UW Dairy Pipeline

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Hispanic cheeses: A promising new market for the specialty cheesemaker

by Jim Path, CDR Cheese Outreach Specialist

Just as Italian immigrants established a market for Italian cheeses in North America years ago, rapid growth of the Hispanic population in the United States is opening up a promising new market for Hispanic cheeses. And because Hispanic cheeses are generally high in moisture, these varieties could prove to be particularly profitable for dairy manufacturers.

Currently, the Hispanic population in the United States stands at 19 million people. By the year 2010, this population is projected to increase to about 30 million (1). This population increase is already being reflected by an increase in the consumption of Hispanic cheeses. In 1988, Hispanic cheese consumption was 29 million pounds and had a market growth rate of 10 percent per year (2).

Much of the growth in the Hispanic population is occurring in California, where most domestic Hispanic cheeses are currently produced. However, numerous other areas around the country also have large and rapidly growing Hispanic populations. These include large metropolitan areas such as New York City-Northern New Jersey with 2.5 million Hispanics, Chicago-Gary with 811,000, San Antonio, Texas, with 667,000, and Miami-Fort Lauderdale, Florida, with 858,000 (3).

High Yield, Profit & Risk

There are many varieties of Hispanic cheese. Some are similar to European or North American cheeses, but others are unique to Latin American. The most popular Hispanic cheeses are the hard

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What's Inside:

New CDR outreach specialist to bring applied technology to the cheesemaker's door

Before long, Jim Path hopes to know every cheesemaker in Wisconsin. A former dairy plant general manager and university researcher, Path joined the CDR staff in October as the Center's first full-time Cheese Outreach Specialist. The newly-created position is funded by WMMB to provide a better link between the CDR research program and the technical needs of dairy manufacturers. Path's role as a cheese technology consultant will take him around Wisconsin as he visits the state's dairy plants. He will also assist in developing CDR training seminars, workshops, and videotapes.

Path was a cheesemaker and later the general manager of the Farmer's Creamery in Bangor, WI, and was general manager of the Bangor-Ridgeway division of Swiss Valley Farms from 1985-1987. In 1988 he became a principal research associate with the Dairy Products Technology Center, California Polytechnic State University. While at Cal Poly, he focused on specialty cheese research and development. His research also included investigations into the use of ultrafiltered milk in cheesemaking, as well as recent work with lowfat cheeses and Cottage cheese.

Hispanic cheese, from page 1

white (Cotija) and the soft white (Queso Fresco) types (4, 5). Many other varieties, such as Panela, Ranchero, Cuajada, Asadero, Chihuahua, Manchego and Anejo, can be found in markets that serve the Hispanic population.

The high moisture content of Hispanic cheeses leads to very high yields in manufacturing. For example, one hundred pounds of 3.5 percent milk yields approximately 11.9 pounds of Queso Fresco (52 percent moisture). This is about two pounds more than would be obtained making Cheddar cheese with a moisture content of 38.5 percent. If the market price of the Queso Fresco were based on the Cheddar cheese market, this extra yield would generate more than $2 of additional profit per hundred pounds of milk.

On the negative side, the high moisture contents and high pH levels (6.2) found in Hispanic cheeses create problems of their own, particularly short shelf-life and high return rates on outdated cheese. Contaminating bacteria, including *Listeria monocytogenes* and other pathogens, are more likely to survive and grow at high pH. For example, the 1985 listeriosis outbreak in California was traced to a Hispanic-style cheese from Mexico. This underscores the importance of maintaining particularly high sanitation standards when manufacturing Hispanic cheeses.

Hispanic Cheese Research

As a researcher at the Dairy Products Technology Center (DPTC) at California Polytechnic State University in San Luis Obispo, Calif., I participated in a project that reflected California's interest in the growing Hispanic cheese market. The project, under the direction of Dr. Wayne Geilman, involved analysis and development of manufacturing procedures for Queso Fresco (6). Dr. Geilman's experience as a former employee of Quesos La Caperucita, a Hispanic cheese manufacturer in Mexico, was an invaluable resource during the project.

