Wisconsin Center for Dairy Research

DAIRY PIPELINE

A Technical Resource for Dairy Manufacturers

Summer 1999, Volume 11 Number 3

Milk Pricing—Is Compensation by Component Near?

by Bob Cropp, Randy Shaver, Bill Wendorff [1]

Multiple component pricing (MCP), or paying for Grade A milk based on components has proliferated since federal milk marketing orders were amended November 1,1995. Plants regulated under the order have paid dairy producers based on three components—butterfat, protein and other solids (lactose and ash). Because of competition among milk dairy cooperatives and other milk buyers, most Wisconsin dairy farmers are paid on the basis of these components. However, MCP programs do vary among milk buyers.

Under provisions authorized by the Federal Agriculture Improvement and Reform Act of 1996 (FAIR ACT), the U.S. Secretary of Agriculture issued a final rule for amending all federal milk market orders on April 4,1999. The final rule, if implemented, will change how milk component values are calculated. In addition, the final rule changes how the protein composition of milk is determined.

Existing MCP program

The current MCP program under federal orders is not a true multiple component program. Instead, the monthly USDA Basic Formula Price, (BFP)[2], is used to calculate component values. This monthly BFP price is actually de-composed into component values by the following method.

First, the price per pound of butterfat is determined from a formula based on the yield of butter from 100 pounds of milk and the CME wholesale butter price.

Second, the price per pound of protein is determined from a formula based on the yield of cheese from 100 pounds of milk as protein composition changes and the USDA monthly average U.S. NASS 40 pound Cheddar cheese survey price.

Third, the price per pound for the other solids is a residual value determined as follows:

The announced BFP "at test" (the average milk composition tests for the BFP)

minus

The butterfat value (butterfat price/lb. X butterfat test)

minus

The protein value (protein price/lb. X protein test)

This remaining residual is divided by the other solids test to get the other solids price per pound.

Thus, the sum of the component values per 100 pounds of milk cannot exceed the announced BFP "at test" for the month. This procedure has puzzled many producers. They question why their component values fluctuate so much from month to month and why the other solids component sometimes has no value. For example, relatively high

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What's Inside:

butter prices during the summer and fall of 1998 accounted for the major share of the value of the announced BFP. Not only was there no residual value left for the other solids value, but the protein price per pound had to be reduced so that the sum of the component values did not exceed the announced BFP "at test." This confusing scenario meant that the producer protein price had gone down when cheese prices were relatively high. Table 1 summarizes the changes in component values during May through December of 1998.

The announced BFP is another problem related to MCP. The BFP is based on the price that Minnesota and Wisconsin manufacturing milk plants pay dairy producers for Grade B milk. This announced BFP is used as a mover of the class prices under all federal milk marketing orders. However, you'll find very little Grade B milk in Minnesota or Wisconsin, because 93 percent of the milk is now Grade A in both states. So, the current BFP needs to be replaced in the federal order pricing and this replacement will influence how component values are determined.

Proposed MCP

A major change in the proposed Final Rule for federal order reform makes MCP a true MCP program. Instead of a monthly BFP, with a residual "other solids" value, component values would be based on a new formula. Producers will still be paid for the pounds of butterfat, protein and other solids sold, but the formula will consider the wholesale values of dairy products, the yield of these products as component composition changes, and the cost to make the respective dairy products (make allowance). Residual values will no longer determine component prices. High butter prices will no longer reduce the protein or other solids component values. Instead, each component value would be determined independently. The butterfat price per pound will be based off of the NASS Grade AA survey butter price. The protein price per pound will be based off of the NASS 40 pound Cheddar block and 500 pound Cheddar cheese survey prices. The other solids price per pound will be based off of the NASS dry whey survey price.[3]

This change in MCP will reflect the value of milk components more accurately because each value is based on the actual market value of dairy products produced from the components. While the current MCP program is revenue neutral, that is, the sum of the component values cannot exceed the announced BFP "at test," the final rule MCP will not have this revenue limitation. The component values will still vary, simply because the prices of butter, cheese and dry whey vary considerably from month to month and from year to year. But the final rule MCP does influence component values.

Charting the changes

Take a look at charts 1- 3 (page 3) to see how changes in milk pricing have affected component values. The first chart depicts values prior to January 1996 when dairy producers were not paid on components, but rather on a fat-skim milk basis. As you can see, 60% of the milk value per hundredweight was water, 34% was butterfat, just 2% was protein and 4% other solids.

The second chart shows component values when MCP was implemented to the present (Jan. 1996 through 1998). With MCP programs, water has a zero value. Protein accounted for 44% of the value per hundredweight of milk, butterfat 34% and other solids 22%.

The third and final chart shows component values during Fall of 1999, if the final rule is implemented. As you can see, on average, protein accounts for 58% of the value per hundredweight of milk, butterfat 39% and other solids 3%.

