DAIRY PIPELINE

CDR

Winter 1997 Vol. 9 No. 1 A Technical Resource for Dairy Manufacturers

Wisconsin
Center for Dairy Research

Reducing Phosphorus in Dairy Wastes By Recycling Burst Rinses

reprinted from Dairy, Food, and Environmental Sanitation, Vol 17, No. 2

William L. Wendorff, Sarah J. Westphal and Jenny C.Y. Yau
Department of Food Science
University of Wisconsin-Madison

Summary

Burst rinses, the first, brief rinse of the interior surfaces of bulk milk tankers, processing tanks and sections of transfer pipes were analyzed for milk solids and total phosphorus. The amount of milk recovered in the burst rinses of bulk tankers ranged from 5.84 to 36.69 kg per tanker. Approximately 6-34g of phosphorus per tanker was recovered in the burst rinses. Recovery of milk products in burst rinses was proportional to the viscosity of the product. However, phosphorus recovery was not proportional to viscosity of the product. With conservation of burst rinses from milk tanks and pipelines, milk product losses were reduced by 55-70% and phosphorus discharges reduced by 57-80%.

Introduction

Because milk is a very rich source of phosphorus, dairy plants processing milk and milk products discharge high levels of phosphorus in wastewater from their processing operations. Whole milk contains an average of 93 mg of phosphorus per 100g of milk (10), which equals about 1000 mg of phosphorus per liter of milk. Phosphorus levels in other fluid milk products are very similar to that of whole milk (5). Whey contains from 339 to 766 mg of phosphorus per liter (12).

Recent environmental regulations (13) have established a phosphorus limit of 1.0 mg/L on effluent discharges to surface waters. Dairy plants are experiencing serious problems in meeting these new effluent limits. Harper et al. (5) reported a range of 11 to 160 mg of phosphorus per liter of wastewater from a variety of dairy plants. Cocci et al. (2) reported a phosphorus concentration of 139 mg/L in the effluent from a multiproduct dairy plant in Maryland. Marshall (8) reported phosphorus concentrations in wastewater ranging from 12 to 56 mg/L for butter/powder plants and 17 to 280 mg/L for Cheddar cheese plants. Currently in Wisconsin, fluid milk plants are discharging phosphorus concentrations of 10-40 mg/L and cheese plants 25-80 mg/L in their waste influents to waste treatment plants (11).

Since the cost of phosphorus removal from dairy plant wastewater is significantly higher per unit than biochemical oxygen demand (BOD) or total suspended solids (TSS) (1), a concentrated effort must be made to reduce milk losses going to the sewers. For each 9 kg of milk lost to the sewer, there is 9 g of phosphorus in the wastewater from that milk. Several researchers (3,6,7,11) have reported on various methods of reducing milk losses in dairy plants. One of the waste minimization steps recommended involves saving the initial, or burst rinse, from processing equipment and including it in processed products. Harper and Carawan (6) reported that a well managed dairy plant using burst rinses this way could reduce the BOD of the waste influent by 2 kg per 1000 kg of milk processed.

Information on phosphorus reduction in dairy wastewater through waste minimization is very limited. The purpose of this study was to determine how recycling burst rinses from dairy equipment reduces phosphorus level in wastes from dairy plants.

continued on page 2

What's Inside:

Raw Milk Intake Samples

Twenty bulk tank trucks were unloaded in the usual manner at the intake of a major dairy cooperative. The tanks were allowed to drain for 1 min after the load was pumped off. Then 68 l of potable water was atomized into the tanker through the spray ball located in the manhole lid. Accumulated liquid from the burst rinse was collected and a representative sample of 500 ml was taken for analysis. Burst rinses were collected at the intake from 8:30 a.m. to 1:00 p.m. Burst rinse samples were stored on ice immediately after collection and were transported to the laboratory in Madison under refrigerated storage. Samples were maintained in frozen storage at -18°C until analyzed.

Process Tank Samples

Burst rinse samples were recovered from a 1135 l stainless steel processing tank in the University of Wisconsin Dairy Plant. Five replicates each were obtained for whole milk, skim milk, 1% chocolate drink, 18% cream and ice cream mix. For each sample, the product was pumped from the tank, allowed to drain for 1 min, and the tank was then sprayed with 38 l of potable water. The burst rinse was collected and a representative sample taken for analysis. Samples were frozen immediately after collection and maintained in frozen storage until analyzed.