The first step in the project was to analyze the composition and bacterial load of various commercial Hispanic cheeses purchased from retail stores in California. Our analyses indicated that ranges for moisture, fat, salt, and pH of the samples were wide (Table 1). The pH is typically above 6, giving the cheese unique flavor and textural qualities, but allowing the growth of contaminants during shelf-life. Coliform counts were high for many of the products we analyzed. We estimated the ages of the cheeses to be from 15-40 days, based on the code dates on the packages and on studies by Bruhn, who noted that code dates on Hispanic cheeses range from 45 to 70 days (4).

Based on our analyses of commercial cheeses, the target composition for our Queso Fresco was 48-52 percent moisture, 22-24 percent fat, 1.5-2.0 percent salt, and a pH greater than 6.1. In addition, the coliform content of the cheese should be held to less than 10 per gram. The composition of Queso Fresco made using the procedure developed at DPTC is shown in Table 2. Over 10 trials, the DPTC procedure produced uniform products with

Table 1. Compositional and coliform count ranges of Hispanic cheeses purchased in California (adapted from Geilman).

Cheese Type	pH	Total Solids %	Fat %	Salt %	Coliform (log CFU/g)
Queso Fresco (19 samples)	5.26-6.47*	42.52-58.60	18.0-29.4	1.09-3.12	0.0-4.5
Panela (2 samples)	5.32-6.25	42.52-47.14	19.3-20.7	1.30-1.81	4.6-5.7
Ranchero (1 sample)	5.97	48.36	19.3	1.92	1.0
Cuajada (1 sample)	5.90	48.88	19.7	1.09	0.0
Asadero (2 samples)	5.30-5.34	51.40-58.92	18.7-28.5	1.69-1.73	1.4-3.1
Chihuahua (2 samples)	5.15-5.30	55.00-58.55	26.5-29.5	1.39-1.80	0.0-0.9
Manchego (1 sample)	5.24	58.44	29.0	1.28	0.6
Anejo (1 sample)	5.73	57.48	23.5	3.04	1.3
Cotija (3 samples)	4.72-5.02	58.62-59.27	23.3-27.3	4.70-5.38	0.0-2.0

* Mean pH for Queso Fresco was 6.05

Table 2. Composition of Queso Fresco cheeses produced at DPTC (adapted from Geilman).

Sample	pH	Total Solids%	Fat%	Salt%	Coliform (log CFU/g)
1	5.90	51.46	22.7	1.64	0.0
2	6.19	49.45	22.8	1.56	4.7
3	6.14	50.01	23.4	1.96	0.0
4	6.25	48.18	24.0	1.81	0.0
5	6.22	49.52	22.7	1.30	1.0
6	6.35	48.36	22.5	1.92	0.0
7	6.10	48.88	23.7	1.39	1.5
8	6.37	51.70	22.1	1.80	0.0
9	6.14	47.20	21.9	1.65	0.0
10	6.15	52.73	21.5	1.38	0.0
Mean	6.18	49.75	22.7	1.64	0.72

Cheese was molded in 1 Kg plastic hoops.

moisture, fat, salt, and pH within acceptable ranges. As seen in the table, even under controlled processing conditions, it was difficult to exclude coliform bacteria from the cheese.

Make Schedule for Queso Fresco

Our make procedure for Queso Fresco was based on a traditional procedure obtained from available literature (7). The traditional process is simple — whole or partially-skimmed milk is warmed to 72°-95°F, rennet is added, and a coagulum forms. The coagulum is cut, followed by gentle stirring, and the whey is removed. Salt is added to taste, and the curds are manually mixed. Mixing is often performed by meat grinders. The salted curd is then molded, packaged, and distributed.

Starter: With the DPTC make procedure (Table 3), pasteurized milk (3.5% milkfat) is heated to 88°F. Then 2.5 percent commercial *Streptococcus salivarius* ssp. *thermophilus* starter culture, grown in skim milk according to manufacturer's instructions, is added. Although traditional procedures employ little or no starter, we used the culture both to control cheese pH and to serve as a potential indicator of temperature abuse during storage. Because *S. salivarius* ssp. *thermophilus* is a high-temperature culture, cooling the curd at the proper time during acid development will fix cheese pH at the desired level of 6.1. Later, if the cheese is not refrigerated, the starter may resume growth and cheese pH may drop, giving the cheese a sour flavor and signaling the consumer that spoilage may have occurred.