Table 1. Announced BFP and Component Values Per Pound, Chicago Federal Order, 1998

Month	Announced BFP	Butterfat Price Per Pound	Protein Price Per Pound	Other Solids Price Per Pound
May	$10.88	$1.7976	$1.4524	$0.0000
June	$13.10	$2.2251	$1.6953	$0.0000
July	$14.77	$2.2997	$2.0666	$0.0688
August	$14.99	$2.5142	$2.0014	$0.0000
September	$15.10	$3.2873	$1.1214	$0.0000
October	$16.04	$2.7949	$1.8947	$0.0000
November	$16.84	$1.8861	$2.4178	$0.4090
December	$17.34	$1.4472	$2.4693	$0.7556

Chart 1

BFP component values under fat-skim pricing, prior to Jan. 1996

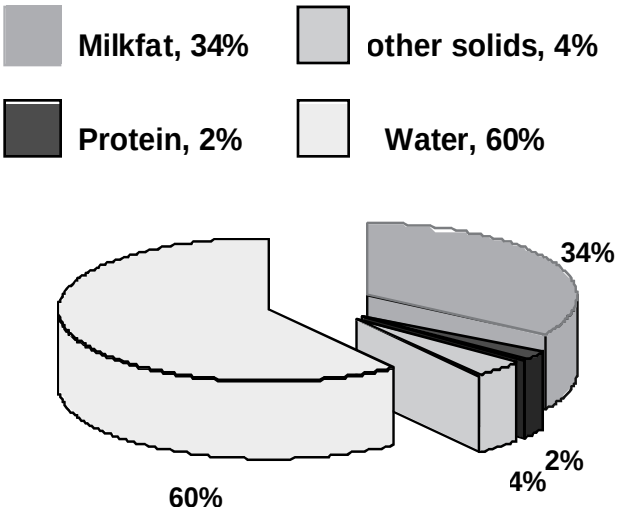


Chart 2

Component values with MCP Jan. 1996 through 1998

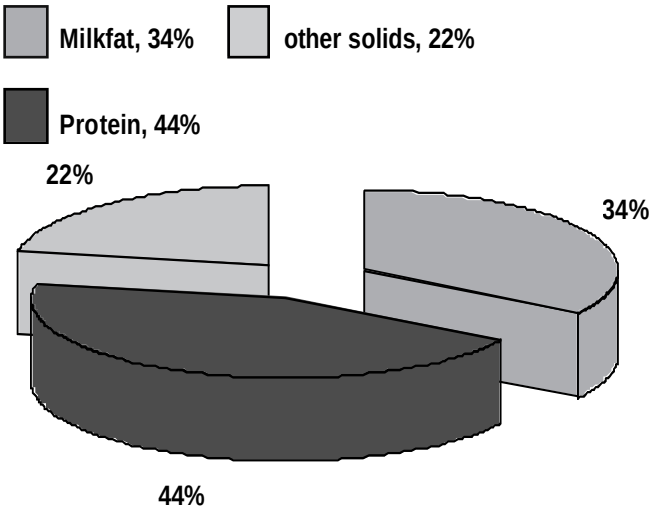
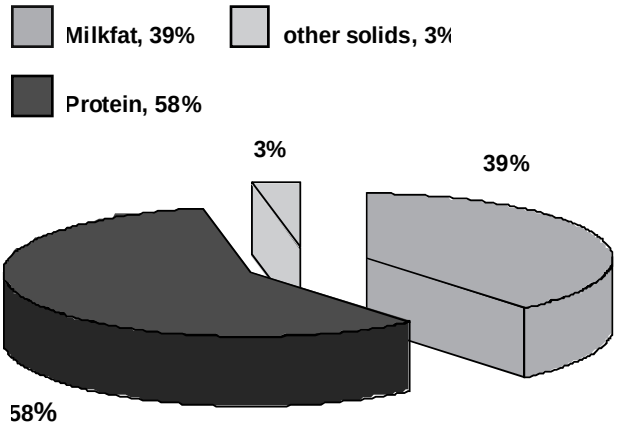


Chart 3

Component values under final rule MCP, Fall 1999



Another change—Testing for "True" protein

Protein accounts for the largest share of the per hundredweight milk value under the current and final rule MCP programs. Thus, accurate testing for protein is critical to dairy producers. Testing for "true" protein, as proposed in the final rule, is a move in the direction of more accurate protein testing.

Historically, we have used the Kjeldahl method to test for milk protein, even though milk protein is not measured directly by the Kjeldahl. The test actually measures the nitrogen content of milk, which is multiplied by a factor of 6.38 to convert the Kjeldahl nitrogen reading to milk protein. The Kjeldahl assumes all nitrogen found in milk is contained in protein. However, this is not the case. A portion of the nitrogen in milk comes from non-protein sources, such as urea and uric acid. These other protein sources are called non-protein nitrogen (NPN). Thus, the Kjeldahl method actually measures what is termed "total" protein. The final rule would change this procedure, paying for "true" protein in milk, the total nitrogen minus the NPN, multiplied by 6.38.

What influences "True" Protein?

Breed of cow

The NPN portion of milk represents approximately 5% of the total milk N so true protein values would be about 95% of total protein values. However, there are distinct differences in the NPN content of milk from different breeds of dairy cattle. Holstein and Ayrshires average about 4.9% of the total N as NPN while Jersey and Guernsey have below average NPN and Brown Swiss and Milking Shorthorns have above average NPN. Accordingly, Jersey and Guernsey herds would show a higher percentage of true protein than other breeds. The NPN percentage within breeds may vary considerably from 2.8 to 10.6% of total milk N. Therefore, selection of genetics in breeding programs is critical for increasing true protein levels in the milk supply.

