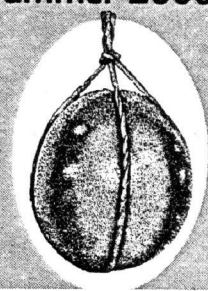


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Cream Line

a new voice for little dairies

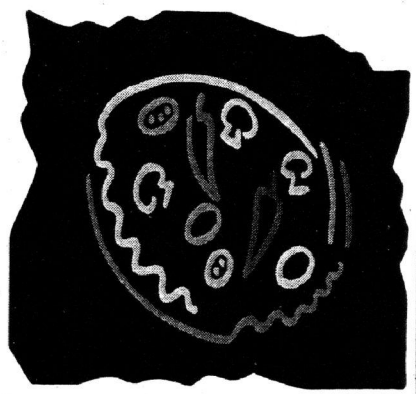
Issue No. 6
Summer 2000



Mozzarella!

Mozzarella is the cheese that everyone wants to know how to make. Even Martha Stewart has shown her viewers how to make Mozzarella from store-bought milk. It's delicious, can be eaten fresh (no waiting!), and has many uses. But homemade Mozzarella is the source of untold frustration and tons of chicken feed every year. What's so difficult about it? Nothing really. If you buy a kit and follow the instructions, you're likely to get Mozzarella from your own milk that's easily as good as Kraft's. But there's something about cheesemakers – we want more! We want flavor, stretchiness and meltability, all in one cheese. And yes, it's possible (maybe). But we'll get to that later.

Mozzarella is one of the *pasta filata* group of cheeses. Literally, *pasta filata* means "spun paste," but in cheesemaking it is often translated as "kneaded curd" or "formed curd." The body of a cheese inside the rind is called the *pâte*, which translates from French as "paste," so all this comes together to make some sense once you know a little about the language origins. [Note that *pâte* (pronounced almost like 'pot') differs from *pâté* (pronounced something like pot-ay'), which means "blotch" or "splotch" and probably comes from the appearance of the insides of a *pâté*, the renowned gourmet liver spread.] It's not too difficult to see where the *filata* or "spun," part comes from, as the curd is often stretched and twisted into various shapes.



There are different types of Mozzarella – most people are familiar with the flat slices and shreds hanging in the cheese case at the grocery store. The product made by the industrial cheese process is a low-moisture, often low-fat cheese that has a long shelf life, and is known as "pizza cheese," since that is its most popular use. The cheese melts well

and gets real stringy – gotta have those strings when you pull the slice of pizza off the tray! – and that's what Americans have come to expect from Mozzarella. The low levels of fat and moisture in the cheese make it more easily shred-able, another trait considered desirable for baking. Then there is "string cheese," basically the same cheese as the slices, only in different form. Industrial pizza cheese does its job well, but it isn't really Mozzarella, at least as the Italians know it.

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Do you know?

How many cheese factories are there in Italy?

Answer on page 15



From the Editor

You have, of course, already noticed that this is not the regulations/HACCP issue, as previously promised for issue #6. I apologize for the change, but several things have happened that made me decide to bump that issue back to Fall. First, it looks like I will actually get to go to the American Cheese Society conference now that closing appears imminent on a house I have up for sale (and therefore will have funds to finance the trip). The ACS is offering a program on HACCP again this year, and that certainly should be included in the regulations issue.

Secondly, I had the opportunity to visit Paul Stephan, maker of Mozzarella cheese, who has even attempted the craft using water buffalo milk, the traditional Italian way. (See related article on p. 13.) Mozzarella is probably **the** most frequently visited topic on the Artisan Cheesemakers' e-mail list (with the possible exception of temperature controllers -- argh). Most cheesemakers want to be able to make it because it's a very useful cheese. Yet, Mozzarella is a very challenging cheese -- the main complaint is that either it won't stretch or it won't melt, or will do neither. I had plans to feature Mozzarella, perhaps in the winter issue, but by doing it now we can eat the product with fresh tomatoes and basil.

If there is anyone whose subscription runs out with this issue, who was not planning to renew, and who was really counting on the regulations/HACCP issue, please contact me (see column to the right).

By now you have received the flyer on the upcoming Goat Lady Dairy workshops (see back page). We are very pleased to be able to offer such experiences. *CreamLine* subscribers were among the first to be notified, but more mailings will be going out soon, so if you are interested in attending, don't hesitate too long. We expect these classes to fill up.

The publication of this issue is about a month later than I had hoped for. Not only is the market garden in full swing, as usual for this time of year, but I'm also in the midst of selling the house, which requires a bunch of repairs before the bank will hand over the cash. The details involved in this process have been occupying an extraordinary amount of time. Buying the house was a lot easier; in the last 23 years, lawyers (and sue-happy people) have found some really ingenious ways to make life difficult. I keep telling myself it will all be over soon!

The other thing the sale means is that I can invest in my little cheese plant. That's exciting and makes it all a bit easier!

Vicki Dunaway

CreamLine is published four times a year by Vicki Dunaway, for the Hometown Creamery Revival Project.

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See page 19 for information on classified ads.

Check out our web site at:
www.metalab.unc.edu/creamery

Comparison of Fat and Moisture Content in Different Styles of Mozzarella Type Cheese

	Fat on Dry Basis	Moisture Content	
	(FDB) -- minimum	Minimum	Maximum
Mozzarella & Scamorza	45%	52%	60%
Low moisture Mozzarella & Scamorza	45%	45%	52%
Part skim Mozzarella & Scamorza	>30%, <45%	52%	60%
Low moisture part skim Mozzarella & Scamorza	>30%, <45%	45%	52%
Buffalo milk Mozzarella	50%		

Adapted from similar table in *Cheese and Fermented Milk Foods* by Frank V. Kosikowski and Vikram V. Mistry, 1997, plus information from *The Cheese Bible* by Christian Teubner.

Fresh Mozzarella is an entirely different beast, as many *CreamLine* readers are already aware. It is soft, full of flavor, high in fat, very perishable and not readily available except in cities. The queen of fresh Mozzarella, *Mozzarella di bufala*, is made from the milk of water buffalo, whose milk tests at an astonishing 8-9% (or higher) butterfat. Paul Stephan, a Virginia cheesemaker who has attempted milking water buffalo (see related article, p. 13), said that his cows each give only about a gallon and a half of milk per day, so it's not surprising that Mozzarella made from their milk must be sold for nearly twice the price of cow milk mozz. In his book, *Cheese Primer*, Steven Jenkins states, "... to me, Mozzarella made from buffalo milk is the finer of the two: it is sweeter and has an immediately recognizable depth of flavor that cow's-milk Mozzarella simply doesn't have." Nevertheless, there aren't many cheesemakers in the U.S. making *Mozzarella di bufala*, with Paula Lambert's "The Mozzarella Company" in Texas being a notable exception. There seems to be an opportunity for patient dairy-men and women interested in producing high-value milk. If you are interested, you can find out more from the American Water Buffalo Association at phone (352) 846-0996, address Box 13533, Gainesville, Florida 32604; Web site <http://members.ccnv.net/waterbuffalo>.

Water buffalo milk aside, perfectly delicious fresh Mozzarella can be made with cow's, goat's or sheep's milk. There are secrets to its perfection, and different cheesemakers have different secrets. Fortunately several of them work if a few basic principles are followed. We'll get to those. Unripened cow's milk Mozzarella is known as *Fior di Latte* (Flower of Milk), in case you are looking for a fancy Italian name for it. Other names for Mozza-

rella, depending on size and shape, include *Bocconcini* ("little mouthfuls"), *Ciliege*, *Nociolini*, *Nodini* and *Ovaline*.¹ *Scamorze* (or *Scamorza*) is a dried fresh mozzarella, often smoked. According to the Wisconsin Center for Dairy Research, "the word means 'dunce' in southern dialect and refers to the shape - like a pear, but with a distinct pointed 'head' formed by the cord used to hang the cheese during manufacture."²

Other Pasta Filata Cheeses

Mozzarella is very closely related to Provolone, which is made by a similar process and sold as a hard cheese after 2-3 months, or as a grating cheese when 6-12 months old. Kosikowski says that "the manufacture of Provolone cheese is simply a continuation of Mozzarella cheese making. The varied shapes of cheese common to Provolone are drawn and twisted from the same hot plastic curd; then the cheese is salted, ripened and possibly smoked."³ *Caciocavallo* ("horse cheese") is a similar cheese with less fat and usually not smoked. "One theory of the origin of the name is that the cheeses, which are tied in pairs and hung over poles to cure, look as if they were hung over a saddle; hence, cheese on horseback, or 'cacio a cavallo.'"⁴

These are just a few of the more common *pasta filata* cheeses; there are many interesting variations. One cheese encloses a piece of butter or butter-sugar paste; in another, fresh cream is enclosed in the Mozzarella and then the cheese is wrapped with fresh leaves from a lily family plant (asphodel).⁵

Continued on page 4

Pizza Cheese

For the sake of this article, we'll make a simple differentiation between **pizza cheese** – the low-moisture Mozzarella common in grocery dairy cases – and **fresh Mozzarella** – the softer type that you cut slices of for eating on tomatoes, topped with basil and olive oil. Fresh Mozzarella can, of course, be used for pizza and is quite good, but to get that gooey, stretchy, stringy effect so important to Pizza Hut commercials, the cheese industry has developed a low-moisture, highly elastic, meltable, shred-able cheese. It's notable that there is an inverse relationship between shred-ability and softness of the cheese, and that "meltable" increases with time between about 7 days and 3-4 weeks.⁶ Thus, fresh Mozzarella is inherently less suitable for pizza type applications.