Coagulation, cutting, and cooking: After ripening for 30 minutes, 3 oz. rennet is added per 1,000 pounds of milk. The coagulum is cut 45 minutes after rennet addition using 1/2-inch wire curd knives. The curds and whey are gently agitated and heated to 100°F over 20 minutes, then held for an additional 20 minutes.

Draining and cooling: After cooking, we drained whey quickly. Traditional methods allow for long drainage times, but the use of lactic starter culture in the DPTC procedure makes rapid cooling necessary to fix pH at the desired level. We cooled the curd either with cold air or through a "quick brine" procedure, which involves washing the curd in 45°F brine immediately after draining. For our laboratory-scale procedure, we put 3.5 pounds of curd in a strainer pail and dipped the pail in the cold brine. We found that a five-second exposure in saturated brine resulted in a salt content approaching the desired level of 1.5-2.0 percent. A procedure has yet to be developed to use this cooling and salting method on a commercial scale.

Salting and molding: Salting is traditionally performed by manually mixing dry salt with drained curd. During the DPTC project, we experimented with three salting methods: dry salting the curd, brine salting after molding, and the quick brine procedure described above. All three salting methods produced acceptable cheese. When dry salting, we added two pounds of salt per 100 pounds of drained curd.

Table 3. Processing procedure for fresh soft white Hispanic-style cheese (adapted from Geilman).

Step	Time(Min.)	Temp.(F)	pH	Comments
Add Starter		88	6.7	Add 2.5% active thermophilus culture.
Add Rennet	30	88	6.60	Use 90 ml per 1,000 lbs milk. Dilute calf rennet 1/40 with cold water.
Cut Curd	75	88	6.58	Use 3/8"-1/2" knife.
Start Stir	85	88		Start Heat
Predrain	105	100		Remove whey to top of curd.
Drain	125		6.40	Separate curds from whey with strainer.
Salt (three options)	130	100		
1. Quick Brine				Immerse curds in 45°F saturated salt brine until salt content is 1.5%.
2. Dry Salt				Mix 2% salt with dry curd. Curd identity can be lost.
3. Brine Salt				Soak cheese in brine after molding.
Mold				Place curd in plastic mold, or extrude. Place in 45°F refrigerator. Turn every 30 minutes for 3 turns, then let drain 6 hours.
Package				Either Cryovac bags or consumer-size draw-down vacuum packages.

Traditional salting and molding are the steps that present the greatest risk for introducing contaminates into the product. Efforts to reduce the risk resulting from grinding, hand labor, and unsanitary hoops have led manufacturers to experiment with various alternative methods of salting and molding. One such method involves using sanitary sausage stuffers to force curd into sanitized cellulose casings. Salt may be added to the curd before it enters the the stuffer and mixed during the filling process, or casings may be filled with unsalted curd and then brine salted.

Packaging and sales: The cheese is cooled overnight at 45°F prior to packaging. Vacuum packaging of the cheese is common, however high vacuum levels tend to pull moisture from the cheese. Our studies indicate that the cheese should be consumed no later than three weeks after the date of manufacture. Code dates should accurately reflect product quality; they should not be used to reduce product returns or to fool consumers. In the case of Queso Fresco, an accurate code date is the best defense against the health risks associated with this product.

References

1. U.S. Bureau of the Census, *Current Population Reports*, Series P-25, No. 995.

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Regulatory concerns

FDA labeling proposals — The time to act is now

by Emerita Alcantara, Ph.D., R.D.

By May 8, 1993 — the anticipated date proposed U.S. Food and Drug Administration food labeling regulations will go into effect — everyone from consumers to manufacturers will have a whole new way of talking about food. According to the FDA, the proposed regulations will affect more than 17,000 firms and 257,000 food labels, and will extend beyond the nutrient content label to include the entire product package.