Seasonal variation

NPN levels decrease rapidly after calving to a low at about 5-10 weeks into the lactation, followed by a gradual increase to the end of lactation. High seasonal temperatures tend to increase the NPN and reduce the true protein in milk. Highest levels of true protein were obtained in milk produced during the winter months.

Milk quality

Mastitic milk is lower in casein and higher in NPN than milk from normal udders. Researchers have reported a

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Lower fat Swiss cheese—Can we improve the flavor?

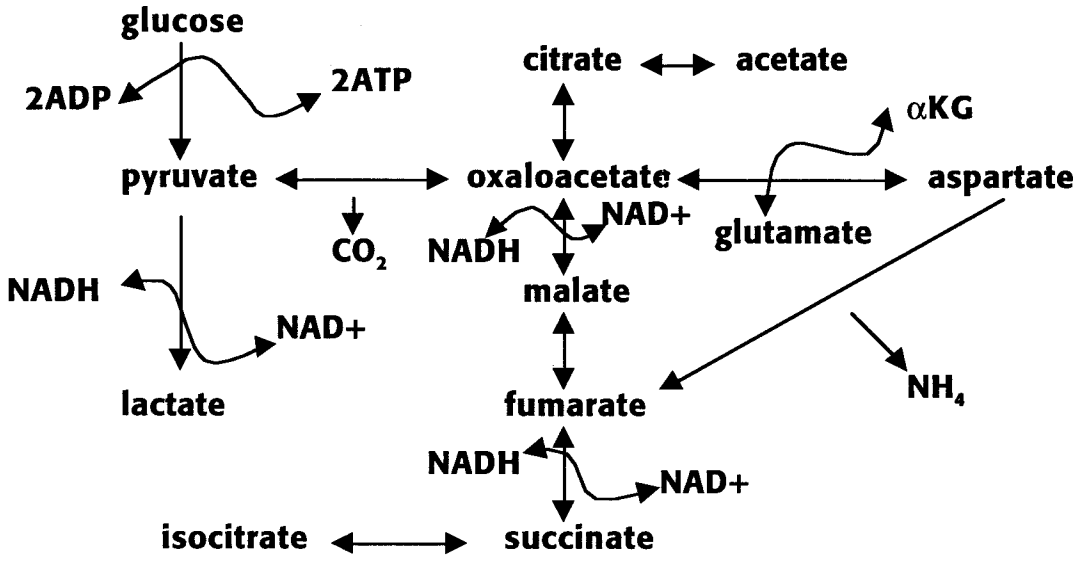
by Amy Dikkeboom,
Wisconsin Center for Dairy Research

Lower fat varieties of food are spreading into every area of the grocery store—including the dairy case. While it has been easy to reduce the fat content of milk, producing lower fat cheese with acceptable flavor and body is still a challenge. Our informal survey of commercial lower fat Swiss cheese produced an array of lower fat Swiss cheeses lacking the typical Swiss flavor. Industry consultants and manufacturers of lower fat Swiss cheese from around the country have also consulted us about this problem. We postulated that adjuncts—non-starter organisms commonly added to enhance cheese flavor—might improve the flavor of lower fat Swiss cheese and we decided to select several and test them.

We targeted three key Swiss flavor components—succinic acid, short branched-chain fatty acids, and furanones. Succinate, in combination with glutamate, gives a full, brothy mouthfeel. The short branched chain fatty acids impart a fruity/sour flavor, which comes from 2 -methyl butyrate and 3-methyl butyrate, and 2 methyl propionate. The furanones are sweet and nutty. The furanones and the succinate must be present to give a good nutty flavor, but it is the addition of the 2 and 3 methyl butyrates that give the "swissy" flavor characteristics.

According to Ed Dudley and Jim Steele, at the University of Wisconsin, there are three different, potential metabolic pathways for the production of succinate in cheese: glycolysis, citrate fermentation and proteolysis. (See Figure 1) Note the aspartate to fumarate pathway, where ammonia is released. This amino acid metabolism explains, in part, why the pH of Swiss cheese increases from 5.56 at 4 months, to 5.94 at 6 months. The other influence is the metabolism of lactic acid to more protonated acids.

Fig. 1. Potential pathways to succinate in Lactobacilli



Dudley and Steele, 1999

Crow and Turner described two potential pathways for the formation of succinate. In one pathway, the enzyme carboxytransphosphorylase catalyzes the reaction of propionic acid and

carbon dioxide, forming succinic acid. The net effect is that propionic acid levels are decreased in the Swiss, giving a tart, fatty acid flavor. The CO_2 levels are also decreased, and eye formation is suppressed. Since succinate by this pathway depends on increased propionic acid levels and its conversion to succinate, propionate is directly related to succinate levels. Thus, there is less flavor when there is restricted development of propionate in Swiss cheese because succinate is not formed. A second pathway for succinate production occurs when metabolism of aspartate to succinate occurs. We chose to supplement the succinate producing propionibacteria with a *Lactobacillus* adjunct (RL3).