Laboratory Samples

A series of five 26 cm sections of 3.5 cm diam. stainless steel pipes was fitted with neoprene stoppers and polypropylene/teflon stopcocks on the bottom end. The pipes were filled with 230 ml of milk or milk product and held at 7°C for 1 h. The pipes were then emptied and allowed to drain for 1 min. A spray bottle was used to deliver 10 ml of distilled water as a burst rinse. The burst rinse was allowed to drain for 1 min and then saved for analysis. Twenty-five milliliters of a 1% solution of chlorinated alkaline cleaner (Monarch 1313SD, H.B. Fuller Co., Minneapolis, MN) at 65°C was added to the pipes. The pipes were capped and agitated for 30 sec. Wash solution was allowed to drain for 1 min and saved for analysis. Pipes were rinsed with 10 ml of distilled water and allowed to drain for 1 min. Studies included trials with whole milk, skim milk, chocolate drink, half and half, heavy whipping cream and ice cream mix.

Initial product, burst rinses, wash solutions and final rinses were analyzed for chemical oxygen demand (COD) and total phosphorus as outlined in *Standard Methods for the Examination of Water and Wastewater* (4). Total phosphorus was determined using the sulfuric acid-nitric acid digestion procedure and the ascorbic acid colorimetric method. Initial products and burst

Using recovered milk solids

When you use both potable water and good manufacturing practices, milk solids can be reblended and standardized with milk for manufactured dairy products. Recovered milk solids in burst rinses should be reblended prior to pasteurization to ensure safe product. You may need additional milk solids in the form of condensed skim or nonfat dry milk to ensure compliance with compositional standards for the product you are producing. Burst rinses cannot be blended back into raw milk for Class I products.

Burst rinse: A burst rinse is a fine spray of water through a spray nozzle or spray ball for a very short duration. The intent is to flush as much product from the tank wall or contact surface with the smallest amount of water possible.

Table 1. Total phosphorus and milk recovered in burst rinses from bulk tankers.[1]

Truck No.	Capacity of tanker (kg)	Milk recovered per load (kg)	Total phosphorus recovered per load (g)
T1	18,200	6.66	6.46
T2	17,700	6.43	6.24
T3	20,450	8.37	8.12
T4	13,650	8.12	7.87
T5	22,050	7.67	7.44
T6	15,450	12.89	12.50
T7	20,300	9.10	8.83
T8	22,500	21.35	20.70
T9	19,500	5.84	5.66
T10	19,100	6.88	6.67
T11	15,700	8.37	8.12
T12	20,150	8.76	8.50
T13	21,600	8.23	7.98
T14	20,450	23.17	22.47
T15	22,950	20.12	19.51
T16	13,900	36.69	34.69
T17	19,550	17.73	17.20
T18	22,750	18.34	17.78
T19	20,450	10.20	9.89
T20	19,200	12.70	12.29

rinses were analyzed for total solids using the vacuum oven procedure, as described *in Standard Methods for the Examination of Dairy Products* (9). Analyses were conducted in duplicate. Milk and milk product losses in wash solutions and final rinses were determined using COD values of the washes and rinses and subtracting COD values of the alkaline cleaner blank.

Results And Discussion

The amount of milk and total phosphorus recovered in burst rinses from bulk tankers at the raw milk intake is shown in Table 1. Bulk tankers ranged in size from a capacity of 13,650 to 22,950 kg. The average amount of milk recovered in burst rinses was 12.59 kg per load. Milk recoveries in the burst rinse increased during the latter part of the receiving day as haulers became more rushed to unload the tanker and get on the road for their second pickups. The average amount of total phosphorus recovered in the burst rinses was 13.25 g per load. With more than 60 tankers per day unloading at the intake, this plant was discharging over 750 liters of milk containing over 0.8 kg of phosphorus which could have been recovered by recycling burst rinses.

The recovery of milk and total phosphorus in burst rinses from the dairy plant processing tank is shown in Table 2. The recovery of milk products in burst rinses was proportional to the viscosity of the milk product processed, skim milk having the lowest viscosity and ice cream mix the highest. Burst rinses from the processing tank contained larger amounts of milk than those from the tankers at intake. Samples from the processing tank averaged 7.56 g of milk/100 cm^2 of surface area for whole milk, while burst rinses from the tankers averaged 2.94 g of milk/100 cm^2. The higher retention of milk in the process tank was most likely due to the flat surface in the bottom of the tank and the longer length of discharge pipe on the process tank.

The amount of phosphorus recovered in the burst rinses was not proportional to the viscosity of the milk products (Table 2) because the viscous higher fat products do not contain as much phosphorus (Table 3).