According to Dr. Paul Kindstedt, there are several factors affecting the way cheese melts, including time, moisture content, fat content and salt content. Just after Mozzarella cheese is made, it is somewhat tough. After about a week it mellows out and its viscosity decreases. Alpha and beta casein content decreases and gamma casein increases, influencing these changes. (These caseins are different forms of protein in milk, which affect the cheese structure and characteristics.) As moisture content of a cheese increases, its viscosity also increases, which means fresh type Mozzarella is less likely to melt; however, very dry Mozzarella becomes too tough to melt, so an intermediate level is desirable. Salt levels of over 3% will inhibit melting properties as well. Kindstedt also says that the state in which the fat is held in the cheese strongly affects the cheese's melting properties. When fat is poorly emulsified and exists in large globules, the cheese melts more easily. This should mean that Jersey milk cheese should melt better than goat milk cheese – anyone have experience comparing the two, prepared by the same recipe under similar conditions?

Melting properties are also associated with seasonal changes in lactation and milk properties. During late lactation viscosity decreases and melting properties are better than in mid-season, when the cheese may tend to melt to a grainy consistency. High fat cheeses may "oil off" when melting; i.e., the oil separates from the cheese. You've had pizza like that, haven't you? Too low a salt content will also result in oiling off.

Fresh Mozzarella

Manufacturers of fresh Mozzarella, particularly Italian cheesemakers seeking to recreate their traditional cheeses, generally start with unripened curd, shipped on ice. The curd is warmed to reactivate the acid ripening process, and then the curd is milled and stretched just before going to market, since the shelf life of this type of Mozzarella is very short, generally less than a week, because of its high moisture content.

When comparing the recipes for Mozzarella cheese and pizza cheese in *Cheese and Fermented Milk Foods*, one notices that the traditional (fresh) Mozzarella cheese employs mesophilic starter. Low-moisture Mozzarella or pizza cheese, on the other hand, is made with thermophilic starter, confirming Paul Stephan's observation (see related story). Acidification of either type is achieved with either long (up to 72 hour) setting to allow acidification by the culture organisms, or by direct acidification with an agent such as vinegar (other recipes use citric acid), or both. No wonder beginners are so confused about Mozzarella!

As described above, fresh Mozzarella has a softer body than pizza cheese and is usually higher in fat. When made by a method using long setting to develop acidity, this cheese also develops a delicious flavor, unlike any of the bland Mozzarella found in the grocery store. When using the citric acid method, many cheesemakers add lipase to improve flavor, but the flavor from lipase is quite different than that which develops naturally.

Acidification

Regardless of the method, proper acidification is probably the most critical step in making Mozzarella cheese. The curd must achieve a pH of 5.6 – 5.7 when using acid, 5.4 – 5.5 when using lactic (mesophilic) cultures or 5.2 – 5.3 when using thermophilic cultures. Otherwise it simply will not stretch properly, which is the property that gives *pasta filata* cheeses their distinctive texture. Before the curd reaches the pH range of 5.6 to 5.2, it is a smooth white gel which entraps fat, insoluble salts and some sugar, but it will not stretch when exposed to hot water. However, when the pH reaches the required range, the curd, known as paracaseinate curd, becomes soluble in warm sodium chloride solution and, upon heating to 125° F. or higher, it becomes smooth and stringy and will retain fat. At a pH below 5.2, calcium is released and a

Continued on page 5

new compound, paracasein, is formed. Paracasein has a weak structure that cannot hold fat well; thus, overacidified curd will lose fat into the whey or water, which may cause the cheese to be tough and/or grainy.⁷ The curd should not be overheated; over 135° it will “seize up” and become rock-hard. Note that this is the temperature within the curd, not the water temperature.

Monitoring pH

Traditionally Mozzarella makers monitored the status of their cheese curd by taste, smell and other factors. Since most of us don't have an Italian grandmother to learn from, we must rely on crutches in the form of instrumentation or other aids to guide us – at least until our senses register the necessary information.

First of all – what is pH? Most of us remember it vaguely from high school chemistry class. There is a more extensive discussion of pH in Issue 4 of *CreamLine*, but for purposes of this article we'll just say that pH is a measure of hydrogen ion concentration and the balance between acids and bases in your solution – in this case, your milk, curd or whey. The pH scale measures from 0.0 to 14.0, with 7.0 being neutral; anything above 7.0 is less acid, anything below is more acid. Mozzarella recipes call for testing pH rather than TA (for reasons I'm unclear on). According to R. Scott, “The major advantage of pH measurement, apart from the speed and sensitivity of the most recent systems, is that the parameter being measured is that which has a direct effect on the functional properties of the milk proteins and hence on the curd.”⁸

The simplest and least expensive way to test pH is with indicator strips. These are paper strips that change color with changes in pH. The strips come in various ranges, and it is important to obtain strips that measure as small a range as possible, giving better accuracy. Strips with a good range for cheesemaking (4.6-6.2) are available from New England Cheesemaking Supply (1-413-628-3808, web page www.cheesemaking.com). You can also get pH paper from any laboratory supply company and from winemaking suppliers.

If you plan to make a lot of cheese, you will eventually want to purchase a pH meter. The pH meter measures the difference in potential or voltage of two electrodes in a sample of the solution, which is translated into a direct

reading of pH on the meter. If you decide to buy one, be sure you equip the meter with the proper type of reference electrode. For most dairy products a non-glass, double-junction electrode is recommended. Dr. Paul Kindstedt, a professor at University of Vermont who specializes in cheesemaking, recommended buying an electrode that compensates for temperature changes. He also suggested a spear-tip for measuring actual curd pH. However, to get all these features in one electrode is impossible. The variety of electrodes is overwhelming, and consulting with a technical support person at the supply house should give you the best results. A good pH meter with electrode runs about \$250-\$300, and you must also purchase buffering solutions for calibrating. Sources of high-quality pH meters include Nelson-Jameson (1-800-826-8302) and Cole Parmer (1-800-323-4340).

One thing that should be mentioned is that measurement of the pH or acidity of whey is only an indirect measurement of what is going on in the curd; the pH in the curd tends to be a bit lower, and the discrepancy is not constant. R. Scott says the difference depends on “(a) the proportions of lactic acid-producing bacteria in the whey and curd, roughly 20% to 80%; (b) the temperature and size of curd particles which, in turn, control the rate of whey expulsion; and (c) the proportion of anti-microbial substances produced by bacteria growing independently in the separate media, whey and curds.”⁹ For home cheesemaking purposes this is probably not a big issue, but in commercial cheesemaking direct measurement of the curd pH is more accurate. I've noticed as much as 0.6 pH point difference between whey and curd.

Continued on page 6

The Hot Iron Test

An old way of determining if Mozzarella is ready to stretch is the hot iron test. Before the days of pH meters, a cheesemaker would heat an iron bar to black heat. She would then gently press a piece of the curd against it, then pull the curd away and estimate the length of strands that developed before they broke. The longer the strand, the lower the pH (higher acidity). This could be done with a soldering iron in the modern age. It would take some practice to determine the proper strand length, but at least would give the cheesemaker a marker as to the development of acid in the curd.

Other Mozzarella “Accessories”

If you are going to make Mozzarella on a regular basis, you might also want to invest in a bottle of citric acid, which can be bought from a cheesemaking supply company or winemaking company. Julia Farmer, moderator of Artisan Cheesemakers’ e-mail discussion group¹⁰, said she bought citric acid from Presque Isle (www.piwine.com, 1-800-488-7492) for around \$15 for 8 pounds.