Table 1

Desirable Swiss Flavors	
Sweet, Nutty	Furanones and α dicarbonyl reaction flavor compounds
Full, Brothy (Nutty)	Succinate, glutamate
"Swissy" (Fruity / Sour)	2 methyl butyric, 3 methyl butyric, 2 methyl propionic
Generic Cheesiness	Volatile free fatty acids
Sharpness (Pungency)	Propionic, Acetic and Lactic acid

Preininger et al, Zebensm, Inter Forsch, 1996

Selecting adjuncts

We selected adjuncts based on their performance in other varieties of cheese, and on their ability to produce specific flavors. We chose *Lactobacillus helveticus* LH 32 because it is a proteolytic starter adjunct that increases the sweet, nutty flavor intensity, and also the fruity/sour intensity. A succinic acid producing *Lactobacillus* species (RL3); and Lila, an esterase positive *Lactobacillus casei* were also chosen to increase specific flavor attributes of lower fat Swiss cheese. Previously, we used LH32 to accentuate flavor development in other cheeses such as Parmesan, Gouda and Manchego. RL3 was initially isolated from aged Cheddar cheese, and was chosen because of its ability to produce high levels of succinic acid and furanones. Lila, an esterase positive adjunct, was also isolated from aged Cheddar cheese. Its ability to release moderate levels of volatile short N-chain free fatty acids has enhanced the overall cheesy flavor characteristic in other reduced fat cheeses.

Preininger et al, identified the influence of flavor compounds on Swiss cheese. (Table 1) Subsequently, we were able to introduce the succinic acid into the flavor system via bacteria. Dr. Robert Lindsay and his lab from the University of Wisconsin were able to isolate a strain of *lactobacillus* from Cheddar cheese, the RL3, which produced high levels of succinic acid.

Manufacturing schedule

Our manufacturing schedule was based on previous trials that had given us good eye formation, included pre-acidifying the milk with acetic acid (using a ratio of 1:4 of acetic acid:water). Adjuncts were added either as a single culture, or in combination. A whey dilution step was included, and the cooking temperature was limited to 38˚C. Cheeses were hooped, pressed, brined, pre-cooled for 10 days, then placed in a 22˚C warm room for 21 days. The cheeses were then aged in 2˚ or 7˚C incubators.

The adjuncts we used included LH32 (as a commercial frozen pellet), and RL3 and Lila strains which were grown in MRS broth overnight. The pH of the cheeses at brining was 5.19, 5.21 at 1 day, 5.87 at 4 months, and 5.94 at 6 months. The pH measurements were quite high, which we attribute to both the metabolism of the amino acids and lactic acid.

The composition of the unstandardized milk used for cheese making resulted in a C:F of 2.10. Average cheese composition at 2 months gave a moisture content of 44.5, and a fat content of 14.3. The FDM is a 25.8, which is a 40% reduction based on the minimum legal description of a full fat Swiss cheese.

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small but significant relationship between SCC (Somatic Cell Count) and NPN. Plasmin in mastitic milk can breakdown up to 20% of the ß-casein in milk prior to processing. Also, proteolytic enzymes from psychrotrophic bacteria can break down casein and increase the NPN content of milk. For this reason, PI counts on raw milk should be kept to a minimum.

Testing Procedures

Currently, most milk protein testing is done with infrared milk analyzers using Kjeldahl total N as a basis for total protein calibration. In 1991, the Assn. of Official Analytical Chemists approved a procedure for determining true protein (TP) and NPN in milk. TP could either be determined indirectly by determining total Kjeldahl protein and subtracting the NPN or precipitating the proteins with trichloroacetic acid and determining the TP content of milk directly.

True protein concentrations determined by infrared analyzers would represent an accurate measurement of the usable protein constituents of milk and would be a fairer basis for determining true value of milk constituents for both producers and processors.

Feeding

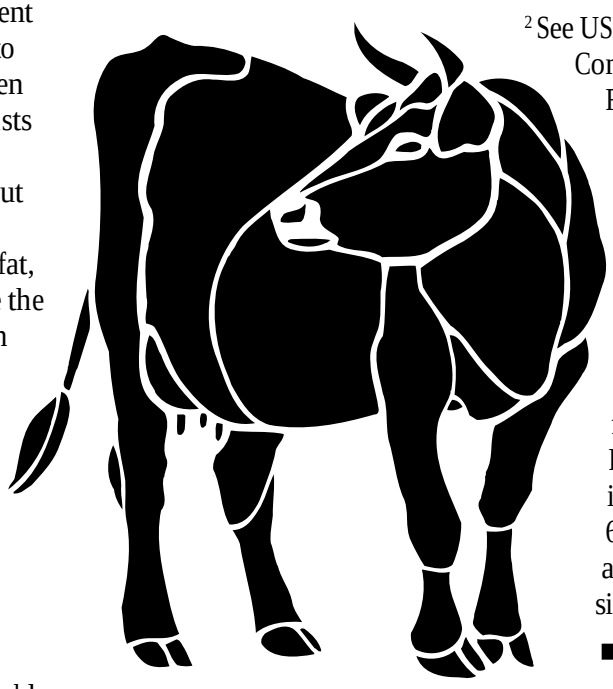
Diet affects milk composition and component yields in dairy cows. Adequate neutral detergent fiber (NDF) is needed in the ration to maintain normal cud chewing, rumen pH and 3.5% milkfat test. Nutritionists and dairy producers are constantly striving to improve milk yield without depressing the milkfat test. Since producers are paid for their yield of fat, it is extremely important to evaluate the way a diet intervention changes both milk yield and the fat test.