In the meantime, however, the FDA is seeking comments and suggestions on its proposed regulations. Concerned manufacturers can work through their trade associations, or can submit comments directly to FDA. For most proposals, written comments will be accepted until February 25, 1992 — 90 days after the proposals' publication date in the Federal Register. A 60-day comment period, extending until January 27, applies to the proposal on cholesterol and percent fat-free claims.

As director of the manufacturer relations program for the Dairy Council of Wisconsin (DCW), I receive many inquiries regarding the proposed regulations. One commonly asked question concerns how various nutrient descriptors — words used to describe a product's nutritional qualities — will apply to dairy product labeling.

Briefly, only descriptors defined by the FDA will be permitted when making nutritional claims on food labels. Among the proposed definitions impacting the dairy industry are:

Lowfat — contains 3 grams or less of fat per serving and per 100 grams of food. In addition, the term "percent fat-free" may be used only in describing foods that qualify as lowfat. (Standardized foods whose names include the term "lowfat," i.e. 2% lowfat milk, may continue to use the term even if they do not meet the proposed definition.)

Reduced-fat — contains no more than half the fat of the comparison product. To avoid trivial claims, the reduction must exceed 3 grams of fat per serving.

Lite (or Light) — contains one-third fewer calories than the comparison product. If a food derives more than half of its calories from fat, this term may only be used when fat is reduced by at least 50 percent.

High - contains at least 20 percent of the recommended daily allowance of the nutrient per serving. The term "source of" may be applied to products containing 10-19 percent of the recommended daily allowance of a nutrient per serving.

A labeling issue of major importance to dairy manufacturers is whether the new regulations will allow manufacturers to label dairy products as sources of calcium for reducing the risk of osteoporosis. Dairy products are the main source of calcium in the American diet, accounting for about 76 percent of the calcium in the nation's food supply. However, while the health claim regarding calcium and osteoporosis will be allowed for foods containing at least 180 mg of calcium per serving, many products will be ineligible for this claim because they exceed disqualifying levels of fat, saturated fat, cholesterol, or sodium.

Disqualifying levels (those above which total fat, saturated fat, cholesterol, or sodium are deemed to increase the risk of a diet-related disease or health condition) are 11.5 grams of fat, 4.0 grams of saturated fat, 45 milligrams of cholesterol, and 360 milligrams of sodium per serving or per 100 grams of the product.

Using these criteria, the FDA notes that whole milk as well as most hard cheeses will be disqualified from being claimed as a calcium source for reducing the risk of osteoporosis. Skim and lowfat milk, lowfat yogurt, cultured buttermilk, and 2 percent chocolate milk are among the products that will be eligible for this claim.

An important question comes to my mind regarding the appropriateness of this approach to calcium and osteoporosis. Will the disqualifying levels, applied to individual products, further reinforce the concept that some foods are good and other foods are bad? This is a direct contradiction to the

universally accepted nutritional principle that products should be evaluated in the context of the total diet rather than in isolation.

Another common concern among cheese manufacturers involves the FDA requirement that the number of servings per container of product be shown on the label. For some foods, such as cheeses cut from large wheels into random weights, labeling the number of servings per package would be impractical. The FDA recognizes this, and is proposing an exception for random weight packages that allows the number of servings per container to be labeled as "varied," provided the nutrition information is based on a reference amount expressed in ounces.

Keep in mind that these are only proposed regulations, and that the FDA will consider your input. These are critical issues for the dairy industry, and deserve thoughtful comment.

Correspondence may be sent to:

Dockets Management Branch (HFA-305)
Food and Drug Administration, Rm. 1-23
12420 Parklawn Dr.
Rockville, MD 20857

All comments **must** include the docket numbers of relevant proposals. Call your local FDA office for assistance.

Emerita Alcantara is director of manufacturer relations for the Dairy Council of Wisconsin. DCW's manufacturer relations program provides nutritional information and technical assistance in nutrition marketing communications to dairy processors and manufacturers in Wisconsin, northern Illinois, and northwest Indiana. For more information, call (708) 655-8866.