If you want to experiment with lipase in your cheese, you can purchase it from a cheesemaking supply company as well. Lipase powders come in various types:

Kid lipase – sharp, picante (also called “Capilase”); for Romano and Provolone

Kid-lamb lipase – traditional “peccorino” for Romano, Provolone and Feta

Lamb lipase – very sharp “peccorino” for Romano

Calf lipase – mild (may be called “Italase”), for Mozzarella, Asiago, Provolone, Feta and Bleu cheeses¹¹

Lipase powders are lipolytic enzymes – enzymes that break down fat – made from the tissues of the respective animals. (Kosikowski calls them “pre-gastric-oral” preparations, whatever *that* means!) There are also natural lipases produced by the existing bacterial enzymes in milk, which assist in cheese ripening. Lipase powders have largely replaced rennet paste, formerly used for flavor enhancement.

Finally, consider purchasing some disposable, non-powdered latex gloves. The gloves are not required, but it’s much easier to work the cheese by hand than with two wooden spoons, as some recipes recommend. If you have tough hands, great, but dipping your hands into 160+° water can be rough on them. Rubber dishwashing gloves are too bulky, in my opinion, and I don’t like the way they smell (which I think transfers to the cheese). You can get the latex gloves in drugstores.

With this very important information under your belt, you’re ready to start making Mozzarella. We’ll start with “instant Mozzarella,” made in the microwave in a short amount of time, and work up to the traditional, long-setting Mozzarella. **Recipes begin on page 9.**

References Cited

¹ Teubner, Christian. *The Cheese Bible* (New York, 1998), p. 49.

² University of Wisconsin Center for Dairy Research, World Cheese Exchange web site: www.cdr.wisc.edu/. Click on “Technical Resources,” then “CDR World Cheese Exchange.” This is a great resource for information on thousands of cheeses.

³ Kosikowski, Frank V. and Vikram V. Mistry, *Cheese and Fermented Milk Foods*, volume 1 (Westport, CT, 1997), p. 174.

⁴ University of Wisconsin Center for Dairy Research.

⁵ Teubner, p. 49.

⁶ Kindstedt, Paul. *Controlling the Physical Properties of Mozzarella Cheese*. Videotape. (Madison, WI, 1991).

⁷ Kosikowski, pp. 182-184.

⁸ Scott, R. et al. *Cheesemaking Practice*, 3rd edition. (Gaithersburg, MD, 1998), p. 86.

⁹ *Ibid.*, p. 89.

¹⁰ To join, send an e-mail to Artisan_Cheesemakers-subscribe@onelist.com

¹¹ Dairy Connection catalog. (1-800-810-0127, www.dairyconnection.com)

Sheep Dairies in Vermont Will Likely Lose Animals

By now most Americans who have time to watch the news have heard that four dead sheep in Vermont were found to have evidence of transmissible spongiform encephalopathy (TSE), a disease related to mad cow disease. The government plans to destroy 355 sheep on two farms in East Warren and Craftsbury, Vermont that may be contaminated. One farmer has already sold 21 sheep to the government for destruction. Sheep originally brought from Belgium have been under careful surveillance by the U.S. government after it was learned that they may have been fed contaminated feed while in Europe. One of the affected farms is that of Linda and Larry Faillace of the Three Shepherds of the Mad River Valley, featured in Issue 3 of *CreamLine*. The Faillaces were instrumental in importing the East Friesian sheep to America in the mid 1990s. They state the sheep were not exposed to contaminated feed and are fighting to save their flock. (The four dead sheep were not from their flock.)

Sales of lamb and sheep milk cheese in Vermont have suffered dramatically from the bad publicity. According to an article in the *Burlington Free Press*, cheesemaker David Major of Vermont Shepherd has experienced cancellations from about half his sheep cheese buyers, jeopardizing the fate of about 20,000 pounds of cheese that is aging at his farm, although his is not one of the suspect farms. Consumers are apparently generalizing their fears to include all Vermont sheep dairies and lamb producers, and others in the fledgling sheep dairy industry worry that people may begin to avoid ewe milk products altogether.

It is hoped that a quick resolution will come about in this very unhappy situation. Our heartfelt best wishes go out to the Faillaces and the other affected dairies. ☘

Bottling Issue Update

In the Spring 2000 issue on Bottling, I printed a letter from Andy Lee of Virginia saying he was giving up on the idea of going into bottling milk because he found it too expensive. I'm pleased to relate that Andy has since changed his mind and is in the process of building a milk bottling plant alongside an organic poultry processing plant on his farm. He has decided to go with used equipment to save money. Best of luck, Andy!

American Cheese Society to Hold Conference August 10-13

The theme of the 17th Annual Conference of the American Cheese Society is "*Terroir*," a French term which emphasizes that cheese is a living food shaped by the unique flavor influences of a region such as soil, weather, grasses and feeds. This year's conference offers many events celebrating American cheesemaking, as well as a number of panels addressing topics and issues of interest to cheesemakers, cheese sellers and cheese lovers.

"The future is very bright for America's small cheesemakers," said Bill McKenna, conference co-chair. "We are seeing a renaissance of fine cheesemaking in this country driven by a marketplace that is showing growing appreciation for American artisan and farmstead cheeses. While our industry faces some issues that concern us, we also have much to celebrate."

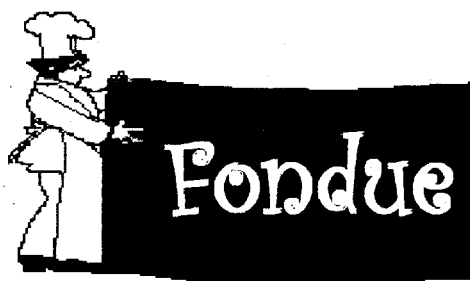
The conference will be headquartered at the Sonoma County Double Tree Hotel in Rohnert Park with additional events and activities planned throughout Sonoma and Napa counties. Attendance is open to cheesemakers, cheese retailers and distributors, food media, chefs and other culinary professionals. The final event, the Festival of Cheeses, will be held at the Culinary Institute of America at Greystone in the Napa Valley on Saturday evening, where attendees will sample more than 300 cheeses entered in the ACS' annual competition, including the winning cheeses that will be announced at the event.

For more information about this year's conference, contact the American Cheese Society, (262) 728-4458, or visit the Web site: www.cheesesociety.org.

— ACS press release ☘

Chef's Corner

with
Kelly Shepherd



Don't have that yard sale just yet. Sift through your stuff and find that old fondue set you've had since 1976 and dust it off. Fondue is back. And for those of you who don't know the simple pleasures of bread cubes and melted cheese, beware! All it takes is once and you're hooked. There will be no leftovers.

Fondue is a French word, meaning "melted." According to one source fondue originated in Europe as a means of using up stale bread and cheese that was becoming too dry. Cheese was melted in an earthenware pot called a *caquelon*. The preparer added local wines and seasonings, and then the family or other group would dine from the communal pot, dipping the crusty bread in the melted cheese. Despite its simplicity, the ritual of fondue can vary greatly with each Swiss household.

There are a few basic rules:

- Use a heavy pot.
- Use both high and low heat.
- Use the best cheese you can find.
- Use a dry white wine.

Have all your ingredients ready before you begin. Add ingredients with one hand – your other hand will be busy stirring with a wooden spoon. This is a last-minute dish, only taking about ten minutes to prepare. It disappears even faster. Have ready a bowl filled with crusty French bread cut into one-inch cubes, which are impaled on long forks and dipped into the cheese. Fondue is wonderful served with fresh fruit.

The following recipe is definitely worth trying. You might even find yourself having a fondue party.

Classic Fondue (4 servings)

- 1 lb. Emmentaler cheese (or ½ lb. Emmentaler, ½ lb. Gruyère), shredded
- 1 clove garlic, peeled
- 2 cups dry white wine
- 3 tbsp Kirsch
- 1 tsp. cornstarch
- nutmeg, white pepper and/or paprika

Rub the garlic in a heavy saucepan. Put wine into the pan and heat, uncovered, on moderately high heat. Dissolve cornstarch in Kirsch, set aside. When the wine is almost covered with foamy bubbles, add the cheese, stirring constantly. Keep the heat high, but don't let fondue boil. Keep adding the cheese until you can feel a very slight resistance to the spoon as you stir. Then, still stirring, add the Kirsch mixture. Continue to cook and stir until the fondue thickens. Add spices to taste and transfer to fondue pot to keep warm. Serve immediately.