Diet also influences milk protein. However, the potential for diet-induced variation in milk protein test is lower than for milkfat test (.1-.3% units versus .5-1% units). Analyzing milk for true protein rather than total protein will lower protein test .1 to .2% units. This should not lower the milk price if the dollar value of protein is increased enough to compensate for the drop in protein content. However, there are differences in how diet intervention influences milk true protein versus total milk protein. Focusing on milk true protein provides a better framework for evaluating the adequacy of diet formulation, efficiency of protein utilization, and the economics of feeding programs.

Summary

The U.S. Secretary of Agriculture is in the process of federal milk marketing order reform, as required by the 1996 FAIR ACT. Out of this reform two major changes in MCP may occur. First, it will be true MCP program since the value of each component value will be determined independently from wholesale prices of dairy products. Second, testing for "true" protein will be direct rather than estimated from testing of total nitrogen in milk. Both changes will more accurately reflect the component values in milk marketed by dairy producers. These proposed changes in MCP would more accurately reward dairy producers for the value of milk marketed.

[1]Bob Cropp, Randy Shaver, and William Wendorff are Professors in the Departments of Agricultural and Applied Economics, Dairy Science, and Food Science, respectively, College of Agricultural and Life Sciences, University of Wisconsin-Madison. Each is also an extension specialist with University of Wisconsin Cooperative Extension.



[2] See USDA's Final Decision on Multiple Component Pricing for Midwest Federal Milk Marketing Orders, Marketing and Policy Briefing Paper, No 53, Department of Agricultural and Applied Economics, University of Wisconsin-Madison for details on component calculations.

[3] For details of the pricing formulas see "Federal Order Reform: The Final Rule," marketing and policy briefing paper No. 68, Department of Agricultural and Applied Economics, University of Wisconsin-Madison.

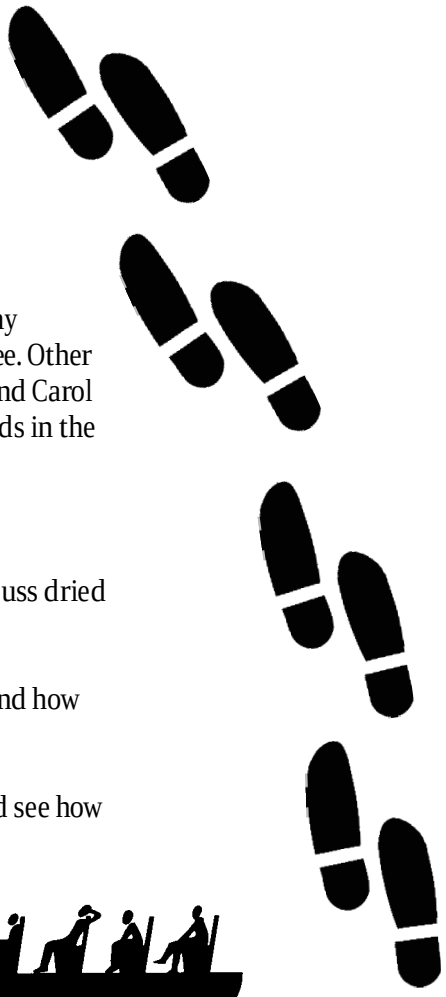
Editor's Note:
This is a condensed version of the original article. For more information, including the complete text, check the following website: **www.aae.wisc.edu/future**

News from CDR

CDR welcomes Rani Govindasamy-Lucey, who is now working with Mark Johnson and the cheese group. Rani adds some international style as well as both an interest and experience in dairy research. She comes to us from Singapore via New Zealand—while earning her Ph.D. at the National University of Singapore, Rani also did some work at Massey University in New Zealand. After graduation, she returned to New Zealand to work as a food scientist, and eventually found her way to the New Zealand Dairy Institute, where she worked on a research project focusing on bacteria and cheese making. Rani is settling into her new job, getting to know a new country and looking forward to her first Wisconsin winter.

Rani Govindasamy-Lucey, Ph.D.

Christian Westing is another new person you might meet at CDR. Christian is a student from the University of Applied Science in Hanover, Germany, and he is doing a four month internship at CDR. Christian grew up in Hilten, (Germany) where his parents have a dairy farm. Then, he spent two years in a dairy plant apprenticeship making cheese and yogurt. Christian will be working with Mark Johnson and Jim Path while at CDR. He plans to finish his education and seek a career in dairy management.