It was difficult to obtain representative samples during the cleaning cycle from clean-in-place (CIP) systems because the intake and processing tank were difficult to isolate. So, we conducted a series of trials with the stainless steel pipe sections to determine the efficiency of phosphorus reduction with conservation of burst rinses. Composition of the milk products used in the trial are given in Table 3. Milk recovery in the burst rinse from stainless pipe sections was lower than that observed for the tankers or the processing tank (Table 4). The average burst rinse concentration of 0.77 g/100 cm^2 for whole milk was lower because of more complete drainage of product from the pipe sections prior to cleaning. Vertical tanks or pipes provide a more complete drainage of product than horizontal tanks or pipes. Ice cream mix exhibited the greatest product loss in the

next page

Table 2. Total phosphorus and milk product recovered in burst rinses from 1135-liter processing tank.[1]

Milk product	Milk product recovered (kg)	Total phosphorus recovered (g)
Whole milk	4.33	4.19
Skimmilk	3.05	3.13
1% Chocolate milk	3.59	3.67
18% Cream	4.72	3.84
Ice cream mix	6.99	3.62

[1] Means of five replicates for each milk product.

Table 3. Total phosphorus, COD and total solids of milk and milk products.[1]

Product	Total solids (g/100 ml)	COD (mg/L)	Total phosphorus (mg/L)
Whole milk	12.1	147,000	995
Skimmilk	8.9	121,400	1035
1% Chocolate milk	15.8	127,600	1080
Half & half	23.1	223,900	970
Heavy whipping cream	40.9	373,100	620
Ice cream mix	40.6	266,700	570

[1] Means of duplicate determinations.

Table 4. Milk product recovered in burst rinses from stainless steel pipe sections.[1]

Product	Product loss in cleaning[2] (g)	Product in burst rinse (g)	Reduction in product loss (%)
Whole milk	3.00	2.10	70.1
Skim milk	2.50	1.87	74.8
1% Chocolate milk	3.97	2.49	62.7
Half & half	2.14	0.90	59.3
Heavy whipping cream	1.52	1.03	67.5
Ice cream mix	5.65	3.15	55.6

[1] Means of five replicates for each milk product.
[2] Includes burst rinse, alkaline wash and final rinse.

cleaning process. By recycling burst rinses from the pipe sections, 55-70% of product losses could be recovered for further use.

Without saving burst rinses, phosphorus concentrations in spent cleaning solutions ranged from 13.6 mg/L for heavy whipping cream to 64.0 mg/L for 1% chocolate milk. Phosphorus concentrations of burst rinses were highest for 1% chocolate milk and lowest for heavy whipping cream (Table 5). Recycling burst rinses would have reduced phosphorus in waste discharges by 57 to 81%.

Table 5. Total phosphorus (P) recovered in burst rinses from stainless steel pipe sections.[1]

Product	Total P loss in cleaning[2] (mg)	Total P in burst rinse (mg)	Reduction in Total P loss (%)
Whole milk	2.89	2.00	69.3
Skim milk	2.50	1.92	76.9
1% Chocolate milk	4.06	2.53	62.5
Half & half	2.02	1.16	57.7
Heavy whipping cream	0.98	0.72	73.3
Ice cream mix	2.92	2.39	81.8

[1] Means of five replicates for each milk product.
[2] Includes burst rinse, alkaline wash and final rinse.

Phosphorus losses from milk handled in the three types of equipment were proportional to the size of the equipment and surface area. Phosphorus losses from milk would be much greater in pipelines than in large storage tanks in where only a small volume of milk would have contact with the tank surface.

Conclusion

With increased restriction on phosphorus in wastewater effluents from dairy plants, a greater emphasis must be placed on reducing product losses in the plant. By saving burst rinses of tanks and pipelines, milk product losses can be reduced by 55-70% and phosphorus discharges reduced by 57-80%. With good product management and recycling burst rinses, dairy plants should be able to meet new phosphorus discharge limits, significantly reducing the cost of waste treatment and improving plant efficiencies.

Acknowledgments

The authors express their appreciation to the dairy plants and personnel who assisted in application of burst rinses in the tanker and processing tank studies. This research was supported in part by the College of Agriculture and Life Sciences.

References

1.Berg, G.J. 1993. Methods for reducing phosphorus in wastewater treatment systems. Pages 109-114 in Proc. 1993 Center for Dairy Research Cheese Res. Technol. Conf., Madison, WI. Wisconsin Ctr. Dairy Res., Madison.

2. Cocci, A.A., B.F. Burke, R.C. Landine and D.L. Blickenstaff. 1991. Anaerobic-aerobic pretreatment of a dairy waste. A case history. Dairy, Food & Environ. Sanitation 11: 505-509.