Editor's note: Kelly had also submitted another recipe but it requires six weeks and \$35 to obtain permission to print it. Also, I didn't give her enough warning about the change in my plans for the theme of this issue. I'm sure she has some great Mozzarella recipes to share. Maybe next issue! -- Vicki

Mozzarella Cheesemaking Recipes

“Instant” Microwave Mozzarella -- *This is the one you can make in half an hour.*

1 gallon milk
2 tsp. citric acid powder
¼ tsp. lipase powder
1/8 tsp. liquid rennet

Pour the milk into a large stainless pot. Dissolve the citric acid in ¼ cup cool water or milk, then add to the pot of milk. Stir to mix well. Heat the milk to 88°. Add the lipase powder. Mix the rennet in ¼ cup cool water and add to the milk. Stir well, at least twenty strokes. Allow the milk to set for 15-30 minutes until you get a “clean break” – that is, the curd will break cleanly when you insert a knife blade. Cut into 1” cubes and allow to rest for 10-15 minutes.

Place the pot into a larger pot or sink full of hot water and bring the temperature up to 108°, occasionally stirring the curds gently. Maintain this temperature for about 35 minutes. Drain the curds in a colander for 15 minutes.

Cut or tear about one cup of the curds into a microwave-safe bowl. Heat in the microwave on high for about 50 seconds. Remove and knead the cheese with gloved hands (or dip your hands occasionally in cold water). The curds should begin to meld together. Heat for another 25 seconds, then repeat working and shaping of the curds. You are aiming for a smooth, glossy, elastic curd that will stretch without breaking. Repeat microwaving for short periods if needed until the curd stretches properly. Note: You can heat it too much – if the curd gets over 135° inside it will get hard as a rock. Once you get the proper stretchy, glossy cheese, stop working it, shape it as desired, and allow to cool in ice water for about half an hour. Then place in a saturated brine (about six cups of coarse salt per gallon of warm water) in a bowl that will not corrode (glass, plastic or ceramic are good), and soak for 2-8 hours. Length of brining time will depend on the size of your cheese pieces and your salt preferences.

Continued on page 10



More Mozzarella Help

There are several excellent sources of information, with detailed instructions and even photographs, for making Mozzarella, supplied by cheesemakers on the World Wide Web:

http://Biology.clc.uc.edu/Fankhauser/Cheese/Mozzarella/MOZZARELLA_jn0.HTM

<http://members.xoom.com/cheesemaker/Cheesemakers-L.htm> (click on Recipes link)

<http://www.fiascofarm.com/dairy/mozzarella.htm>

Also see page 19 for reviews of two other resources.

My Favorite Mozzarella

I prefer Mozzarella that develops acidity and flavor using a long setting period, something like "cheddaring." I do not use lipase or citric acid. It takes longer but I think it tastes much better. My thanks to Margaret Morris of Glengarry Cheesemaking and Dairy Supply (613-525-3133) and Julia Farmer of Artisan Cheesemakers e-mail discussion group (send e-mail message to Artisan_Cheesemakers-subscribe@onelist.com), whose instructions enabled me to finally make the Mozzarella cheese I wanted! These are notes from my first successful batch, and I've used them a number of times since.

I used about 2 gallons whole raw milk (I think the Canadienne breed runs about 4-4.5% fat, but we haven't had our milk tested yet) and added cream from another gallon. I heated the milk to 86°, added ¼ tsp. MM100 DVI (MA011 is also good) and ¼ tsp LH100 DVI. About an hour later I added 1 tsp liquid calf rennet in ¼ cup cool water. (The rennet is from Glengarry and I find it of a lesser strength than Hoegger's, which is the only other one I've used.) About 40 minutes later I had a firm curd and cut the curds to about ¼" cubes (the curd should be ready in 30-45 minutes, according to R. Scott). Then I heated to 102° F, about 5-6 degrees every 15 minutes, stirring gently. This takes a total of about 45 minutes. Then I let the curds set for 30 minutes at 102°.

Next, I poured off a third of the whey, set another 20 minutes, then drained the curd in a colander for about 50 minutes with the colander in the top of the pot over the warm whey. Then I cut the curd into two slabs, put one on top of the other and allowed to ripen for a couple hours, turning the slabs occasionally. After two hours the pH was between 5.0 and 5.5 by litmus (I was too lazy to get the pH meter out that day), and the curd tasted quite tangy. Finally I worked the curd in hot (about 160-165°) water, taking the curd out to work by hand with latex gloves, returning the curd to the water if it didn't stretch well, then trying again until I got a good stretch and glossy sheen. I would occasionally add more hot water to keep the temperature up. Then I formed the cheese into balls and cooled them in ice water for half an hour. When everything was worked up I brined (saturated brine) for about 5-1/2 hours. It probably could have used few more hours but I wanted to go to bed.

Some notes on the above recipe:

- (1) This recipe is adapted from one I got from Margaret Morris of Glengarry when she taught her cheesemaking class at Jekyll Island, GA last winter. Julia Farmer was instrumental in helping me learn about working the curds. Attempting to knead curd with wooden spoons (like so many recipes tell you to do) was ridiculous. The water is very hot, so it's critical to know that it is okay to remove the curd from the water to work it.
- (2) On the first trial of this recipe, I had a problem with fat leaking out into the water I was storing the cheese in. A friend had told me to simply store the cheese in tap water (we have wonderful, unchlorinated, mountain well water), but Kosikowski says to use acidified water or pasteurized whey. Mary Falk of Lovetree Farmstead Cheese also suggested that the problem might be soft surface defect (as Dr. Kindstedt discusses in his Mozzarella video -- see p. 19), and that calcium chloride might be added to the water. In soft surface defect, calcium migrates from the cheese curd into the brine or water and causes the casein at the surface of the curd to solubilize, giving a somewhat slimy surface. The solution is to add 0.06% calcium chloride, or use pasteurized whey (pH 5.1 or less). The whey must be pasteurized to prevent it from developing further acidity, but it does contain soluble calcium. Too much calcium chloride can cause a leathery surface of the cheese. (Note that soft surface defect is also a common problem with feta cheese in brine.)
- (3) Other possible causes of the sliminess might include not cooling the cheese down in ice water before brining, and pH being too low, causing loss of fat.
- (4) Mozzarella cheese can also be stored by freezing.
- (5) I plan to try the same recipe without the LH100 (thermophilic) culture. I believe that this culture makes the process go faster, but traditional Mozzarella uses only mesophilic culture (and may take up to 72 hours to complete!), and the result is supposedly a softer, moister cheese. Mine is nice and soft but I'll be experimenting with it this summer.
- (6) For pizza cheese, use a lower fat milk and only thermophilic culture. Mold and press the cheese to remove excess whey. Refrigerate for at least a week to allow the cheese to mellow and become "meltable."

Ricotta

Hand in hand with Mozzarella cheese goes Ricotta cheese, another soft Italian cheese. Ricotta is almost as confusing as Mozzarella! The name “ricotta” means “recooked,” derived from the procedure of cooking whey left over from cheesemaking to a high temperature in order to precipitate proteins. Technically much of the Ricotta you find in the grocery store isn’t really Ricotta by Old World standards – grocery Ricotta is usually made with whole or skimmed milk using an acidifying agent to form the curd. The industry appears to have accepted the milk-based version as “Ricotta” and has apparently renamed the whey protein curd as “Ricotone.” Most references describing world cheeses, however, refer to the whey cheese as Ricotta. As with Mozzarella, there are many versions of Ricotta by different names:

- ◆ **Ricotta di Pecora** – the original Italian variety, made from sheep cheese whey
- ◆ **Ricotta di Vacca** (or Ricotta Vaccina) – made from cow milk whey
- ◆ **Ricotta Tipo Dolce** – unripened, unsalted
- ◆ **Ricotta Tipo Forte** – ripened and salted
- ◆ **Ricotta Secca** – dry ricotta, used for grating when aged
- ◆ **Cacioricotta** – fresh rennet cheese made from milk
- ◆ **Ricotta Salata** – Ricotta which has been salted and pressed
- ◆ **Ricotta Salata Affumicata** – smoked Ricotta Salata
- ◆ **Ricotta Salata al Forno** – baked Ricotta Salata
- ◆ **Impastata** – similar to Ricotta but cooked to a drier state, with differences in pH and stirring technique
- ◆ **Zieger or Ziger** – cheese made in Switzerland from acidulated, heated whey (Molkezieger = whey Zieger; Milchzieger = milk Zieger)
- ◆ **Sérac or Cérat** – French name for Zieger cheese
- ◆ **Requesón** – Spanish version of whey sheep milk cheese¹

Nearly all recipes for Ricotta cheese call for vinegar or lemon juice, and perhaps other acids, but Ricotta made without these aids offers the cleanest, finest flavor. Like Mozzarella, the pH of the milk or whey is critical for making proper Ricotta cheese.