ADSA presentations

The Lower fat Swiss project, described on page 4, was originally presented by Amy Dikkeboom at the American Dairy Science Assoc. meeting in Memphis, Tennessee. Other CDR presentations included Matt Zimbric's "Newly Developed Melt Procedure" and Carol Chen's "Comparative study of milk standardization methods and initial milk solids in the manufacture of 50% reduced fat Cheddar cheese."

Tours/Visitors

USDEC sponsored group from Asia met with the whey applications group to discuss dried whey applications.

Staff from Wisconsin Department of Commerce visited CDR to see what we do and how we do it.

Wisconsin Milk Marketing Board sent their newest members over to meet us and see how we fit in the dairy world in Wisconsin.

Regulatory officials from the food and dairy section of the Turkmenistan government stopped by CDR while visiting Wisconsin.

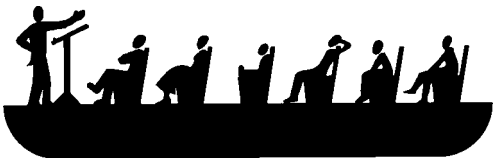


Table 2. Assessing Swiss flavor notes in experimental cheeses

Expert panelists	control, 2˚C +	LH32, 2˚C +	RL3, 2˚C -	Lila, 2˚C -
			RL3, Lila, 2˚C -	
		LH32, RL3, 2˚C +		
		LH32, RL3, Lila, 2˚C -		
			RL3, 7°C +	
		1/2 LH32, 1/2 RL3, 2˚C +		
10 Cheeses		1/2 LH32, 1/2 RL3, 7°C +		

Consumer Panelists		RL3, 2˚C -	
	LH32, RL3, Lila, 2˚C -		
	1/2 LH32, 1/2 RL3, 7°C +		
4 Cheeses	1/2 LH32, 1/2 RL3, 2°C +		

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Evaluating flavor

A small group of five to 10 expert graders evaluated flavor at 4 and 6 months to presecreen the samples and assess the quality of the cheeses, comparing them to high quality commercial samples of Swiss cheese. (See Table 2.) Four cheeses (ages ranging from four to seven months) were picked to verify consumer sensory acceptance. A cheese containing RL3 and LH32 and another one containing RL3 and LH32, ripened at 7˚C were chosen for evaluation because of their high Swiss flavor characteristics. A cheese containing only the adjunct RL3 and another one containing the combination of RL3, Lila, and LH32 were chosen to assess whether the consumer panel would accept a reduced fat Swiss that the expert panel found either slightly unclean or harsh. Both cheeses were judged to have unacceptable Swiss cheese flavor by the expert panel.

Swiss flavor notes

+ present
- absent

The expert panelists tasted 10 cheeses to assess the Swiss flavor notes in the cheeses. Four of the ten were chosen for a consumer taste panel.

The cheese which contained only RL3 was only marginally acceptable to the consumer panelists. RL3 alone does not increase the succinate to a desirable level, resulting in a cheese that lacks flavor. It does have a high level of succinic acid, but without the other flavor compounds, we don't get the desired Swiss flavor. We concluded that all flavors need to be balanced, and that you can't rely on succinic acid alone for good flavor. One of the comparison cheeses we used, an Aged Swiss, which was a high quality commercial cheese picked off the shelf, had a low succinic acid value. It was still a good cheese because the key flavor notes were all balanced.

Consumer panelists agreed with the expert panel when they noted that the experimental cheese (RL3, Lila and LH32), a less acceptable cheese, lacked Swiss flavor, was bitter, and the texture was too rubbery.

Both panels detected Swiss flavor notes in the combination of RL3 and LH32, ripened at 2˚C. Although this cheese had some flavor development, the same combination ripened at 7˚C had more. This

finding suggests that consumers will accept a lower fat Swiss cheese with appropriate Swiss flavor notes.

Combining adjuncts improves flavor

Our goal was to test the feasibility of using adjunct cultures to improve the flavor quality of lower fat Swiss cheese. A combination of two adjuncts, RL3 and LH32, resulted in a 40% reduced fat Swiss cheese with accurate, desirable full-fat like Swiss cheese flavors. We believe they worked because the short branched chain fatty acids in the LH32 imparted the nutty, sweet flavors and the Swiss notes that we were looking for. We also noticed that halving the amount of adjunct produced a better cheese. Too much LH32 imparts off flavors to the cheese, an observation that we made in previous cheese making trials.

The combinations that did not work contained the Lila strain. These cheeses did not have an acceptable level of the Swiss flavor notes that we were looking for. The Lila strain was originally added to impart an volatile short N-chain fatty acid flavor, however, that extra flavor intensity was not needed.

Our study suggests that adjunct cultures can be chosen to provide specific flavor characteristics in lower fat Swiss cheese. We are continuing to study these adjuncts and flavors; we are particularly interested in the ecology and synergism of the total lactobacillus and propionic acid bacteria population in the cheeses.

References

Crow, V. L., Turner, K. W., New Zealand J. of Dairy Sci. 21: 217-227, 1986.