3. Fijalkowski, E., and J. Piotrowski. 1978. Studies on the effect of the reduction of milk and milk product wastage on the pollution load of dairy effluent. Int. Dairy Federation Bull., Doc. 104: 45-52.

4. Greenberg, A.R., L.S. Clesceri, and A.D. Eaton (ed.). 1992. Standard methods for the examination of water and wastewater, 18th ed. Amer. Public Health Assoc., Washington, DC.

5. Harper, W.J., J.L. Blaisdell and J. Groskopf. 1971. Proc. Second National Symp. on Food Processing Wastes. Water Pollution Control Res. Series 12060, Doc. No. EP 1.16: 12060.

6. Harper, W.J., and R.E. Carawan. 1978. Approaches to minimizing water usage and wastes in dairy plants. Int. Dairy Federation Bull., Doc. 104: 53-56.

7. Harper, W.J., R.A.M. Delaney, I.A. Igbeka, M.E. Parkin, W.E. Schiffermiller, T.E. Ross, and R.A. Williams. 1985. Strategies for water and waste reduction in dairy food plants. EPA/600/2-85/076. Washington, DC.

8. Marshall, K.R. 1978. The characteristics of effluents from New Zealand dairy factories. Int. Dairy Fed. Bull., Doc. 104: 123-126.

9. Marshall, R.T. (ed.) 1992. Standard methods for examination of dairy products, 16th ed. Amer. Public Health Assoc., Washington, DC.

10. U.S. Dept. of Agric. 1976. Composition of foods, dairy and egg products. USDA Handbook 8.1. U.S. Govt. Printing Office, Washington, DC.

11. Wendorff, W.L. 1995. Managing chloride and phosphorus by minimizing waste. UW Dairy Pipeline 7(4): 1-4. Wisconsin Ctr. Dairy Res., Madison, WI.

12. Wendorff, W.L., and S. Matzke. 1993. Phosphorus in major varieties of whey produced in Wisconsin. Dairy, Food & Environ. Sanitation 13: 166-167.

13. Wis. Dept. of Nat. Resources. 1992. Chapter NR 217: Effluent stds and limitations. WI Admin. Code. Register, Nov.1992, #443.

A Look at Labeling

by Mary Thompson, Outreach Specialist, CDR

The nutrition facts information panel has been required on food labels since 1994. Information on food labels can help consumers make wise food choices, and consumer polls suggest that food packages are a source of nutrition information. Surveys indicate that consumers use the information when they are choosing between products or buying a product for the first time. In addition, consumers compare the weight and content information on labels to get the best value for food dollars. Also, a quick look at the ingredient list identifies ingredients that people with food allergies, and other health concerns, need to avoid.

In general, the label of a prepackaged food product sold at retail must include:

- ♦ name of the product
- ♦ list of ingredients in descending order of predominance by weight
- ♦ net weight or volume statement
- ♦ name, address, and zip of manufacturer, packer, or distributor
- ♦ the nutrition information panel, unless specifically exempt

Do you need the nutrition panel?

The fact that consumers like the nutrition facts panel so much is probably a good reason to have one on your package. However, not all products require the panel. For example, delicatessens, bakeries, or farmer's markets often sell foods that are not prepackaged. A label is not required when these foods are portioned and packaged for a specific customer request.

In addition, very small food businesses, including manufacturers, packers, and distributors are exempt from nutrition facts labeling. This is true as long as no nutrition or health claims are made, they have less than the equivalent of 10 full-time employees and sell less than 10,000 consumer packages of the specific food item. This automatic exemption is called the "very small business exemption."

If your business grows and you hire more employees or sell more than 10,000 consumer packages, you may still qualify for a "small business" exemption – but you need to apply for it annually. You qualify for this exemption if you employ between 11 and 100 full-time employees and you sell less than 100,000 consumer units of a specific item.

Other items exempt from the nutrition facts labeling include food served for immediate consumption, and bulk foods shipped for further processing or packaging before retail sale. However, remember that any food label making a nutrition or health claim has to provide nutrition facts labeling. Examples of nutrient claims include "low sodium," "reduced calories," and "fat free." Health claims, for example, are comments that link calcium with preventing osteoporosis.

Common mistakes

Some common labeling mistakes that cheesemakers have made in the past include:

Listing all ingredients. If you add ingredients to your cheese, like walnuts or jalapeno peppers, then you need to add it to the list of ingredients, too. This allows consumers to make informed decisions, particularly important for people with life threatening food allergies. A complete ingredient list protects you.