There has been lots of confusion arising from recipes that give completely different – even opposite! – direc-

tions for the making of whey Ricotta. For example, some recipes say to use the whey immediately after making cheese; others say to let the whey sit overnight before attempting to make Ricotta. I’ve pondered this situation and have recently come to the conclusion that both instructions may be correct. How so? It depends on what kind of cheese you are making! A cheese that develops high acidity during its make procedure – like cheddar or Mozzarella – will have whey that is already acid enough to cause the proteins to precipitate upon heating. If you are making a low-acid cheese such as Feta or chèvre, your whey will have to develop more acidity before it will be useful for Ricotta. Kosikowski says a salt imbalance in milk (such as in early spring or late fall, or with a change of diet) may cause a failure of the protein to precipitate, but in general a pH of 5.4 and heating to 180° to 200° should result in successful Ricotta-making.

Another point of confusion is whether the curd floats to the top of the whey or sinks to the bottom. Most recipes say that the curd floats, but many cheesemakers note that theirs forms on the bottom of the pot. Interestingly, these are two types of cheese! Proper Ricotta floats and is scooped off the top with a perforated spoon or ladle into a basket or mold for draining. The curd floats because it contains air. Once the precipitation temperature of about 180° is reached, the whey should no longer be stirred, and the tiny pieces of curd (albumin and other protein) will float to the top and coalesce there. According to Kosikowski, “Medium to severe agitation applied to the coalescing curd mass before it is fixed at the kettle surface ... can destroy a tenuous equilibrium and the curd will drop to the bottom of the kettle, never to be recognized again as Ricotta cheese.”² For Impastata, on the other hand, stirring is continued, the heat and acidity are higher, and the curd forms on the bottom. I’ve had both types in the same pot! The Ricotta was still quite moist after draining overnight in a small mold, while the Impastata, which drained in a cheesecloth bag for the same amount of time, was drier. (Personally, I like the nuttier flavor of Impastata better.) I should note here that Kosikowski refers to Impastata only as the bottom-feeding curd of whole milk Ricotta, and he doesn’t give a name to the whey protein equivalent, but I’ll call it Impastata until corrected.

My ricotta is made mostly with whey, but I add up to one-third the whey volume of skimmed milk or cold water when the temperature reaches about 150°. Most recipes

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do not call for this step, but it was suggested by Alfred (“Freddie”) Michiels, a Belgian cheesemaker, during his class at Ag-Innovations in Vermont (802-496-3998 for future class information). I’ve found it works very well, and I generally prefer to use milk rather than water because it gives more flavor. Freddie said that this addition “shocks” the whey into forming the precipitate. I know for sure that it isn’t necessary since once, when pasteurizing some whey, I let it get too hot and got Ricotta, but I like the flavor of the resulting cheese when using the extra milk.

¹ Teubner, Christian. *The Cheese Bible* (New York, 1998), p. 94-95.

² Kosikowski, Frank V. and Vikram V. Mistry, *Cheese and Fermented Milk Foods*, volume 1 (Westport, CT, 1997), p. 191.

Warning: Be careful making whey cheeses – the whey is very hot and can cause severe burns!

My Whey Ricotta/Impastata Recipe

3 gallons acid whey
½ to 1 gallon skimmed milk (or cold water)

Heat whey on direct heat until it reaches 150° F. Quickly add the milk (for dessert quality cheese) or cold water (for baking cheese) and stir in. Resume heating until the whey reaches around 180°. At around 170° the whey will get foamy – I usually skim this off, but am not sure it’s absolutely necessary. At this point fine white particles begin to form. Stop stirring and turn off the heat. Allow the pot to set undisturbed for about an hour. When you return, you should have a layer of ricotta on top, which can be scooped off into a draining basket or mold to drain at least four hours, preferably overnight. This cheese remains very moist and must be used within a few days.

For impastata, continue stirring and heating until the liquid reaches about 190°. The precipitate will form, but will fall to the bottom of the pot. Allow to set for an hour or so. Have ready a large colander with a large piece of cheesecloth in it; pour the whey through the cheesecloth. When draining has slowed, hang the cheese-

cloth for 4-6 hours or overnight. The resulting cheese is a bit drier than the Ricotta and will last about a week in the refrigerator. I do not salt my fresh ricotta, but some do, to taste.

Whole Milk Ricotta

For whole milk ricotta the critical pH is 5.9-6.0, or titratable acidity of 0.31 (for impastata 5.6 and 0.35 respectively). This level of acidity is created using vinegar or lemon juice. Recommendations for amounts vary – you may need to experiment with your own milk. Typical recommendations range from ¼ cup of vinegar to a gallon of milk, to 7 tablespoons of lemon juice to ½ gallon of milk mixed with cream. (Higher fat milks may indeed require larger doses of acid.)

Heat the milk gradually to approximately 190° to 200°. Stir in vinegar or lemon juice. Curd should form fairly quickly. Allow the pot to set for at least 15 minutes, then ladle contents into a mold, or pour through a cheesecloth-lined colander.* Form the cloth into a bag, hang, and allow to drain for at least an hour. Add salt and/or extra cream if desired.

*For true Ricotta, ladle the curd (formed in the top of the pot) into a mold and allow it to drain; pouring the whey through and over it harms its delicate texture.

Ricotta Salata

Salt the cheese to taste (Desiree Wehner of Georgia says 0.5% was the recommended amount for ricotta salata at the Cal Poly cheesemaking short course), then place the ricotta into a mold or cheesecloth bag and press lightly to further drain the curd. I cannot find specific instructions on the length or weight of pressing and am experimenting with this cheese. One source says it needs to be cured at temperatures over 70° F.

More Ricotta Help

http://Biology.clc.uc.edu/Fankhauser//Cheese/Ricotta/RICOTTA_00.HTM

<http://www.fiascofarm.com/dairy/ricotta.html>

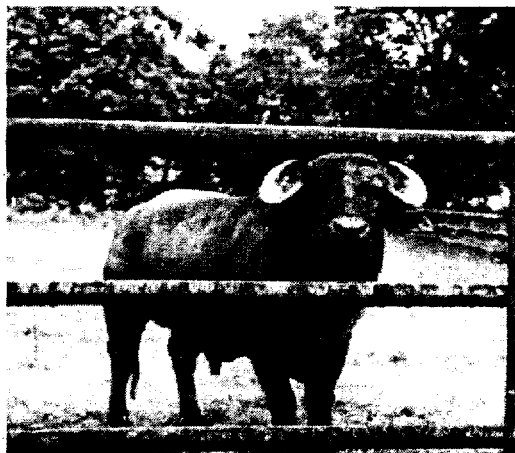


Blue Ridge Mountain Dairy

a little adventure, recounted by Vicki Dunaway

Driving the rollercoaster narrow back roads to Blue Ridge Mountain Dairy, it's hard to believe that the cancerous sprawl of the Washington DC suburbs is only about 30 miles away. The homes here have green space between them – more like communities in rural southwest Virginia than in the neighboring counties, where mansions worth half a million dollars are squeezed onto tiny lots like a Monopoly board in the late stages of a good game. But it's clear that the open land here is preserved not because of distance to market, as in southwest Virginia, but rather as a result of the conscious decisions of people who can afford to choose.

On this misty summer morning, I pull into the driveway of Paul Stephan's 12-acre farm, emerge from my car, and am greeted by the peaceful sounds of birdsong and the quiet gazes of four cow-like animals that look as though they have been teleported from an eon long past – a little like woolly mammoths without the tusks and trunks. I am surprised at their size. My prior images of water buffaloes were of sleek, massive beasts with long horns, dwarfing the tiny stick figures of Asian workers in rice paddies. According to *Cheese and Fermented Milk Foods*, there are 15 breeds of water buffalo in India. Paul's girls are probably about the size of Jersey cows, and have short, stout horns curving away from the face, then back toward the top of the head. They have somewhat shaggy coats, like Scotch Highland cattle, and wide nostrils reminiscent of a gorilla. They definitely do not have the "cuddly" demeanor of a Jersey or a Brown Swiss, and the buffalo's stare suggests that you might want to keep your distance. During my hour-long visit I don't remember hearing a sound out of any of the nine water buffaloes on the farm.