Dudley, E.G., Steele, J. 1999. Production of succinate by *Lactobacillus plantarum*, *Latobacillus casei*, and *Lactobacillus rhamnosus*, abstr.0-72, pg 509. *In* Abstracts of the American Society for Microbiology 99th General Meeting, American Society for Microbiology, Washington, DC.

Preininger, M., Warmke, R., Grosch, W. Z Lebensm Unters Forsch 202:30-34, 1996.

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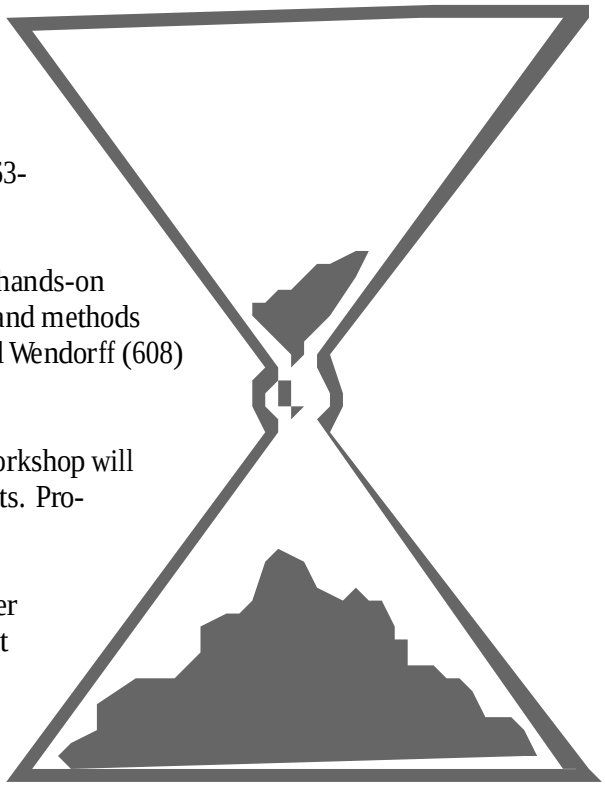

Feb. 1-2 Wisconsin Dairy Field Reps Conference. Madison, WI. Call Bill Wendorff at (608) 263-2015.

Feb. 22-23 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. 14 Wisconsin CIP Workshop, Madison, WI. This one-day hands-on workshop will cover the basics of clean-in-place (CIP) systems and methods of monitoring cleaning efficiency. Program Coordinator: Dr. Bill Wendorff (608) 263-2015.

Mar. 15 Dairy HACCP Workshop, Madison, WI. This one-day workshop will cover design and implementation of HACCP plans in dairy plants. Program coordinator: Marianne Smukowski, (608) 265-6346.

(NOTE: The CIP Workshop and Dairy HACCP Workshop together fulfill the requirements for the Master Cheesemaker Safety Short Course.)

Mar. 27-31 Wisconsin Cheese Technology Short Course. Madison, WI Program Coordinator: Dr. Bill Wendorff, (608) 263-2015.

Curd Clinic

Curd clinic doctor for this issue is Eric Johnson, Professor, Food Microbiology and Toxicology. This summer Dr. Johnson was honored by the International Association of Milk, Food and Environmental Sanitarians (IAMFES). He received the Educator Award, honoring outstanding service to the public and IAMFES. If you have questions about this article, you can reach Dr. Johnson at (608) 263-7944.

Questions for the Curd Clinic?
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Q. It seems like outbreaks of *Listeria monocytogenes* in food are becoming more common. During the most recent outbreak I read somewhere that people can be carriers of *Listeria monocytogenes*, although they show no signs of illness. Is this true? What are the implications for dairy plants?

A. *Listeria monocytogenes* has been recognized as a human pathogen for over 70 years, but the 1985 Jalisco cheese outbreak in California made it infamous within the dairy industry and established the organism as an important foodborne pathogen. Human disease caused by *L. monocytogenes* usually occurs in high-risk human groups, including pregnant women, neonates, and immunocompromised adults, but it can occasionally infect persons who have no obvious predisposing condition. The symptoms range from a mild flu-like condition to very serious complications, including abortion, meningitis, and death. The fatality rate of about 25% is tragically high compared to many other foodborne illnesses.

L. monocytogenes, a very hardy bacterium, is found in many ecological niches—soil, water, decaying vegetation (including silage), and the intestinal tracts of humans and animals. Numerous studies have documented that *L. monocytogenes* can infest the gastrointestinal tract of humans without causing listeriosis. Widely varying rates of fecal carriage have been reported (0 to 77%). Some of this variation may be attributed to differences in the populations studied, culture techniques, and specimen handling. For example, a 77% rate of fecal carriage was reported in laboratory workers who routinely handle *L. monocytogenes*, a 9.7% rate in employees from a cheese plant, 0.8% rate in 2000 healthy food handlers, and a 2.7% fecal carriage rate in healthy pregnant women. The rate of fecal carriage was higher than the average in household contacts of cheese plant employees or in household contacts of pregnant women with listeriosis. The human fecal carriage rate is generally higher in the summer months of July in August.