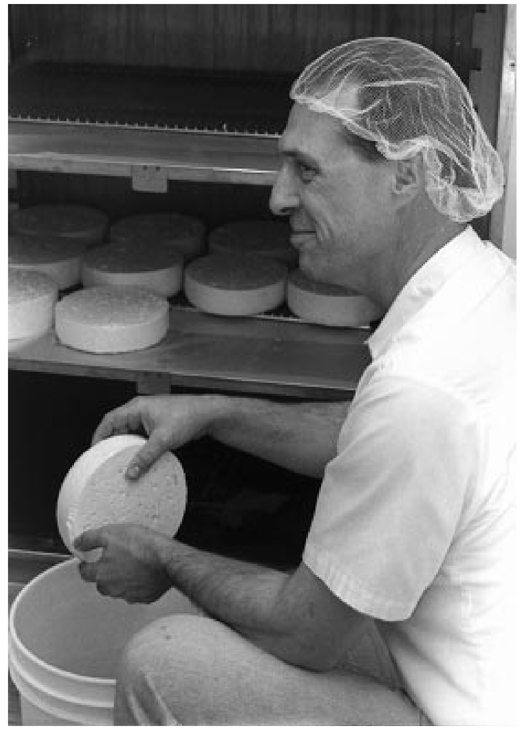
Forgetting to include the common household measure. The first text line on the nutrition facts panel is serving size, which should be provided in a "household measure term" like cups, tablespoons, one package (for single serving containers), followed by the metric equivalent in grams. For cheese, a common household measure for serving size is one ounce, or a one inch cube.

Splitting labels. Like all the nuances of the nutrition facts panel, splitting the label to place it on your product involves following the rules. Consult the experts and do it right.

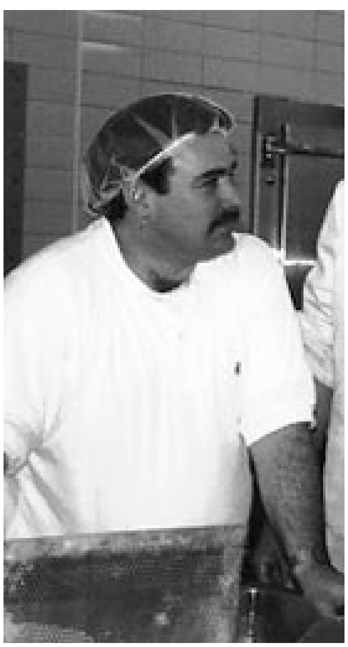
The nutrition and labeling experts can be found at the Dairy Council of Wisconsin. Call Emerita Alcantara at (630)655-8866.
Or write:
Dairy Council of Wisconsin
999 Oakmont Plaza Dr. Suite 510
Westmont, IL 60559

Wisconsin’s Very First Master Cheese Makers℠

It’s a disheartening reality that Wisconsin has slowly been losing a unique segment of our state culture— the smaller cheese plants and cheese makers who run them. Since1950, the number of Wisconsin cheese plants has decreased from over 1200 to around 150 in 1997. However, there is an economically viable niche opening up for small cheese plants—the specialty cheese market. The size of a plant is an advantage in this specialty market, particularly here, since Wisconsin’s small cheese plants have the flexibility to experiment and increase production slowly.



CDR, along with the Wisconsin Milk Marketing Board, and UW-Extension, has developed the Wisconsin Master Cheese Maker℠ program to capitalize on Wisconsin’s unique heritage as a leader in cheese technology and quality cheese making. Four cheese makers have now completed the formal sequence of courses, they are the first graduates of the program to earn the title of Wisconsin Master Cheese Maker℠. A recognition ceremony will take place at the Wisconsin Cheese Industry Conference in Green Bay on April 3, 1997. (See schedule on pages 8 and 9).



Randy Krahenbuhl

(left)
Randy started making cheese 22 years ago, at Washington Cheese in Monticello, Wisconsin. Since 1995 Randy has made Swiss and other eyed cheeses at Prima Kase in Monroe, Wisconsin. He will be a Master Cheese Maker℠ of Swiss and Gouda cheese.

Thomas Jenny

(pictured above)
Like many program participants, Tom’s cheesemaking skills developed over many years. He has worked at Old Wisconsin Cheese for 31 years, and made cheese for 25 years. He makes Swiss, brick, Colby and Cheddar and is graduating as a Master Cheese Maker℠ of Swiss cheese.