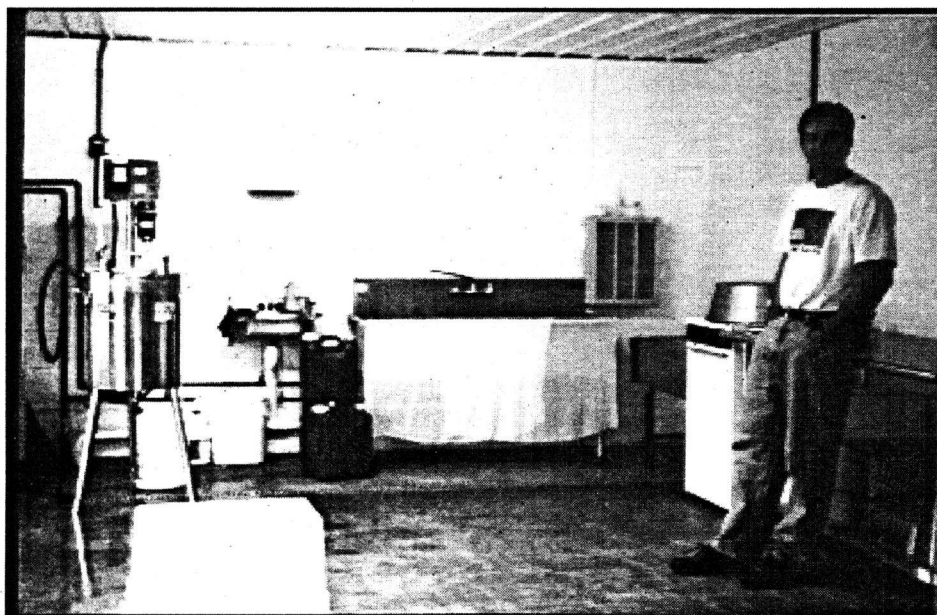
After taking a few pictures, I go up to the house to find Paul Stephan, who has graciously agreed to let me interview him on one of his busy pre-market Mozzarella-making days. No one answers the door of the two-story, Civil War era home, so I head out to the plain white block building that houses the cheese room and his office. He is there, and greets me quietly, opening a sliding glass door to let me in. Paul Stephan is a bright-eyed young man, obviously educated and intense. I had heard the rumor that he had been a chef, and I had fancied that he was a cheese aficionado, frustrated by the lack of availability of *Mozzarella di bufala* in the U.S., who took it upon himself to supply the market. It wasn't exactly like that. Paul did complete chef's training at the Culinary Institute of America but wasn't fond of the long hours, and decided he would prefer to be in restaurant management rather than filling a chef's hat. Then, somewhere along the way, he got the idea that farming might be more interesting, and he thought it would be great to work for himself.

Cheesemaking appealed to his chef's heart, and Paul brought four water buffaloes north from Florida. Last season he didn't find them to be terribly cooperative. They didn't like the milking parlor, and Paul found it too stressful (and dangerous) to milk them, so he turned them out to pasture and bought a couple of Jersey cows. The Jerseys supply more milk (the buffaloes each only yielded about a gallon and a half per day) and are much easier to work with. Recently Paul and his wife Allison have begun working with the buffaloes again, taking them into the milking parlor and handling their udders and teats in order to prepare them for milking when they freshen. They will also attempt to train the four bred heifers to the parlor and Paul hopes he will again be able to make the traditional Italian-style Mozzarella, which he says brings about twice the (already substantial) price of cow milk fresh Mozzarella. His milking parlor is small, about the size of a large stall within a modest barn. He milks two animals at a time in his 12 x 12 parlor. To construct the milking parlor he converted a section inside a dirt-floored horse barn by pouring a concrete floor and applying pebble-textured dairy paneling to the walls. The milk room was formerly a tack room.

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I asked whether the buffaloes need water for wallowing and swimming. Paul said that they like to have a body of water available, but it isn't required. This is probably less important in Virginia than it would be in the heat of the deep South. There are two major types of water buffalo – the swamp buffaloes from Southeast Asia and the river buffaloes from India and Pakistan. River buffaloes, which are the type that Paul has, are adapted to habitats throughout the U.S. (and, of course, Italy). The web page of The American Water Buffalo Association has photos of river buffaloes in the snow in Montana. Their Web site is at <http://members.ccgmv.net/waterbuffalo>. The organization's address is Box 13533, Gainesville, Florida 32604; phone (352) 846-0996. Fencing requirements for the river variety of water buffalo are similar to those for regular cattle.



Paul stands in his processing room -- this is pretty much it! Pasteurizer is to the left, Rubbermaid tub in foreground is used as a cheese vat. Note food-grade cubitainers near sink for milk transport and storage.

Currently Paul milks the two Jerseys and buys some milk from a cooperative to fill the growing demand for his Mozzarella and Ricotta cheese. Ideally he would prefer to buy water buffalo milk directly from a farmer, or he might hire someone to milk his herd so that he can devote his time and energy to cheesemaking and marketing. He has recently worked out a deal to purchase some Guernsey milk from a nearby farmer until he is able to work up to his ideal situation.

As mentioned before, his cheesemaking room is in a simple block building, pre-existing on the farm, which he renovated for the purpose. His operation is quite elegant. The cheese room contains only a 15-gallon pasteurizer, a triple sink, a water heater, a dishwasher, some stainless steel counters and a couple of refrigerators. He makes cheese in large Rubbermaid tubs and transports milk in food-grade cubitainers from Wal-Mart. The latter, he says, are nice because they stack well in the refrigerator and are easier to handle than milk cans. After milking, he cools the milk in these containers in an ice bath. He has tested the milk temperatures and found that this cooling procedure works well within the state requirements. His entire operation, including renovation of the building and purchase of the animals, cost about \$60,000.

Blue Ridge Mountain Dairy has already outgrown the 3-month-old 15-gallon pasteurizer ("The Vat" – sorry, it's already sold), and Paul is looking for a larger one to allow him to streamline his cheesemaking. Currently he is making about 130-140 pounds of Mozzarella per week (less during holidays), that he sells in half-pound balls. His primary markets are a farmers' market in Baltimore and the Sunday Dupont Circle market in Washington, D.C. He recently started advertising with a small local newspaper ad to sell cheese from the farm, and

has been surprised at the good response to that ad. Paul gets \$6 per half pound of cheese at the farm, \$6.50 in Baltimore and \$8 at Dupont Circle (the high rent district). Mozzarella is packaged in brine in deli cups. Paul also uses the resulting whey to make Ricotta cheese, which he sells in pint deli containers for \$6 per pound, about 40 pounds a week.

Paul confided that one of the biggest problems he has had, aside from milking the buffaloes, has been getting help when learning to make the cheese. He found those who make Mozzarella for sale to be quite secretive about their recipes and less than forthcoming in revealing tricks of the trade. Out of respect for his business, I did not ask for details of his make procedure, but when he asked

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whether I use mesophilic or thermophilic culture for Mozzarella my curiosity was piqued. I told him I used a little of each and asked him what he uses. He said he had settled on using only mesophilic culture because it helps to retain moisture in the cheese, though most recipes for Mozzarella call for thermophilic starter. As most cheesemakers soon learn, there are endless variations on every recipe!

During the interview, Paul was starting his cheese for the day. He pasteurized two 15-gallon batches of milk and added starter and rennet, and set the cheese to work its magic. He frequently ran a sponge mop over the floor during this time, saying he was a fanatic for keeping things clean. He said the dairy people from the Virginia Department of Agriculture and Consumer Services (VDACS) had been extremely helpful in getting him started. Paul believes he can make a good living at his craft, given time and the right equipment.

I ran out of coffee, questions and film, and so decided to head on into the city in preparation for a meeting the next day, rather than break his concentration while he worked. I briefly visited with the four older buffalo cows and the bull, then packed up and drove back down the winding road, filled with a renewed sense of hope for the farmstead cheesemaker and the future of cheese in America. ☘

Contact Blue Ridge Mountain Dairy at (540) 822-4363.

Tricks and Tips

This space is for good ideas! If you have found a way to save money or time, to recycle materials or reduce consumption, let us know. If your tip is printed, we'll add two extra issues to your subscription.

Molds for feta cheese: Sharon Lawson of Willis, VA discovered that the perforated pans used in restaurants for steaming and draining make excellent feta cheese molds, giving the cheese that blocky look that consumers expect. She covers the curd with cheesecloth, then sets a homemade wooden follower on top of that, then weights on that if needed (more so in early spring and fall). These pans are easily available at restaurant supply places.

