



UCCE Master Food Preservers of Amador/Calaveras County

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Make & Take: Cheese

The recipes included in this handout are recommended for beginners. These are soft cheeses and require little equipment to produce. They are eaten fresh, requiring no long aging times. These cheeses must be kept in the refrigerator and will keep for about one week.

Food Safety Concerns

There are four major pathogens associated with fresh cheese that can cause foodborne illness. They are: *Salmonella*, *E. coli*, *Listeria monocytogenes*, and *Staphylococcus aureus*. These pathogenic bacteria are controlled by good sanitation of equipment and food contact surfaces, proper cooking, cooling and handling of cheese curds during processing, and proper hand washing.

Essential Tools/Equipment

1. Large stock pot, generally 6 to 8 quarts. The pot should be stainless steel or unchipped enamel. Avoid pots made of aluminum or other reactive metals.
2. Thermometer, digital or a candy thermometer. Make sure the thermometer goes low enough for your recipe as some candy thermometers start at 200°F.
3. Measuring spoons and cups, stainless steel, glass or plastic.
4. Long-handled spoon and slotted spoon. You need a spoon for stirring as well as a spoon to remove the curds from the whey. They can be stainless steel, plastic or nylon. However, stainless steel is the easiest to clean.
5. Large bowl for catching drained whey.
6. Cheese cloth, butter muslin or flour sack towel to drain the curds.
7. Colander or strainer made from any non-reactive material (plastic, metal, enamel). As with other utensils, avoid aluminum or other reactive material, even when lined with cheesecloth.

Clean and sterilize all equipment before and after cheese making. Most home cheese making failures are caused by unclean or unsterile equipment. When finished with a utensil, rinse it thoroughly with cold water. Then wash it in hot water with a good dishwashing detergent. Rinse thoroughly in hot water.

Sanitization

You must sterilize your equipment before use.

1. Boil all cheese-making equipment for 5 minutes or soak all cheese-making equipment in a bleach water solution for 2 minutes.
2. Reuse cheese cloth, butter muslin or flour sack towel **only** if they have been sanitized.

Bleach Water Solution:

- 1 gallon of water
- 2 tablespoons household unscented bleach

Cleaning and Reusing Cheesecloth or Butter Muslin

If the cloth is only used to drain curds, it will not be as difficult to clean as if it is used to press or age cheese for a long period of time.

How to Reuse Cheesecloth or Butter Muslin:

1. Rinse immediately after use.
2. Wash in the washing machine or by hand in the sink.
3. Avoid detergents and fabric softeners. Use only mild detergent if necessary, and rinse thoroughly to remove any soap residue.
4. If there are bits of curd sticking to the cloth, rinse with whey or white vinegar to help remove it.
5. For sterilization, boil the cheesecloth or butter muslin for about 5 minutes or soak it in the Bleach Water Solution. If soaking in bleach solution, rinse thoroughly before hanging it out to dry.
6. As soon as the cheesecloth or butter muslin is dry, fold and store in a zipper-style plastic bag until ready to use again.

Milk

Milk is a complicated substance. Seven-eighths of it is water. The rest is proteins, minerals, milk sugar (lactose), milk fat, vitamins and trace elements. As a result, variation in the quality of cheese does occur, depending on the type of milk used. When we make cheese, we cause the protein part of the milk to curdle. Cheese can be made from whole milk, 2%, 1%, skim milk or reconstituted milk powder.

Whatever type of milk used, it should always be pasteurized. The fresher the milk, the better the cheese.

