeses.

Cheese moisture

The moisture level of cheese alters the amount of salt retained. Salt losses increase as the amount of moisture in the cheese increases. Sutherland (1974) found that when the moisture content of the curd was increased from 39.1% to 43.4%, whey drainage increased by 30%. This caused the percent salt lost to increase from 41 to 58%. Gilles (1976) found a 15% salt loss in cheese curd was caused by an increase of 6% moisture in the curd. Other research conducted by Fox (1993) also found that an increase in the initial moisture level decreases the rate of salt absorption leading to lower salt and salt-in-moisture values in cheese for a fixed salting rate.

Concentration gradient

For brine salted cheeses, the concentration gradient between the brine and curds causes differences in salt retention. A salt-in-moisture gradient between the cheese and salting medium must exist for salt absorption to occur (Fox, 1993). An increase in brine concentration leads to higher rates of salt absorption and an increase in the salt-in-moisture level in cheese. Brine concentrations in the range of 5-20% do not affect the rate at which salt diffuses into the curd. However, as the brine concentration increases, the rate at which salt is absorbed starts to slow. (Fox, 1993)

Cheese geometry and shape

Salt retention is affected by geometry, specifically, the surface area to volume ratio of cheese. When comparing whole molded cheeses to milled curd, it is clear that increasing the surface area to volume ratio of curd increases the rate of salt absorption (Fox, 1993). There is a linear relationship between salt uptake and surface area to volume ratio.

The shape of a molded cheese also affects salt absorption. Two main aspects of cheese shape are responsible for this difference. First, salt retention is influenced by the number of directions the salt penetrates the cheese. Next, the ratio of curved to planar cheese area affects salt retention. Salt absorbs better through planar areas of cheese than curved surfaces. Thus, the rate of salt absorption per surface area unit is greater for a rectangular shape than for a cylindrical shape and a cylindrical shape has a greater rate than a spherical shape (Fox and Guinee, 1986).

Operational modifications

When milled curd is salted, it is stirred at the same time to ensure proper distribution of the salt. Because of its consistency and completeness, mechanical stirring works better than manual stirring. Uniform salt distribution is essential for proper cheese ripening. Sutherland (1974) reports that extending the stirring time (to greater that one minute), showed a significant decline in the amount of salt that was lost from the curd into the whey. The salt and salt-in-moisture content of the cheese greatly increased.

After salting, the curd is commonly held in the cheese vat or bed before pressing to allow for additional whey drainage. The holding period does affect the salt retention of curd. Breene *et al* (1965) found the greatest increase in salt retention occurs over the first fifteen minutes of holding. However, the level retained continued to increase through the entire sixty minutes of holding. Therefore, Breene recommends that manufacturer's hold cheese for at least fifteen minutes prior to pressing to minimize salt loss. During this holding period, the depth of the curd bed prior to pressing varies. Sutherland (1974) found the amount of salt lost during holding increased with an increase in the curd depth but showed a corresponding decrease during pressing. Overall, a slightly greater salt loss with deeper curd beds was experienced. This increased salt loss is caused by the greater gravitational force exerted on the cheese curds as the weight increases.

Temperature and acidity

Temperature plays a vital role in the level of salt retention in cheese. Sutherland (1974) found an increase in curd temperature correlated with an increase in the rate of whey released. The overall trend found salt loss increased at higher curd temperatures. Although data provided by Breene *et al* (1965) showed no significant variation when curd temperature varied between 80 and 110˚F, as the brine temperature increased from 80 to 110˚F, the salt absorption increased 0.1% (Breene *et al*, 1965).

Indeed, there is a critical temperature for salt absorption in cheese curd. Breene *et al*, 1965, report that, compared to higher or lower temperatures, at 32˚C salt has the least affinity for absorption. At 32˚C, a layer of fat is exuded onto the curd's surface, which prevents salt from readily absorbing into the curd. At lower temperatures, this fat has not been released from the curd to the surface. At higher temperatures the exuded fat is dispersed into the whey as a liquid (Fox, 1993).

Acidity level, or pH, is another intrinsic property that alters salt retention in cheese. Gilles (1976), originally reported that curd salted under less acidic levels, or a higher pH, absorbs more salt than cheese salted under strong acidic conditions or low pH.