Since *L. monocytogenes* is commonly found throughout the environment, and is relatively resistant to many sanitization procedures, avoiding colonization of plants and product contamination presents a difficult challenge. Refrigerated food plants that produce moist, minimally processed products such as cheeses, provide ideal conditions for *L. monocytogenes* colonization and survival, often in hard-to-clean locations such as condensers, floor drains, and "nooks and

crannies"in equipment. *L. monocytogenes* has been found adhering to food-contact surfaces to form a biofilm, which creates a major sanitization challenge.

Preventing plant and product contamination is best achieved by preventing the comingling of raw milk with finished product, separation of receiving and processing areas, following good manufacturing practices (GMPs) including employee sanitation, and enacting a HACCP program. Finally, and returning to the original question of human carriers, it does not seem practical to screen and quarantine workers that are positive for *L. monocytogenes*. It seems more practical to follow the advice listed above and wash your hands, wash your hands, wash your hands!

FDA Risk Assessment

The US Food and Drug Administration (FDA), is currently conducting a risk assessment to determine the prevalence and exposure to consumers of foodborne *Listeria monocytogenes*. Although the consequences of listeriosis can be severe, it's estimated that 2-6 % of the healthy population harbor intestinal *Listeria monocytogenes* without any sign of illness. Since the documented prevalence in both people and commonly eaten foods is much higher than the incidence of listeriosis, some experts believe that eating foods with low levels of *Listeria monocytogenes* may not be a general health hazard because it doesn't cause illness.

Historically, FDA has held a zero-tolerance position—the detection of any *Listeria monocytogenes* in a 25 gram sample means the food is adulterated. The current risk assessment will analyze information regarding the epidemiology of foodborne listeriosis, the level of contamination of foods, consumption levels and corresponding health consequences. For more information about the risk assessment, contact Richard C. Whiting, Center for Food Safety and Applied Nutrition, FDA, at (202) 260-0511.

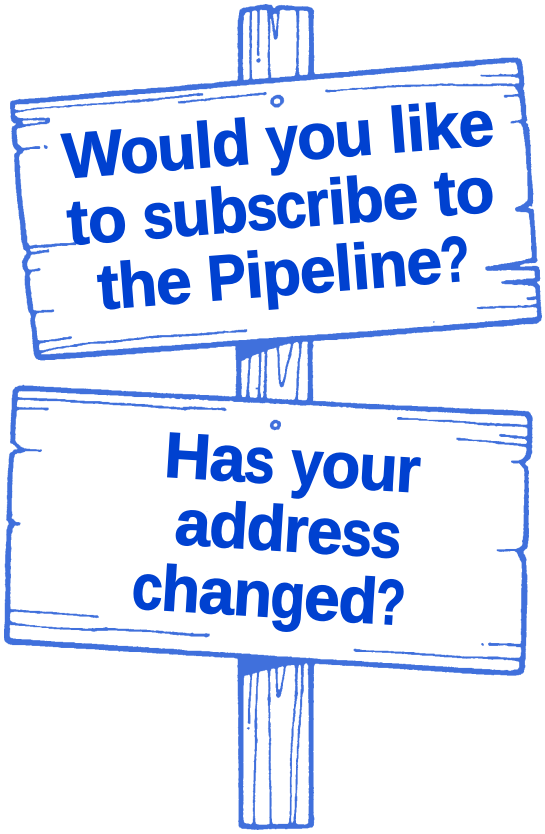
References

The Cheese Reporter, May 14, 1999

Internet resources

http://vm.cfsan.fda.gov/~mow/chap6.html

http://www.inform.umd.edu/EdRes/Topic/AgrEnv/ndd/safefood/LISTERIA_THE_ORGANISM_AND_THE_DISEASE.html



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Calendar

Oct. 13-14 North Central Cheese Industries Assn. Annual Convention. Minneapolis, MN. For information, call Dr. Dave Henning at (605) 688-5477.

October 14-15, 1999 Pasteurization Short Course for Trained Operators UW-River Falls. For info, call (715)425-3702.

Oct. 18-22 Wisconsin Cheese Technology Short Course. Madison, WI. Call Bill Wendorff at (608) 263-2015.

Oct. 28-31 IDFA Annual Convention, Chicago, IL. Sponsored by International Dairy Foods Assn., (202) 737-4332.

Nov. 4-6 Great Lakes Dairy Sheep Symposium, Brattleboro, VT. (Sponsored by UW-Madison and Univ. of Vermont) For information, call Ctr. for Sustainable Ag. at (802) 656-5459.

Nov. 9-10 Wisconsin Cheese Grading Short Course. Madison, WI. Call Bill Wendorff at (608) 263-2015.

Jan. 3-6 Milk Pasteurization and Process Control School. Madison, WI. Call Bob Bradley at (608) 263-2007 for information, or the CALS Outreach Services (608) 263-1672 to register.

Jan. 17-21 Ice Cream Makers Short Course. Madison, WI. Call Bob Bradley at (608) 263-2007 for information, or the CALS Conference Office (608) 263-1672 to register.

Jan. 24-25 Ice Cream Retailing Workshop, Madison, WI. Call Bob Bradley at (608) 263-2007 for information, or the CALS Conference Office (608) 263-1672 to register.

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CDR DAIRY PIPELINE

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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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