- Raw milk is that which is collected from a dairy animal and not processed further. **It may contain harmful bacteria. Raw milk should be pasteurized before it is used in the production of soft cheese.**
- Pasteurized milk is milk that has been heated to destroy all pathogens. All milk purchased in the store has been pasteurized.
- UT (Ultra-Pasteurized) or UHT (Ultra High Temperature) pasteurized milk is milk that has been heated to 191° to 212°F and 280°F respectively to kill bacteria and extend shelf life. Avoid using this milk as this process changes the protein structure of the milk, preventing it from separating into curds and whey.
- Homogenized milk is milk that has been subjected to a process that breaks up the fat globules so that they will no longer separate from the milk. Most milk purchased at the store has been homogenized. You can use homogenized milk to make cheese.
- Whole milk is pasteurized milk with 3.25% fat (by weight)
- Skim milk is milk that has had some or all of its fat removed.
- Homogenized milk is milk that has been subjected to a process that breaks up the fat globules so that they will no longer separate from the milk. Most milk purchased at the store has been homogenized. You can use homogenized milk to make cheese.
- Milk Powder can be reconstituted and used in cheese making.

Pasteurization

Pasteurization destroys most disease producing organisms and limits fermentation in milk, beer and other liquids by partial or complete sterilization. The pasteurization process heats milk to 161°F for 15 seconds, inactivating or killing organisms that grow rapidly in milk. Pasteurization does not destroy organisms that grow slowly or produce spores. While pasteurization destroys many microorganisms in milk, improper handling after pasteurization can re-contaminate milk. Raw milk can also be pasteurized on the stovetop. Microwaving raw milk is not an effective means of pasteurization because of uneven heat distribution.

How to pasteurize milk

Milk must be heated, with agitation, in such a way that every particle of the milk, including the foam, receives a minimum heat treatment of 145°F continuously for 30 minutes or 161°F for 15 seconds. The temperature should be monitored with an accurate metal or protected glass thermometer. Commercial operations commonly use a high temperature, short-time process in which the milk is heated to 170°F for 15 seconds and then cooled immediately to below 40°F to increase storage life without any noticeable flavor change in the milk. Pasteurization of fluid milk has very specific requirements for time and temperature as listed in the chart.

Temperature-Time Pasteurization Requirements for Fluid Milk

<i>Temperature</i>	<i>Time</i>
145°F	30 minutes (vat pasteurization)
161°F	15 seconds (high temperature, short time pasteurization)
191°F	1 second (Higher-Heat, Shorter Time)
212°F	0.01 second

Cheese Salt

Cheese salt is merely a salt that is non-iodized. Iodized salt harms and inhibits bacterial growth and well-being that is essential to any good cheese-making. **You can use any non-iodized salt in cheese-making.** Salt is important in a number of cheese-making steps: it adds to the flavor of the cheese, it helps to dry the curds during draining and it will help to kill bacteria and other harmful growth when used as a brine.

Whey

Whey is the yellowish liquid left over when you make various cultured milk products. There are actually two kinds of whey, and they have different uses.

1. Acid Whey

- Acid whey is the liquid produced from making more acidic cultured dairy products such as paneer, feta, chevère, or **whole milk ricotta**.
- Uses for Acid Whey
 - Soak grain in acid whey for making breads.
 - Feed acid whey to animals. They may like sweet whey better than acid whey. Whichever kind you feed them, be careful, because it can upset their digestion if they consume too much. Cats should not be feed whey.

2. Sweet Whey

- Sweet whey is the liquid that is produced when making hard cheese like cheddar or **most soft cheeses**.
- Uses for Sweet Whey:
 - Use sweet whey the same way you use acid whey
 - Add it to smoothies and shakes to provide more vitamins, minerals, and proteins.
 - Use as cooking liquid for potatoes, rice, grits, pasta, and grains.
 - Drink it straight!
 - Make whey cheeses.
 - Put it in your compost pile. It adds nutrients and makes thick, black compost.

Whey may be frozen up to 3 months until used.

Testing the Accuracy of a Thermometer

It is important to test the accuracy of your thermometer and make any necessary adjustment to assure your final product is neither over- or under-cooked. Here is a quick and easy method to test the accuracy.