It is obviously complicated to balance the factors that influence salt retention in cheese. However, cheesemakers need to control salting and pressing procedures if they desire maximum salt retention in the curd. By maximizing salt retention in curd, manufacturers can also reduce chloride levels in whey, and they may increase the economic efficiency of their plants.

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Curd Clinic

Q. I'm looking at a new market for my cheese—slices at the grocery store Deli. What details do I need to pay attention to when I make cheese for this market?

Curd Clinic doctor for this issue is Carol Chen, researcher at the Wisconsin Center for Dairy Research.

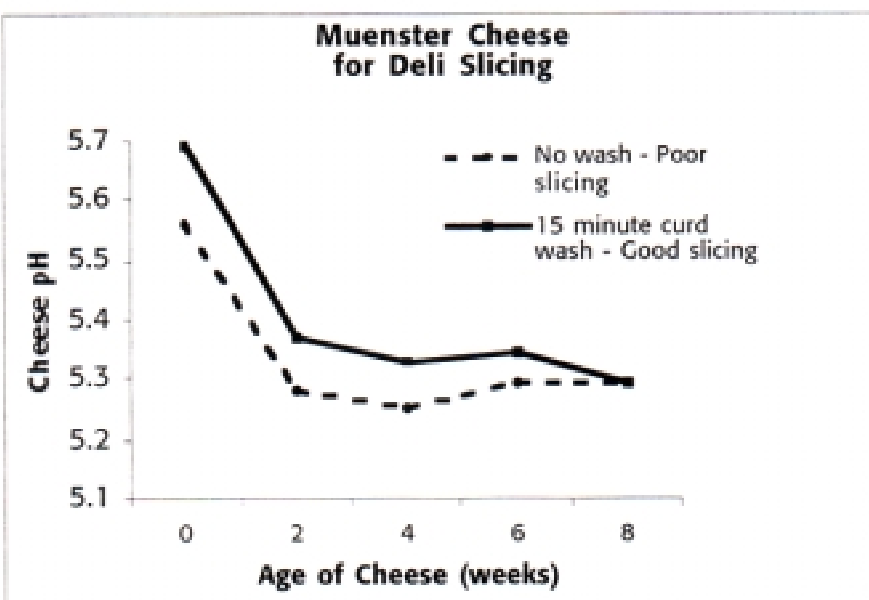
A. The delicatessen market can indeed be a good target for a value-added cheese. Of course, deli operators want a high quality, good tasting cheese, but what they desire most of all is a cheese that slices easily. Certainly, planning ahead can help you supply both good flavor and functionality.

Cheese that is easy to slice doesn't crumble, tear, or turn to mush as the slicing blade moves through it. This characteristic, or sliceability, actually depends on the chemistry and microstructural properties (or physics) of the casein network. Sound familiar? A review of this concept, focusing on melt and stretch of cheese was featured in Volume 12, Number 1 of the Dairy Pipeline. (Which you can access through CDR's website: www.cdr.wisc.edu). Cheesemakers influence the chemistry and physics of cheese melt, stretch and sliceability when they adjust the following factors: milk heat–treatment, pH during cheese manufacture, cheese composition, the lowest pH obtained in the cheese, and proteolysis, or the breakdown of intact casein.

Visual appearance of Muenster deli cheese slices (moisture content 45%). The Muenster cheese on the left was made using a no-wash procedure. The no-wash Muenster cheese texture was not elastic enough to prevent tearing. The Muenster cheese on the right was washed (curd soaked for 15 minutes prior to hooping), and the cheese pH remained above 5.30. As a result, the cheese texture was elastic and the cheese was easy to slice.

The Wisconsin Milk Marketing Board recently funded a project at CDR to investigate and define the key parameters that influence the machining of cheese. Through our work with this project, we have started looking closely at cheese properties like texture and sliceability.

We know that moisture control; composition and proteolysis are important factors that influence functionality of cheese. However, I have found that a crucial detail to watch is the pH.