Terry Lensmire

Terry’s working life in cheese plants started when he was still in grade school, he has been making a variety of cheeses for 27 years. Terry makes Cheddar, Monterey Jack, and low fat cheese at Land O’ Lakes for the last 6 years. He will be a Master Cheese Maker℠ of Cheddar and Monterey Jack cheese.

Doug Peterson

Doug has worked for Foremost Farms in Arena for twenty years, making Colby, Monterey Jack, Cheddar, flavored jacks and pizza cheese. Doug will be a Master Cheese Maker℠ of Colby and Monterey Jack cheeses.

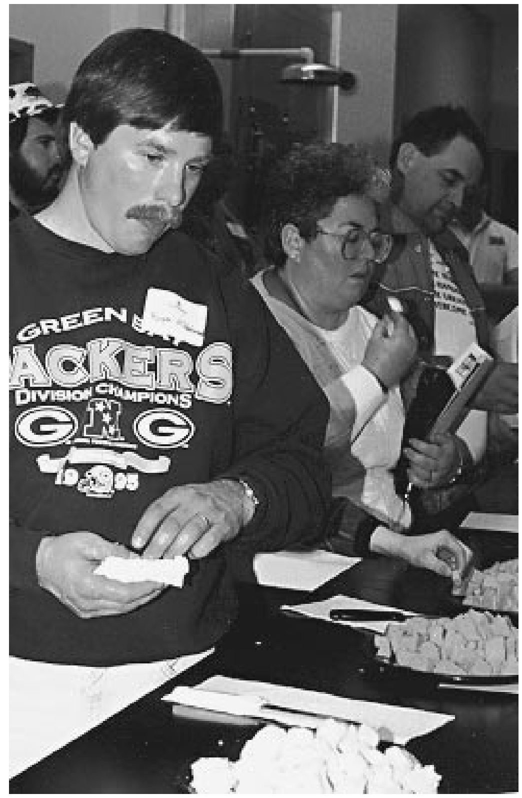
News from CDR

Mary Thompson is the latest addition to the CDR staff. Mary's background includes writing, nutrition education, and labeling regulation, which augment her role at CDR. Her new niche, Outreach Specialist, runs the gamut from organizing CDR's efforts at trade shows, setting up workshops, seeking out scientists for the Visiting Scientist program, and continuing to revise and expand CDR's technology transfer programs.

Around two hundred members of Foremost Farms Cooperative took time out from their annual meeting to tour the facilities at CDR and learn about our research and applications programs. During the course of the tour, our guests tasted CDR's pizza cheese, sampled some specialty cheeses (see photo), learned about the safety and quality program, and viewed the milkfat fractionation pilot plant. We enjoyed the opportunity to meet the individuals who help us pay our bills.

CDR now has an Applications Lab! Underused laboratory space was recently refurbished into a large, spacious kitchen. Funded by the Milkfat Consortium, the new applications lab will allow Kerry Kaylegian's group to start testing milkfat fractions in baked goods, candies, and other foods.

In the last issue of the Pipeline we printed an incorrect e-mail address for Carol Chen, the correct address is: cchen@cdr.wisc.edu



Foremost Farms members sampling specialty cheeses.

The Pride of Poland

Interested in specialty cheeses? The next CDR Specialty Cheese Artisan Workshop, "The Pride of Poland, Cheeses from a Proud Country" takes place April 22-24. Aleksander Surazynki and Janusz Turowski, from the Institute of Dairy Technology in Olsztyn, Poland will be traveling to Madison to present this workshop. Call Jim Path with questions at (608) 262-2253, or CALS Outreach Service to register, (608) 263-2988.

Photo by Jim Path

Aleksander Surazynki,far left, working with students at the Institute of Dairy Technology in Poland. He will teach at the next CDR Artisan workshop.

Wisconsin Cheese Industry Conference

Regency Suites Conference Center, Green Bay, Wisconsin
April 2-3, 1997

Wednesday, April 2 10:00 a.m. to noon

Managing for Cheese Safety/Quality
CDR and Wisconsin Cheese Makers

Business impacts of HACCP
Rob Byrne, IDFA
John Kvenberg, FDA

FDA/Alto Dairy Pilot Program
Dean Sommer, Alto Dairy Coop

HACCP Verification in Cheese Plants
Steve Ingham, UW-Madison

CDR Safety and Quality Application Program
Marianne Smukowski, CDR

1:00 to 4:30 p.m. Tabletop Mini-Expo
5:00 to 7:00 p.m. United States Championship Cheese Contest Auction and Reception