UW Dairy Manufacturer's Conference

Wednesday, March 11, 1992
Paper Valley Hotel
Appleton, WI

9:00 a.m. **Registration** — Coffee and Rolls

9:30 a.m. **Opening Remarks** — Dr. Bill Wendorff, UW Department of Food Science

Current Issues for the Cheese Industry

Moderator: Jim Path, Cheese Outreach Specialist, Center for Dairy Research

9:35 a.m. **Heterofermentative Lactobacilli — A Real Problem for the Industry**; Dr. Mark Johnson, Center for Dairy Research

10:05 a.m. **Cleaning and Sanitizing — Some New Perspectives**; Dr. Kathy Reisterer, Monroe, WI

10:45 a.m. **Some Real Potentials in Milkfat**; Kerry Kaylegian, Center for Dairy Research

11:15 a.m. **Consumer Perceptions — How do You Handle it?** Prof. Mary Mennes, UW Department of Food Science.

Future Impacts on the Dairy Industry

Moderator: Dr. Bill Wendorff, UW Department of Food Science

1:00 p.m. **Milk Pricing and Dairy Marketing**; Dr. Ed Jesse, UW Department of Agricultural Ecomomics

1:30 p.m. **Dairy Production Systems**; Dr. Terry Smith, UW Department of Dairy Science

2:10 p.m. **Environmental Concerns**; Mike Witt, Wisconsin Department of Natural Resources

2:40 p.m. **Biotechnology**; Dr. Jim Steele; UW Department of Food Science

3:10 p.m. **Questions and Answers — Open Discussion on Above or Other Topics**

3:30 p.m. **Adjorn**

Cost for the conference is $40. To register call the CALS Conference Office at (608) 263-1672.
For program information call Dr. Bill Wendorff at (608) 263-2015.

pH Puzzle

Eleven causes of inaccurate pH measurement

by Fritz Buss, Laboratory Products Manager, Nelson-Jameson Inc.

Since becoming Laboratory Products Manager at Nelson-Jameson eight years ago, I've become particularly aware of two aspects of pH testing. First, acid development is the most critical parameter measured during the manufacturing process of cheese and other cultured dairy products. Second, pH values for given lots of product measured in different laboratories are among the most disputed of test results. For example, a recent informal survey conducted by a major cheese buyer found that split-sample test results obtained by several suppliers spanned a standard deviation exceeding 0.3 pH units.

Why do such large differences exist, and what can be done to make pH test results more accurate? It seems so simple — sticking a glass combination electrode into a piece of cheese and recording the value displayed by a digital meter — yet numerous factors can alter the test results. The following hypothetical account of a pH measurement of Cheddar cheese contains at least 11 possible sources of error. Can you find them? Read through the technician's procedures in the following example, then compare your ideas for improving the accuracy of this analysis with my list of recommendations on the next page.

Before beginning the first test of the day, a technician examined the pH meter and electrode. Our technician observed that the reference electrode chamber was half-full with fill solution, and also determined that the crystals that had formed at the bottom of the cavity were not excessive. The technician then calibrated the meter using two buffers — a pH 7 buffer in which the electrode was stored, and a pH 4 buffer kept in a closed jar at room temperature. The calibration adjustment of the meter was used to set 7, and 4 was entered using the slope control. Next the meter was placed in the absolute millivolt mode while the electrode remained in pH 4 buffer. The display indicated 145 millivolts. (errors 1-6)

Following meter calibration, our technician removed a sample of Cheddar cheese from the refrigerator, and cut a half-inch slice from one side of the block to expose a fresh surface. The electrode was gently pressed into the freshly cut sample. At first, the numbers on the meter's display changed rapidly. After about 10 seconds, the numbers continued to change, but very slowly. The new-style meter's automatic end point recognition feature locked-in the display, and the pH value was recorded. (errors 7-9)

The technician noted that the electrode tip had acquired a coating of residue from the sample. This was washed away using a squirt bottle containing deionized water. The probe was then wiped dry with a piece of tissue and returned to the pH 7 buffer for storage. (errors10-11)

The technician in this example probably used more care than most, yet there are at least 11 instances where technique could be improved. Turn to the next page to see what they are.