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Minimum pH

Specifically, the minimum pH that the cheese reaches, sometimes referred to as the 10-day pH. This 10-day reference can be rather misleading. Unless you are monitoring the pH daily, you can not be sure that the lowest pH of your cheese occurs on day 10. Because of buffering effects in the cheese itself, your cheese may reach the lowest pH on day 3 or day 4, and then rebound upwards before falling again near day 10.

Why is this important? If you want to produce a cheese that slices easily you will want this keep the minimum pH within a very small range, between 5.25 and 5.35, and the final pH should be 5.30 to 5.45.

How do you influence this 10-day pH? There are several things you can do to adjust the manufacturing process and influence the pH. You can wash the curd shortly after cutting, (like Swiss or Gouda) or after draining (like Muenster or Colby). After the curd has been cut and healed, a portion of the whey may be drained. The remaining whey and curd mixture may then be diluted with water. You can also wash the curd after draining by simply adding water to the drained curd on the finishing table.

Other influences

The person operating the cheese slicer also has some influence over the sliceablity of the cheese. Slicing cheese at cooler temperatures allows easier slicing and less fouling of equipment. A clean, sharp blade also makes the job easier. Speed is a factor, too. When the operator can slow down and not rush this task, slicing cheese also gets easier.

Are you interested in specialty cheese?

Paul Scharfman, president of Specialty Cheese Company in Lowell, Wisconsin would like to build a new cheese plant in Reeseville, Wisconsin. Scharfman has developed his cheese manufacturing business by filling a specialty cheese niche—he produces authentic Hispanic and Middle Eastern cheeses that are sold throughout North America. As he builds this new plant, he would like to encourage the growth of Wisconsin specialty cheese by offering an opportunity to other cheesemakers to develop and make cheese. Scharfman suggests that his plant could be thought of as the "mother ship" and smaller, separate buildings would be auxiliary plants, owned or leased by cheesemakers. Although Scharfman has applied for a patent for his "specialty cheese condominium" concept, his enthusiasm for the idea seems based on the synergism possible when you get people together who have a passion for cheesemaking.

This cheese condo concept offers a chance to share the physical plant costs, like heat, water, wastewater treatment, whey treatment, and storage rooms and loading docks. It also offers an opportunity to build on one of Wisconsin's unique advantages—the human resources that include decades of cheesemaking experience. If condo owners choose, they could brainstorm about product development and marketing, or they could share business expenses like accounting or a retail store.

Do you have goats? Sheep? A dream for the future that includes making your own cheese? Call Paul and talk about it.

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Mehmet Ak, has been honored in his native Turkey for his cheese research. TUBITAK, the Scientific and Technical Research Council of Turkey, awards young scientists (under 40) who are recognized internationally for their promising scientific work. Mehmet,who was one of the five recipients in engineering, earned his Ph.D. at the University of Wisconsin in 1994 and also worked for CDR while in Madison.

Mehmet (pictured below) received his award on Nov. 9, 2000 from the President of Turkey.

CDR welcomes...

Cindy Martinelli, who has joined us to work with the analytical group. Cindy has all around experience in the dairy industry—she grew up on a dairy farm and later became herd manager before working in a butter plant. "I've seen the industry from the ground up so to speak," says Martinelli. "CDR has a different atmosphere from industry," she notes, "everything is done with research in mind, as opposed to just evaluating products and production efficiency."

Spray dryer shipped to CDR

CDR's whey program is setting up a spray dryer for pilot plant use. The APV Anhydro dryer is gas fired, with an approximate product feed rate of 0.2 to 1.6 gallons per minute. This dryer offers two dryer methods; two fluid nozzle atomizer for mixed flow and two fluid nozzle atomizer with co-current flow. The dryer is designed to handle sensitive materials, like milk proteins. An additional option, the mechanical broom, allows drying of very sticky materials. Questions about using the spray dryer? Call K.J. Burrington (608-265-9297) (burrington@cdr.wisc.edu) or Karen Smith (608-265-9605) smith@cdr.wisc.edu).

The paperless Pipeline—now it's an option

Starting with the next issue of the Pipeline, readers can choose to receive an e-mail message notifying them when the newsletter is posted on the CDR website.