Thursday, April 3
8:30 a.m. to 10:00 a.m. Concurrent Seminars

Brine Quality/Cheese Defects
presented by CDR

Randy Sakuma, Cargill Salt, moderator

Salt and Brine Management
Bill Wendorff, UW–Madison

Preventing Bacterial Contamination
Eric Johnson, UW Food Research Institute

Impact of Brine Quality and Salting on Potential Flavor Defects
Robert Lindsay, UW–Madison

Managing for Crisis
presented by Wisconsin Cheese Makers

Richard Wagner, Weyawega Milk Products
Joanne Tremulis, Burston Marsteller

10:30 a.m. to Noon Concurrent Seminars

Cheese Flavor
presented by CDR

Influence of Fat on Cheese Flavor
Robert Lindsay, UW–Madison

Development of Cheese Flavor through Starter Adjuncts
Jim Steele, UW–Madison

Influence of Milk Pasteurization and Non-starter Microorganisms on Ripening and Sensory Properties of Cheese: European, French Experiences
Remy Grappin, INRA (France)

Rebuilding a Basic Formula Price
presented by Wisconsin Cheese Makers

Michael Dunn, USDA
Ron Knutson, Texas A &M
Kevin Hintzman, Nat. Ag Statistics Service
Jim Hahn, Federal Order 30
Mike Brown, National All-Jersey, Inc.

1:30 p.m. to 3:00 p.m. Concurrent Seminars

Cheese Quality Considerations presented by CDR

Improved Shredded Cheese Quality
Joe Marcy, Virginia Tech

Undesirable Gas Formation in Cheese
Mark Johnson, UW–Madison

Control of Pinking in Cheese
Bill Wendorff, UW–Madison

Futures Markets and Forward Contracting for Milk presented by Wisconsin Cheese Makers

Robert Cropp, UW–Madison
Carl Babler, First Capital Ag Inc.
Don Desjarlais, Alto Dairy Coop

3:30 p.m. to 4:30 p.m. Concurrent Seminars

Cheese Functionality presented by CDR

CDR Cheese Applications Program
Carol Chen, CDR

Melt Characteristics of Cheese
S. Gunasekaran, UW–Madison

Dairy Leadership Perspectives presented by Wisconsin Cheesemakers

Moderator, Jerry Dryer
Panelists:
Larry Salathe, USDA
Bill Blakeslee, Mid-America Dairymen
Paul Christ, Land O' Lakes, Inc.

5:30 p.m. to 6:30 p.m. United States Champions Reception

6:30 p.m. to 8:30 p.m. Awards Banquet, including Wisconsin Master Cheese Maker^{SM} recognition

For registration information contact Wisconsin Cheese Makers Association
P. O. Box 2133
Madison, WI 53701
(608) 255-2027

Curd Clinic

Q. I attended a CDR seminar in October that focused on "Producing Safe Dairy Foods." In the afternoon, Dennis Heiden discussed food processing sanitation guidelines. During his lecture he mentioned that quaternary ammonium compounds (QAC) are commonly used for preventing the growth of Listeria in drains. Why are quats used in drains, I thought iodophors were more effective?

A. Ironically, it is one of the disadvantages of quaternary ammonium compounds, or quats, that explains their usefulness. Quats tend to form films, and it is this residue that makes them particularly effective in drains. Conversely, quat's residual effect also means that you won't want quat anywhere near your starter vats because the film will interfere with starter growth.

When you clean surfaces, and then sanitize with quat, the residual quat layer dries. The next time moisture comes in contact with this surface film it reactivates the sanitizer. This gives you one more tool to prevent potential problems and to control your bacteria problems.

Some concerns have been raised regarding quats' limited efficacy against gram negative organisms, bacteriophage, spores and viruses. Questions have also been asked about quats' low tolerance for hard water.

The concerns have lessened since the development of the "fourth generation" of quats. These are blends of dialkyl quats and the first generation ADBAC quats (or alkyldimethyl benzyl ammonium chlorides) and they exhibit the highest biocidal efficacy of all quaternary compounds. In addition, this performance advantage is especially evident in hard water and organic soil load conditions.

Recently, fourth generation benzyl ammonium chlorides were tested in our lab against well known pathogenic gram negative strains, including *Esherichia coli* 0157: H7, *Salmonella typhi,* and *Listeria monocytogenes.* These compounds eliminate 99.99% of the harmful bacteria in 60 seconds.

Tests of the fourth generation benzyl ammonium chlorides in a 500 ppm water hardness and a 5% organic serum at .34 oz./gal. water (200ppm active) against:
Escherichia coli, *Listeria monocytogenes*, *Escherichia coli* 0157:H7, and *Staphylococcus aureus*.