Dairy Products Technical Conference to focus on milk proteins, April 29-30

All evaporated milk, dry milk, and whey products manufactures, as well as those interested in processing, marketing, or utilizing these products, are encouraged to attend the 1992 Dairy Products Technical Conference, April 29-30 in Chicago. Co-sponsored by the American Dairy Products Institute and the Wisconsin Center for Dairy Research, the biennial conference will be held at the Chicago O'Hare Marriott Hotel in conjunction with the ADPI Annual Meeting.

Speakers from industry, government, and academia will provide a wide range of perspectives on a variety of issues. Among the topics to be covered are the functional properties of milk proteins, whey product processing and marketing, and new products.

For more information, call Dr. Warren Clark, Jr., ADPI executive director, at (312) 782-4888.

pH Puzzle *...continued from previous page*

Eleven recommendations for more accurate pH testing

1. Keep the reference electrode chamber filled to the fill port with electrolyte solution. This creates a slight hydrostatic pressure that helps the solution flow through the junction.

2. Any crystals in the reference component of a combination electrode can cause problems by clogging the junction. Remove crystals by flushing with warm deionized water.

3. Keep calibration buffers in separate, closed containers at room temperature, and replace them after a few days of use. Keep reserve supplies refrigerated in tightly closed bottles marked with the dates they were first opened. Once opened, buffers should be used within two months and must be discarded if any cloudiness or specks appear in the liquid.

4. After setting 4 and 7 calibration points to bracket the anticipated pH range of the cheese samples, use an intermediate buffer such as pH 5 to check the accuracy of the calibration. A displayed value that deviates more than ± .03 pH units from 5 indicates an inaccurate meter setting for the pH 4 or pH 7 buffer.

5. Before using the absolute millivolt mode of a pH meter to check electrode slope, set the meter to zero millivolts using a shorting strap or plug.

6. A responsive electrode normally has a slope of ± 50-60 millivolts per pH unit. Given a value for pH 7 buffer of zero millivolts (neutral — neither acid nor alkaline), the electrode in the example should have produced a reading of at least 150 millivolts while in the pH 4 buffer.

7. Sample and buffer temperatures should be the same. If the temperature difference between the buffers and sample is excessive (more than 5°C), recalibrate the meter using the temperature of the sample as a basis.

8. Blend cheese samples, especially those from recent production, before measuring pH. The probe will then contact the sample in a location that represents its average composition.

9. Even slow drifting of displayed pH values after 10 seconds of contact with the sample indicates a problem with the electrode. In the example, the junction of the electrode is probably clogged. While new meters with automatic endpoint recognition are convenient, they may conceal drifting by artificially creating a stable reading before the "best" value has been reached.

10. Use a fat solvent followed by an acidic solution to dissolve the film of fat, protein, and minerals that accumulates on the electrode tip when cheese and other milk products are tested. While a squirt bottle is good for removing cheese particles, it is ineffective for removing this film.

11. Avoid rubbing the glass or plastic electrode body while drying it, as this may create a static charge. Simply blotting the end of the probe with a tissue or cloth will remove droplets without affecting the electrode's sensitivity.

Fritz Buss demonstrates procedures for pH measuring and electrode maintenace in a new training videotape produced by Nelson Jameson Inc. See Dairy Resource Center *(page 10) or call CDR Videotapes at (608) 262-2217 for information.*

The Curd Clinic

Question: When I change brines, it always seems that the first few batches of cheese have a soft surface. As the brine gets older it seems to improve. What causes this problem?

Answer: Several factors in the brining process, including using a brine with an improper calcium concentration, pH, or temperature, can affect the rind characteristics of cheese.

The mineral concentration in a brine, especially calcium, should be similar to that of the cheese being placed in the brine. When using a newly-prepared brine, calcium levels are often lower in the brine than in the cheese. This causes calcium to leach from the surface of the cheese into the brine. As calcium is removed, casein at the cheese surface becomes more soluble, and the cheese rind softens. This leaching continues until the calcium concentration in the brine eventually reaches the calcium concentration in the cheese. To eliminate this problem, we recommend adding calcium chloride to new brines. Dr. Paul Kindstedt of the University of Vermont recommends adding 0.06 percent $CaCl_2$ to brines used for mozzarella cheese. For semi-hard cheeses, you may need to add more $CaCl_2$, up to about 0.3 percent. However, if too much calcium is added to the brine, the cheese will adsorb additional calcium and develop a firm, dry, horn-like rind.