Here is how it will work. Send an e-mail to hogensen@cdr.wisc.edu with the subject "pipeline." In the message section type: your name, title, company and e-mail address. We will then remove your name from the standard mailing list, and add it to the e-mail list. Once an issue of the Pipeline goes to press, we will notify you when it is posted on the CDR web site (http://www.cdr.wisc.edu). Simply go to newsletter-current newsletter and download the latest issue, which will be saved in a pdf format.

You don't have to drop your mailed issue of the Pipeline to access the paperless version. All back issues of the Pipeline are currently posted on our web site, filed under newsletter-back issues.

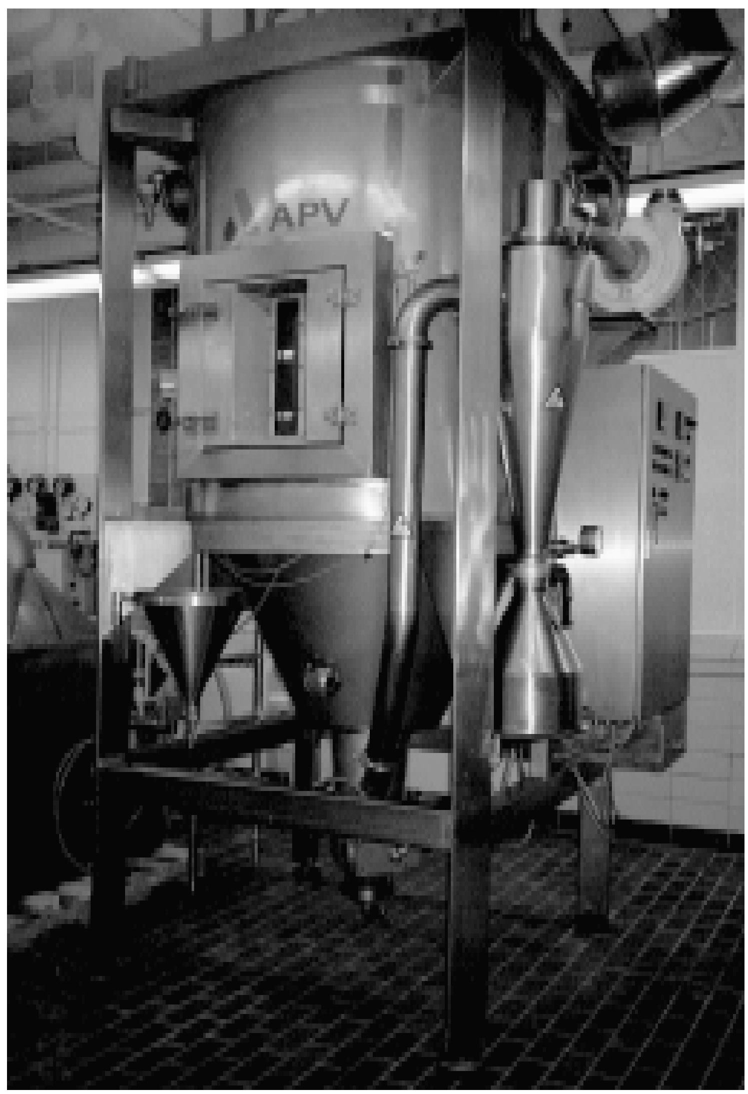


Photo by Gene Barmore

UW Dairy Products Judging Team Scores!

The UW Dairy Products Judging Team participated in the National Collegiate Judging Competition in San Francisco, CA on October 9, 2000.

Contestants evaluate 8 samples of milk, butter, Cheddar cheese, cottage cheese, strawberry yogurt, and vanilla ice cream. They have 35 minutes to evaluate samples for flavor, texture, body, and appearance defects. Lead product judges then score the student's efforts.

At this year's competition, there were 21 teams, 63 undergraduate participants and 20 graduate participants. The Wisconsin Team, coached by Dr. Bob Bradley, Mark Johnson, and Heide Hromadka, included 3 undergraduate students (Craig Schutta, Melissa Maragos, Jesse Vorwald), and 2 graduate students (Sarah Rauschenberger, Kerry Kaylegian).