The fourth generation quats offer another advantage over other sanitizers – you don't have to rinse when you use this generation at levels of 150 to 400 ppm. This level is at least double the level allowed for all other quaternary ammonia compounds.

Curd clinic doctor for this issue is Dennis Heiden, Anderson Chemical Company

Questions for the Curd Clinic?
Write to:
CDR, *UW Dairy Pipeline*
1605 Linden Dr.
Madison, WI 53706
FAX: 608/262-1578
e-mail: Paulus@cdr.wisc.edu

The following chart gives you a comparison of sanitizer properties:

Comparison Of Sanitizer Properties

	Benzyl ammonium chloride	Other quats	Chlorine	Iodophor
Affected by pH	No	No	Some	Yes
Corrosive to equipment	No	No	Yes	Yes
Unpleasant Odor	No	No	Yes	Yes
Skin irritant at use-dilution	No	No	Yes	Yes
Reduced surface tension	Yes	Yes	No	Yes
Can be used on items too large to immerse at twice concentration with no rinse	Yes	No	Yes	Yes
Positive deodorizing power	Yes	Yes	No	No
Organic soil tolerance (at use-dilution)	Good	Fair	Poor	Poor
Hard water tolerance	Good	Fair	Good	Good

pH: Chlorine (or more accurately hypochlorite solution) is "most active" in the pH range from about 4 to 7. "Most active" here refers to fast and efficient kill of microorganisms (i.e. 30-60 second contact time). Hypochlorite solution is still effective above pH 7 but the killing time is much longer. For example, in the 8 to 9 pH range the hypochlorite may have to be held on the surface to be sanitized for 10 or more minutes and this may be unsatisfactory. Iodophor products which deliver active iodine are most effective in the pH range of 1 to 5. Iodophors generally contain large amounts of phosphoric acid to insure pH control. QAC's are generally effective over the entire range.

Corrosivity: Both iodophor and chlorine sanitizers are corrosive to stainless steel to a degree and very corrosive to other metals; i.e., iron, steel, aluminum, etc. Jewelry metals worn by those working with these materials can also be attacked by iodophors and chlorine, but QAC's are not corrosive.

Odor: Hypochlorite solutions give off the very pungent chlorine odor. Iodophors have an acrid smell, but this is less objectionable than chlorine. QAC's do not typically cause an odor problem.

Organic Soil Tolerance: This soil type has protein residue which is not strongly attracted to QAC's. However, the proteins tend to complex with and deactivate chlorine and iodine.

Hard Water Tolerance: This factor is unimportant because most of the QAC's are effective in water of 400ppm hardness and benzyl ammonium chloride is effective in water of 800 ppm hardness. Of course, if the water hardness raises the pH, this could slow the efficacy of chlorine.

Calendar

Apr. 8-9 Whey and Whey Utilization Short Course, Madison, WI. Call Bill Wendorff at (608) 263-2015 or Jim Path at (608) 262-2253.

Apr. 22-24 Polish Cheese Artisan Course, Madison, WI. Call Jim Path at (608) 262-2253.

May 6-7 Dairy Plant Water & Waste Management Short Course, Madison, WI. Call Bill Wendorff at (608) 263-2015.

May 21-22 Applied Dairy Chemistry Short Course, Madison, WI. Call Bill Wendorff at (608) 263-2015.

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

June 22-25 American Dairy Science Association Annual Meeting, sponsored by American Dairy Science Assn. Guelph, Ontario. For more information call ADSA, (217) 356-3182.

July 17 Wisconsin Dairy Products Association Annual Butter and Cheese Grading Clinic. Wisconsin Dells, WI. For information call WDPA, (608) 836-3336.

Aug. 25-28 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.

Sept. 3-5 Producing Safe Dairy Foods. Madison, WI. Call Mary Thompson (608) 262-2217 for more details.

Sept. 25-26 Dairy, Food and Environmental Health Symposium. cosponsored by Wisconsin Association of Milk and Food Sanitarians, WI Association of Dairy Plant Field Reps, and WI Environmental Health Assn., Wisconsin Dells, WI. For more information, call Bill Wendorff at (608) 263-2015.

Oct. 6-10 Wisconsin Cheese Technology Short Course. Madison, WI. Call Bill Wendorff at (608) 263-2015.

Wisconsin CENTER FOR DAIRY RESEARCH
University of Wisconsin-Madison
1605 Linden Drive
Madison, Wisconsin 53706

Nonprofit Org.
U.S. Postage
PAID
Madison, WI
Permit No. 658

ADDRESS CORRECTION REQUESTED