Improper pH is also a common cause of rind defects when using new brines. The pH of a new brine is likely to be higher than the pH of the cheese. This causes protein on the surface of the cheese to soften and dissolve, and the cheese develops a greasy or slippery feel. We recommend adjusting the pH of new brines by adding acetic acid or lactic acid. If too much acid is added and the brine pH drops below the cheese pH, calcium ions in the cheese surface are replaced with hydrogen ions. This results in a hard rind with a short body in the cheese just beneath the rind.

Many cheesemakers add a portion of whey to their new brines as a method of adjusting brine composition. By doing so, they are adding soluble calcium and acid to the brine. However, they are also adding lactose to the brine, which is undesirable. Better control over brine composition can be maintained by adding the exact amount of calcium chloride and food-grade acid needed to match cheese composition.

For mozzarella cheese, the temperature of the cheese when it is put in the brine is another possible source of soft cheese surface. Mozzarella should be pre-cooled to ambient temperature before brining. If hot mozzarella is put into cold brine immediately after stretching and molding, salt will rapidly diffuse into the cheese surface while moisture is rapidly removed. After the cheese is pulled from the brine, the high salt concentration at the cheese surface will draw moisture from the cheese interior, producing a cheese with a soft surface and a drier interior.

In addition, regularly adding hot cheese to the brine will warm the brine. Warm brine will keep the cheese warm and give non-starter bacteria in the cheese interior a better opportunity to grow.

Curd Clinic Doctor for this issue is Dr. Bill Wendorff, Assistant Professor of Food Science and UW Extension dairy manufacturing specialist.

Please send your questions to:
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UW Dairy Pipeline
1605 Linden Dr.
Madison, WI 53706
FAX: 608/262-1578

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Dairy Resource Center

New selections from the CDR Videotape Library:

Determining pH During Cheesemaking: Step-by-step Instructions. An revised version of the earlier tape of the same name. Fritz Buss, laboratory products manager with Nelson Jameson Inc., demonstrates recommended calibration, cleaning, and maintenance procedures for both gold- and glass-electrode pH meters. Produced by Nelson-Jameson Inc., the tape is available through CDR. Call for availability. ($15)

Making Quality Reduced-fat Cheddar: A CDR Research Update. A two-tape (3.5 hr.) set, recorded at the November 1991 CDR Reduced-fat Cheddar Seminar. Topics discussed include marketing, flavor quality, economics, and recommended make procedures for reduced-fat Cheddar cheese. Featuring CDR Senior Scientist Mark Johnson, CDR Researcher Carol Chen, UW Food Science Professor Robert Lindsay, and WMMB Manager of Education and Training Regi Hise. ($30)

Numerous other educational and training videotapes are available from CDR. To order, or for more information, call CDR Videotapes at (608) 262-2217.

UW dairy research projects: Dairy foods safety and nutrition

Numerous dairy-related research projects are underway at UW-Madison. The following are only those concerning the safety and nutritional qualities of dairy foods.

1. Identification of environmental sources of *Listeria monocytogenes* in dairy product manufacturing plants and development of HAACP programs designed to prevent *Listeria* contamination of dairy products. Dr. Eric Johnson, Food Research Institute (WMMB) 7/89-11/91

2. Growth inhibition of milkborne pathogens by fatty acids. Dr. Eric Johnson, Food Research Institute. (NDPRB) 7/90-6/92

3. Behavior of foodborne pathogens in the presence of lactic acid bacteria. Dr. Elmer Marth, Dept. of Food Science. (WMMB) 12/89-3/92

4. Control of *Listeria monocytogenes* surface colonization. Dr. Eric Johnson, Food Research Institute. (NDPRB) 1/91-12/91