More corrections and additions to the *Small Dairy Resource Book*:

I was recently alerted that several of the links on my Web page (and thus in the Resource Book) were dead, and when I checked them, indeed they were. If you have the book, please make the following changes:

Page 52. The URL for the California Polytechnic Cheese Short Course II has been changed to:
www.calpoly.edu/~dptc/cheeseii.htm

Page 52. The URL for the Washington State University short course has been changed to:
www.wsu.edu/creamery/aboutwsucreamery/shortcourse.html

Page 52. The URL for Glengarry Cheesemaking & Dairy Supply cheese workshops is:
<http://glengarrycheesemaking.on.ca/>

Other book changes:

p. 49. FAX number for Chr. Hansen: (414) 476-3630.

p. 49. Additional cheesemaking supplier: Cheesemaking Supply Co., 9155 Madison Rd., Montville, OH 44064. (No other information available.)

p. 50. Additional equipment supplier (used equipment): Schier Company, 14459 S. 65th W. Ave., Sapulpa, OK 74066; (918) 321-3151; Web site is www.schiercompany.com

p. 54. Other resources: The Farmstead Dairy Tapes, two audio tapes from a meeting (conference?) held in November 1999. Send \$30 to Farm Center, P.O. Box 8911, Madison, WI 53708. Phone (800) 942-2474. According to Jim Amory of Leraysville Cheese Factory, "these tapes provide in-depth information on how to make cheese, the equipment needed, and challenges of production."

Answer:

Around 16,000, according to Giulia Ionata, owner of Gemelli Handcrafted Italian Specialty Cheeses in Silver Spring, MD, and speaker at On-Farm Dairy Processing conference in Frederick, MD, April 1, 2000. *Remember the question in the last issue?*

Can't Find Those Books?

Ricki Carroll of New England Cheesemaking Supply called to alert me that a couple of the publications listed by Peter Dixon in his *Farmstead Cheesemakers' Newsletter*, included with the last issue of *CreamLine*, are almost completely unavailable. *The French Cheese Book* by Patrick Rance is out of print and is nearly impossible to find used, as are the *Pfizer Cheese Monographs*. Probably the best way to obtain these materials (temporarily) is through interlibrary loan at your local library.

Starter Cultures Resource

Thanks to cheesemaker Mary Falk for this one! Chr. Hansen has published a terrific book called *Cultures for the Manufacture of Dairy Products*. It's about 150 pages long and contains lots of great information on the subject. You can request a copy by calling (414) 476-3630, faxing (414) 259-9399, or from their Web site, www.chr-hansen.com/hansen.htm. In case you aren't familiar with them, Chr. Hansen is a major supplier of cultures for the dairy industry. They've been around since the late 1800s.

The Dairy Practices Council

The Dairy Practices Council develops and disseminates guidelines for the production and processing of milk and the manufacture of dairy products. There is a set of guidelines for farm use and another set for processing plants, but individual guidelines can be purchased at small cost. The guidelines include specifications for plants and milkrooms, information on sampling and testing, milk and product handling, wastewater, sanitation and much more. To receive a copy of their informational brochure, contact the DPC at (732) 203-1947. Their address is 51 E. Front St., Suite 2, Keyport, NJ 07735. Guideline titles are listed on the web page: www.dairypc.org.

Recycled Paper Source

I've been looking for Domtar's 100% post-consumer recycled printing paper for a long time, and recently just stumbled across a source of it. Graphic Paper New York, Inc., carries a nice line of this paper called "Sandpiper." This issue of *CreamLine* is printed on "mushroom" stock. For more information contact Grèg Barber at (800) 840-4555, e-mail greg@pcw100.com. His web site is at: www.pcw100.com.

Slow Food

Yep, you got it! The opposite of Fast Food. This is an international organization dedicated to the appreciation of good food. These folks put on a huge cheese festival every other year in Italy (the next one is in 2001) and the Salone del Gusto (a big food festival) in alternate years. Local chapters are known as "convivia" – members meet to eat and engage in numerous other events and activities. One Slow Food project, The Ark of Taste, exists: "To protect the small purveyors of fine food from the deluge of industrial standardization; to ensure the survival of endangered animal breeds, cheeses, cold cuts, edible herbs - both wild and cultivated - cereals and fruit; to spread the teaching of taste; to make a stand against obsessive worrying about hygienic matters, which kills the specific character of many kinds of production; to protect the right to pleasure." (from the Slow Food Web site, www.slowfood.com). To learn more, visit the web site, or contact Egg Farm Dairy at (800) 273-2637 and ask for information on Slow Food.

The Mysteries of Cheese

by Peter Dixon

This is a new question/answer column for folks who are interested in those hard-to-answer problems in cheesemaking and other dairy processing ventures. Peter Dixon is a dairy consultant with a great deal of experience in establishing small-scale cheese-making plants and developing recipes and techniques. Peter has farmed all his life. In the late 1970s he bottled Jersey milk in glass, and then in the 1980s made French type cheeses for six years after training with fourth-generation French cheesemakers. He has a Masters degree in Animal and Food Sciences from the University of Vermont. He has worked as a consultant to Vermont Shepherd and as a cheesemaker and quality control manager at Shelburne Farms and Vermont Butter and Cheese, after which he did some consulting in international development projects. Currently Peter holds workshops for farmstead cheesemakers at a New Hampshire farm, and works as a consultant in manufacturing and quality control of dairy products, especially cheese. He provides training and technical assistance in business establishment, including planning and cost analysis, and can help locate the proper equipment and develop recipes. Peter does telephone and on-site consulting. Contact him at (802) 387-4803.

Question: When browsing through Kosikowski's *Cheese and Fermented Milk Foods*, I came across the statement, "Adding formaldehyde to cheese milk legally to suppress the clostridia and other spoilage bacteria has been closely associated with Grana cheese production in Italy." I have made some Parmesan and Romano, which are still aging, and am wondering why such cheeses would require the addition of such a noxious chemical. -- Vicki Dunaway

Answer: *Clostridium tyrobutyricum* is an anaerobic, lactate-fermenting, spore-forming bacterium, which survives pasteurization, and is found in all cheese milk. It comes primarily from soil, surface water, feed polluted with soil, and particularly silage and haylage, in which these bacteria have the opportunity to develop. The critical pH to arrest their growth is 3.5 to 4.0.

If the numbers of spores haven't been kept low, they will cause serious damage to the cheese during aging. The clostridia metabolize lactate and produce hydrogen and carbon dioxide gas. Hydrogen gas cannot be absorbed into the water phase of the cheese. In cheeses with eyes like Gouda, Swiss and Danbo so much gas can be produced that cheeses will be ripped apart. This is called "butyric blowing" or "late blowing" and happens at three weeks to three months of age. In Grana cheese it is not possible for large cracks to form due to its low moisture content but textural problems can occur, such as small gas holes and cracks and surface bulges. These problems with texture and appearance are accompanied by unpleasant flavors that are produced by the bacteria's strong proteases.

In Denmark, where many varieties of cheeses with eyes are made, the accepted standard for sporeformers is 100-1000 spores per liter but the goal is to lower this to 10-100 per liter. For some private dairies in France, the standard for first class suppliers is a few hundreds of spores per liter, although this is still not sufficient to avoid the use of saltpeter (sodium and potassium nitrates). In Holland, milk with no more than 10 spores per liter is required to avoid blowing in cheeses. In the making of Grana cheeses in Italy (Parmigiano-Reggiano and Grana Padano), milk with counts of more than 1,000 spores per liter will cause problems during aging. For milk quality programs in the Parma-Reggio region, a test for the absence of clostridia in 10 ml of milk is used.

Grana cheese is susceptible to contamination from clostridia and other sporeformers for a few reasons:

- Cheeses are brine salted on the day following culturing. The salt is not fully absorbed into the middle of the cheese for four to five weeks. Therefore, there is a slow fermentation before brining and areas of low salt content in the cheese for a long time following brining.
- The cheese pH is relatively high before brining (5.3-5.4) and increases during aging.
- The aging temperature is relatively high (59-68° F).

All of these conditions allow the sporeformers an opportunity to grow.