1. At sea level, water boils at 212°F. With each 500-foot increase in elevation, the boiling point of water is lowered by just under 1°F. At 2,500 feet, for example, water boils at about 207°F. Determine your elevation and then refer to the chart below to determine the temperature at which water should boil at your elevation. This will be your baseline.
2. Insert the thermometer into a pot with at least 2 inches of water and bring the water to a rolling boil. The amount of water needs to boil for at least 10 minutes. The bubbles should be constant and vigorous. Leave the thermometer in the water for 10 minutes to give it time to get an accurate reading. Make sure the bulb of the thermometer is fully immersed in the water the entire time and that it is not touching the bottom or sides of the pot—this can give a false reading.
3. Inspect the temperature on the thermometer making sure you are eye level with the thermometer and not looking at it from an angle. If it is 212°F (or the corresponding temperature for your elevation shown in the chart, below), your thermometer is accurate!
4. If the thermometer is off by a few degrees or more, take this temperature difference into account when doing all future cooking with the thermometer. For instance, if you are at sea level and your thermometer registers 215°F when inserted in boiling water, you know that your thermometer reads

temperatures 3° hotter than it should. If you have a recipe that calls for a temperature of 220°F, you need to add 3° and reach 223°F on your thermometer. On the other hand, if you are at sea level and your thermometer registers 210°F in boiling water and your recipe calls for a temperature of 220°F, you will need to reduce that temperature by 2° (the difference between the actual reading and the temperature at which water should boil at sea level). Make a note of the inaccuracy so that you can easily remember the "thermometer adjustment" required for your elevation.

5. Perform this test on a regular basis, to ensure that your conversion is still accurate. Make a note of the adjustment that needs to be made either on the thermometer with a Sharpie or record your findings below. If you find that you are regularly getting drastically different results from your calibration that means your thermometer is no longer reliable and it is time to replace it.

Elevation (Feet)	Boiling Point of Water	Gelling Point of Jam
Sea Level	212°F	220°F
500	211°F	219°F
1,000	210°F	218°F
1,500	209°F	217°F
2,000	208°F	216°F
2,500	207°F	215°F
3,000	206°F	214°F
3,500	205°F	213°F
4,000	204°F	212°F
4,500	203°F	212°F
5,000	202°F	211°F
5,500	201°F	210°F
6,000	200°F	209°F
6,500	199°F	208°F
7,000	198°F	207°F
7,500	197°F	206°F

Record Your Findings Below

Your elevation: _____

Boiling water temperature _____ Degrees variance * _____ Date: _____

*Difference between the boiling point of water shown above for your elevation and the actual reading on your candy thermometer.

Adjust recipes as follows:

- If your thermometer reads higher than the temperature shown in the above table, **add** the difference to the stated temperature in your recipe.
- If your thermometer reads lower than the temperature shown in the above table, **subtract** the difference from the stated temperature in your recipe.

Recipe: Mozzarella Cheese

Makes approximately ¾ pound

Ingredients

- 1 gallon milk (not ultra-pasteurized)
- 1-1/4 cup cool water (chlorine-free)
- 1-1/2 teaspoon citric acid
- 1/4 rennet tablet or 1/4 teaspoon liquid rennet
- 1 teaspoon cheese salt (optional) (Salt substitutes and/or herbs can be used as an alternative.)

Equipment

- 1 gallon stainless steel pot or any non-aluminum or non-cast iron pot
- Instant-read thermometer or candy thermometer
- Measuring cups and spoons
- Colander or strainer
- Butter muslin, flour sack towel or cheese cloth
- 4-quart mixing bowl to collect whey
- Slotted spoon
- Extra spoon
- Long knife
- 2-quart microwaveable bowl (Pyrex)
- Rubber gloves
- Microwave
- Timer

Mozzarella Cheese Instructions

Before you start, put on your gloves.

1. Dissolve ground/liquid rennet in ¼ cup of cool, chlorine-free water. Stir; set aside.
2. Mix 1-1/2 teaspoons citric acid into 1 cup cool, chlorine-free water. Ensure the citric acid is fully dissolved.
3. Pour the citric acid solution into your pot.
4. Pour 1 gallon of milk quickly into the pot and stir vigorously.
5. Heat milk slowly to 90°F while stirring. Use thermometer to check temperature.
6. Take pot off burner, add rennet solution while stirring slowly top to bottom (folding) for approximately 30 seconds.
7. Cover pot with lid and leave undisturbed for 5 minutes.
8. Check the curd. It should look like custard, with a clear separation between the curd and the whey. If the curd is too soft or the whey is milky, let sit for a few more minutes.
9. Cut the curds in a 1-inch checkerboard pattern with a long knife.