5. Factors which affect mineral bioavailability. Dr. Janet Greger, Dept. of Nutritional Sciences. (SEA) 9/93

6. Adhesion of *Listeria monocytogenes* and *Salmonella typhimurium* to dairy equipment surfaces. Dr. Amy C. Lee Wong, Food Research Institute. (WMMB, NDPRB) 7/91-6/93

7. Health maintenance aspects of dietary recommendations designed to modify lipid metabolism (NC-167). Drs. Charles Elson and Earl Shrago, Dept. of Nutritional Sciences. (SEA) 9/92

8. Development of genetic tools for molecular analysis of *Listeria moncytogenes*. Dr. John Luchansky, Food Research Institute. (Hatch Grant) 10/90-9/94

9. Effects of dietary fats and intravenous fat emulsions on lipid metabolism. Dr. Denise Ney, Dept. of Nutritional Sciences. (Hatch Grant) 1990-1994

10. Standardized non-microbiological procedures for cleanability assessment of clean-in-place treated milking systems. Dr. Doug Reinemann, Dept. of Agricultural Engineering and Dr. Albrecht Grasshoff, visiting scientist, CDR. (WITEP) 9/91-6/92

11. Control of *Salmonella* colonization in cheese. Dr. Eric Johnson, Food Research Institute. (NDPRB, CDR) project begins 1/92

This and that...

Associate Researcher **Kerry Kaylegian** joined the CDR staff in September. A milkfat specialist, Kaylegian recently completed her master's degree at UW-Madison where she spent three years researching milkfat fractionation with Dr. Robert Lindsay. Her primary responsibility with CDR is to write a monograph on milkfat fractionation technology and applications. The monograph is intended to serve as a technical resource and practical guide for milkfat fraction utilization. She is also working in conjunction with the Wisconsin Milk Marketing Board to help develop milkfat fractionation on a commercial scale in Wisconsin. The process is widely used in Europe to produce specialty milkfat ingredients for the pastry, bakery, ice cream, and confectionery industries.

A delegation of French dairy scientists, including high-level officials from the French Ministry of Agriculture, visited CDR and the UW-Madison Department of Food Science in October. While on campus, the French group met with various faculty and staff from CDR, Food Science, and Dairy Science to discuss techniques for educating and training dairy and food industry personnel. They were particularly interested in mechanisms currently used by UW Extension and CDR, such as short courses, conferences, videotapes, and satellite programming. Their visit was a inspired by a presentation on extension training programs given by **Dr. Bill Wendorff** at the 23rd International Dairy Congress in Montreal.

Calendar of Events

Jan. 6-10, 1992
Ice Cream Maker's Short Course. Call Bob Bradley at (608) 263-2007 for information. To register call the CALS Conference Office at (608) 263-1672.

Jan. 13-16 ***Milk Pasteurization and Process Control School.*** Call Bob Bradley at (608) 263-2007 for information. To register call the CALS Conference Office at (608) 263-1672.

Feb. 5-6 ***Wisconsin Dairy Field Representatives Conference.*** Holiday Inn-West Towne, Madison, WI. To register call the CALS Conference Office at (608) 263-1672.

March 11 ***UW Dairy Manufacturer's Conference.*** Appleton, WI. See page 6 for program information, or call Bill Wendorff at (608) 263-2015. For registration information call the CALS Conference Office at (608) 263-1672.

March 30-April 3
Wisconsin Cheese Technology Short Course. Madison, WI. For information call Bill Wendorff at (608) 263-2015.

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Jim Path, Cheese Outreach Specialist, CDR
Tom Szalkucki, Administrative Officer, CDR
Bill Wendorff, Asst. Professor, Dept. of Food Science

April 21-24 ***Basic Cheesemaker's License Short Course.*** River Falls, WI. Call Ranee May at (715) 425-3150 for information.

April 29-30 ***Dairy Products Technical Conference***, O'Hare Marriott, Chicago, IL. Sponsored by CDR and the American Dairy Products Institute. See article on page 7. For more information, call Dr. Warren Clark, Jr. at (312) 782-4888.

CDR
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