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The presence of clostridia is high, above all, where silage forage is used. In regions outside Parma-Reggio, where Grana Padano is made, shredded corn silage is a normal component of the feed ration. The milk is enriched with clostridia, propionic, and other heterofermentative bacteria capable of causing problems during long aging. Formaldehyde is used to reduce bacterial populations, thereby preventing the growth of high numbers of sporeformers. In making both Grana Padano and Parmigiano-Reggiano, milk is set in shallow pans overnight for 12 hours to allow gravity separation of cream and hand skimming the following morning to standardize the fat content to 2.5%. In Parma-Reggio, where the number of sporeformers is much lower, this technique can reduce sporeformer numbers from 263 per liter to 18 per liter. This large reduction in spores constitutes an effective way to avoid bulges and other defects in the cheese.

In the production of A.O.C. Ossau-Iraty sheep cheese in the Atlantic-Pyrenees a count of 1000 spores per liter poses a risk to cheese quality; 2000 per liter causes real problems such as cracks, internal moisture and unclear flavors. There has been a steady increase in clostridia in milk from 1992 to 1997 (1157 spores/liter to 1780 spores/liter). This is explained by the increased use of milking machines and new types of feed such as silage and wrapped hay. Once in the farm environment, the spores will multiply under certain conditions in manure from animals that have ingested contaminated forage and through contamination of the udders from infected bedding material. Dirty and improperly sanitized milking and cheesemaking equipment will also aid in the spread.

The best way to control the sporeformers like clostridia is by having good silage quality, cleanliness, and hygiene. The silage pH and condition should be checked to ensure low clostridia counts. I've been asked about the use of haylage (wrapped bales and Ag-bags) for feed to make cheese milk. The same reasoning holds true; the quality must be assured. If there are rips in the wrapper and the hay has been exposed to the air for some time, don't use it to feed the milking animals. My experience has shown me that fresh grass and baled dry hay is the best forage to produce Grana cheeses, most brined large-wheeled cheeses, and cheeses with eyes.

Peter Dixon

Submit your question for Peter to "Mysteries of Cheese,"
c/o CreamLine, P.O. Box 186, Willis, VA 24380

References:

Kosikowski, Frank V. *The Quality of Raw Milk in Relation to Use: Production of Hard Cheese for Long Aging.*

Bottazzi, B., Battistotti, B., Bertozzi, L.. Istituto di Microbiologica Universita Cattolica Piacenza. *Cheese Technology-A Northern European Approach.* 1995.

Kristensen, J.M. Buch. International Dairy Books, Danish Dairy Board. *Guide de Fabrication des pates pressees.* S.I.C.A. CREOM ☘

Letters to the Editor

Vicki -- I currently have a small herd of Nubian goats and sell milk for animal use and make cheese at home. I'm researching the feasibility of doing a small-scale cheese operation -- to sell a few varieties of cheese off the farm and to restaurants. *CreamLine* seems to be just the info I'm looking for! J.B., Georgia (*name protected because I don't know the laws there!*)

(I'm passing this next one on to you, readers, because I'm not sure that it can be done part-time):

I am in need of any information I can find on part-time dairy farming (cows). To date I have been unable to find any. If there is any way that you could direct me to any information on part-time dairy farming, whether grass-based or conventional, or any information on getting started, this would be greatly appreciated. Todd Holtz, 15706 CTH-M, Cleveland, WI 53015

Dear Vicki -- Fantastic!! Really enjoyed reading ... re-reading ... rereading. ... I've herded goats for 11 years and have been anxiously awaiting the day to start my dairying. I've found some interest in cheesemaking from an older Italian gentleman who did make cheeses eons ago. Before producing anything I've got many other things to complete, viz. zoning, predators, etc. I farm 40 acres organically at one time but am not interested in CSA ... besides, they would not allow me into their farmers' market (Alachera) for they are against value added products. I'll keep you informed from time to time re progression towards cheesemaking (we're about 1-2 years down the road). Thanks for the uplift and motivation. Respectfully, Martin Young, Williston, FL ☘

Resource Review

Controlling the Physical Properties of Mozzarella

Cheese, video featuring Paul Kindstedt of Center for Dairy Research, University of Wisconsin, 1605 Linden Drive, Madison, WI 53706. 1991. 56 minutes. Available from the Center at www.cdr.wisc.edu/ (click on "Technical Resources, then "Resource Catalog"), or call (608) 265-2133. Price is \$23 for Wisconsin residents, \$28 for nonresidents.

This taped guest lecture at the Center for Dairy Research contains much technical information which would probably be quite useful for an advanced cheesemaker. Kindstedt (known as "Mr. Mozzarella" in cheese circles) explains how the qualities of the cheese are modified by moisture and fat content, and how to manipulate these factors. While the topic is mozzarella cheese, presumably much of the information is transferable to other types as well. The tape doesn't cover fresh mozzarella, instead concentrating on the stringy cheese used for pizza. Paul Kindstedt is a professor at the University of Vermont and has been instrumental in assisting farmstead cheesemakers in that state. (Kindstedt has since given up his cute Beatle haircut.)

The above review is reprinted from *The Small Dairy Resource Book*.

Mozzarella: Inventive Recipes from Leading Chefs with Buffalo Mozzarella. Boston: Periplus Editions, Ltd., 1999. Available by special order from most bookstores, or from New England Cheesemaking Supply, 85 Main St., Ashfield, MA 01330; www.cheesemaking.com. \$21.95, hardback.

Yes, this really is an entire book of recipes using buffalo milk Mozzarella. The four introductory pages do give some history on the topic and a general recipe, but no details for the cheesemaker to sink his or her teeth into. The photographs (by Sian Irvine) are succulent, and most of the recipes look do-able by reasonably competent cooks. Presumably, lacking the real thing, other (lesser) fresh Mozzarella could be substituted. If you have lots of mozz to use up and are tired of lasagne, this might be a good reference. ☘

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200 gallon rectangular cheese vat with knives, stirring paddle, vat strainer. \$3600 firm. **Over-the-vat curd mill** for cheddaring, \$1000. Sweet Home Farm (Alabama) (334) 986-5663.

3 year-old 83% Canadienne cow. Second calf born June 28, easy birth. Currently nursing calf, not being milked. Excellent, excellent mother. Purchased April 20 from Quebec dairy. She is difficult to lead. Doesn't like her head to be handled, but has no problem with her back half being handled. My farm has busy road between barn and pasture, so leading is necessary. Needs a good home set up like a dairy - where she can walk herself to pasture and back to the barn to be milked. Would prefer she be happy in a good home, rather than in my freezer. Curtiss Hallock, PO Box 370, Andover, ME 04216; phone (207) 364-7395.



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Coming up in *CreamLine*:

Fall Issue Feature -- Regulations & HACCP

American Cheese Society conference

Book Reviews -- Fundamentals of Cheese Science
The New American Cheese

Winter -- The Raw Milk Issue

Upcoming Events

Marketing Locally Processed Gourmet Cheese
Leraysville Cheese Factory, Leraysville, PA
August 9, 1 p.m. to 4 p.m.
Call (717) 664-7077 to register.

American Cheese Society 17th Annual Conference
"Terroir" (a sense of place)
August 10-13, 2000
Double Tree, Rohnert Park, CA
Call (262) 728-4458 or visit the web site
www.cheesesociety.org

Wisconsin Dairy Processing Field Days
9/13 Buckwheat Acres Goat Dairy, Three Lakes WI
10/26 Specialty Cheese Company, Lowell WI
Contact the WI Farm Center at 1-800-942-2474

CreamLine
P.O. Box 186
Willis, VA 24380

www.metalab.unc.edu/creamery

Address correction requested

Profitable Farmstead Cheesemaking September 20-21, 2000

Intensive two-day cheesemaking class at Goat Lady Dairy in Climax, NC, presented by owners Steve, Ginnie and Lee Tate. This workshop will consist of two intensive days of cheesemaking and business information and planning. Steve estimates that over half the course will be devoted to the details of cheesemaking, and wait times will be used for outlining what farmstead cheesemakers need to know to build a profitable business. The course fee is \$250, and will include course materials, meals and snacks. Class size is limited to 18 participants.

Advanced Cheesemakers' Seminar September 22, 2000

Peter Dixon, a dairy consultant from Vermont, will lead this full-day session at Goat Lady Dairy, intended for experienced cheesemakers interested in the finer points of the art. (Folks who completed the September 20-21 intro class will also be welcome.) Peter has a great deal of experience in establishing small-scale cheesemaking plants and developing recipes and techniques. Cost is \$100, limited to 18 registrants.

Contact HCR, P.O. Box 186, Willis, VA 24380; phone (540) 789-7877 (before 9 p.m. Eastern time), e-mail ladybug@swva.net. Or visit our Processing Courses page on the Web: www.metalab.unc.edu/creamery