10. Place pot back on stove and heat to 105°F while stirring slowly and gently. Use thermometer to check temperature.
11. Take the pot off the burner and continue stirring slowly for 2 – 5 minutes. (More time will make a firmer cheese.)
12. Place the colander over a 4-quart bowl or pot that will catch the whey. Scoop the curds from your pot with a slotted spoon and place them in the colander. Drain off as much of the whey as you can without pressing the curds too much.
13. Put the curds into a microwave safe bowl (Pyrex glass). If you still have small curds floating in the whey, place a piece of cheese cloth over the colander and pour the whey into the cheese cloth-lined colander. Add the small curds to the microwave safe bowl.
14. Microwave the curds on HIGH for 15 seconds. Drain the free whey into your bowl or pot. **Add salt.** Gently knead or fold the curds into one piece with a spoon or your gloved hands.
15. Repeat #14 until the curds reach a temperature of 135°F. The cheese should be soft and pliable enough to stretch like taffy. Stop heating at this point.
16. Stretch the cheese by pulling like taffy until it is smooth and shiny. The more you work the cheese, the firmer it will be. Form into one or 3 balls to share.
17. Drop cheese balls into ice water to cool.
18. When cold the cheese will last several days refrigerated. Eat or refrigerate you cheese within 2 hours.
19. Clean up following the Sanitary Standard Operating Procedures.

Source: Clemson Cooperative Extension

http://www.clemson.edu/extension/hgic/hot_topics/2017/12%20home_cheese_making_mozzarella.html

Recipe: Ricotta Cheese

Makes 4 cups or approximately 1 ¾ pounds. This recipe may be cut in half.

Ingredients

- 1 gallon whole milk (*not ultra-pasteurized*)
- 2/3 cup lemon juice (fresh or bottled) **or** 2/3 cup distilled white vinegar **or** 1 teaspoon citric acid (available in canning supplies or from cheese-making suppliers)
- 2 teaspoon salt, optional

Equipment

- 8-quart pot
- Instant-read thermometer or candy thermometer
- Measuring cup and spoons
- Cheese cloth, butter muslin or flour sack towel
- Strainer of colander
- 4-quart mixing bowl for whey
- Extra bowl
- Spoon for stirring
- Slotted spoon
- Timer

Ricotta Cheese Instructions

- **Warm the milk to 200°F:** Pour the milk into a 8-quart pot and set it over medium heat. Let it warm gradually to 200°F, monitoring the temperature with an instant read thermometer. This could take as long as an hour. The milk will get foamy and start to steam; remove it from heat if it starts to boil.
- **Add acid and salt:** Remove the milk from heat. Pour in the vinegar or lemon juice (or citric acid) and the salt. Stir gently to combine.
- **Let the milk sit for 10 minutes:** Let the pot of milk sit undisturbed for 10 minutes. After this time, the milk should have separated into clumps of milky white curds and thin, watery, yellow-colored whey — dip your slotted spoon into the mix to check. If you still see a lot of un-separated milk, add another 1 to 2 tablespoons of lemon juice or vinegar or 1/8 teaspoon of citric acid and wait a few more minutes.
- **Strain the curds:** Set a strainer over a bowl and line the strainer with cheese cloth. Scoop the big curds out of the pot with a slotted spoon and transfer them to the strainer. Pour the remaining curds and the whey through the strainer. (Removing the big curds first helps keep them from splashing and making a mess as you pour.)
- **Drain the curds for 10 to 60 minutes:** Let the ricotta drain for 10 to 60 minutes, depending on how wet or dry you prefer your ricotta. If the ricotta becomes too dry, you can also stir some of the whey back in before using or storing it.
- **Use or store the ricotta:** Fresh ricotta can be used right away or refrigerated in an airtight container for up to a week. For longer storage, it may be frozen for up to 6 months.
- **Making Fresh Ricotta Salata:** If you'd like to make a fresh farmer's cheese (Ricotta Salata) from this ricotta, wrap it in cheese cloth and press it beneath a weighted plate in the refrigerator overnight.