The UW team did very well overall, reporting that "The best award our team got was putting a great big grin on our coaches' faces." They returned with the following official awards:

Individual undergraduate awards:

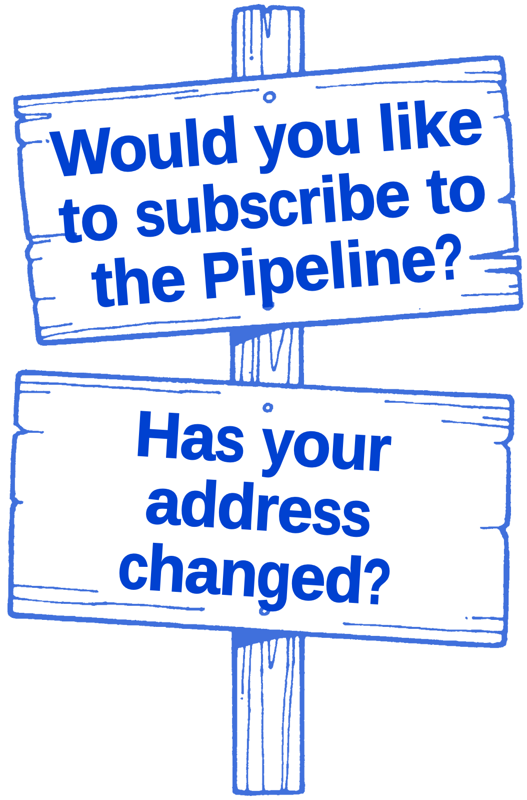
Yogurt - 1st place, Jesse Vorwald
Cottage Cheese - 1st place, Jesse Vorwald
Butter - 5th place, Craig Schutta
Cheddar Cheese - 6th place, Craig Schutta; 10th place, Jesse Vorwald
Ice Cream - 5th place, Jesse Vorwald; 8th place Craig Schutta
All Products - 5th place tie, Craig Schutta

Undergraduate team awards:

Cheddar Cheese - 2nd place
Yogurt - 2nd place
Cottage Cheese - 5th place
Butter - 6th place
Milk - 8th place
Ice Cream - 10th place
All Products - 4th place

Graduate individual awards

Cheddar Cheese - 1st place, Sarah Rauschenberger; 10th place, Kerry Kaylegian
Cottage Cheese - 1st place, Sarah Rauschenberger; 9th place, Kerry Kaylegian
Yogurt - 1st place, Sarah Rauschenberger; 3rd place Kerry Kaylegian
Milk - 1st place, Kerry Kaylegian, 10th place, Sarah Rauschenberger
Butter - 1st place tie, Sarah Rauschenberger, 6th place, Kerry Kaylegian
Ice Cream - 3rd place, Sarah Rauschenberger; 8th place, Kerry Kaylegian
All Products - 1st place, Sarah Rauschenberger; 2nd place, Kerry Kaylegian



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The *Dairy Pipeline* is published by the Center for Dairy Research and funded by the Wisconsin Milk Marketing Board.

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Calendar

Feb. 6-7 Quality Milk Conference (WI Dairy Field Reps). Madison, WI. Call Bill Wendorff at (608) 263-2015.

Feb. 27-28 Wisconsin Process Cheese Short Course. Madison, WI. Call Jim Path at (608) 262-2253 or Bill Wendorff at (608) 263-2015 for more details.

Mar. 26-30 Wisconsin Cheese Technology Short Course, Madison, WI Call Bill Wendorff at (608) 263-2015.

Apr. 4 WDPA Butter & Cheese Evaluation Clinic, Wis. Dells, WI. For information, call Brad Legreid at (608) 836-3334.

Apr. 18-19 Wisconsin Cheese Industry Conference, Green Bay, WI. For information, call Judy Keller at (608) 255-2027.

May 1-2 Dairy Plant Water and Waste Management Short Course, Madison, WI. Call Bill Wendorff at (608) 263-2015.

May 16-17 Applied Dairy Chemistry Short Course, Madison, WI. Call Bill Wendorff at (608) 263-2015.

May 22 Wisconsin CIP Workshop, Madison, WI. Call Bill Wendorff at (608) 263-2015.

May 23 Dairy HACCP Workshop, Madison, WI. Call Marianne Smukowski at (608) 265-6346.

June 5-6 Wisconsin Cheese Grading Short Course, Madison, WI. Call Bill Wendorff at (608) 263-2015.

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