Source: adapted from New Mexico State University, http://aces.nmsu.edu/pubs/_e/E216/

Recipe: Whey Ricotta Cheese

Ricotta cheese is made by heat-acid precipitation of proteins from blends of milk and whey.

Ingredients:

- 1 quart (940 ml) vinegar (5% acetic acid)
- 25 gallons (94 L; 200 lb; 90.72 kg) heat-treated or pasteurized whey
- 2.5 gallons (9.4 L; 20 lb; 9.07 kg) pasteurized whole milk

Procedure:

1. Add whole milk to fresh whey, then heat to 185°F (85°C). Heating must begin immediately after the whey is removed from the curd to prevent further acidification by the lactic acid bacteria. Some small curd particles will form.
2. **Slowly add about 2 teaspoons of vinegar per quart of whey with gentle agitation.** You will see more curd particles forming and the whey will become less "milky."

Note: *More vinegar may be added depending on the amount of milk used. Continue adding vinegar until the whey is quite clear. By adding the vinegar slowly over a time period of about 5 minutes you will obtain better quality curd and it will be easier to know when to stop.*

3. Pour into a cloth to separate the curds. After the curd is dripped dry it is ready to eat.

Source: University of New Mexico - https://aces.nmsu.edu/pubs/_e/E216

Recipe Reductions

Whey	Milk	Vinegar
1 gallon (128 ounces)	12.8 ounces (12 ounces + 5 teaspoons)	1.3 ounces (2 Tablespoons + 2 teaspoons)
3/4 gallon (96 ounces)	9.6 ounces (9 ounces + 4 teaspoons)	.96 ounces (2 Tablespoon)
1/2 gallon 64 ounces	6.4 ounces (6 ounces + 2-1/2 teaspoons)	.64 ounces (4 teaspoons)
1 quart (32 ounces)	3.2 ounces (3 ounces + 1-1/4 teaspoons)	.32 ounces (2 teaspoons)

Recipe: Flavored Mozzarella Cheese

Fresh mozzarella cheese

Oil

Your favorite mix of dried spices and herbs (try lavender!)

Kosher salt and freshly ground pepper

1. Lightly oil a mini cake pan; shaped ones are fun.
2. Take a small amount of cheese that will fill the mini pan, lightly oil the outside and rub spice/herb mixture. Press into mini pan.
3. Cool, pop out of pan



Recipe: Raspberry Lemon Ricotta Cake

1-1/2 cups all-purpose flour

1 cup granulated sugar

1 teaspoon baking powder

3 large eggs

15 oz. ricotta cheese

1/2 teaspoon lemon extract

1 lemon, zest and juice

1 stick salted butter, melted

2-1/2 cup milk

1 cup frozen raspberries

Optional Topping:

whirl lemon on top

before baking

Cooking spray

1. Preheat oven to 350°F. Grease a 10" spring form pan with cooking spray.
2. Combine flour, sugar and baking powder in a bowl; mix well.
3. In a separate bowl, whisk the eggs, ricotta, lemon extract, lemon zest and juice until smooth; then fold in the dry ingredients until blended.
4. Gently fold in butter and 1 cup of raspberries. Pour batter into the spring form pan. Top the batter with the remaining 1 cup of raspberries; then bake for approximately 50 minutes or until the cake is golden brown and a tester inserted into the middle comes out clean.
5. Allow to cool 15-20 minutes before removing it from the pan. Store tightly wrapped at room temperature. Can be made up to 2 days ahead.

Source: Carrie's Experimental Kitchen

Recipe: Lasagna Roll-ups

12 uncooked lasagna noodles

2 large eggs, lightly beaten

1 package (10 ounces) frozen chopped spinach, thawed and squeezed dry

2-1/2 cups whole-milk ricotta cheese

2-1/2 cups shredded part-skim mozzarella cheese

1/2 cup grated Parmesan cheese

1/4 teaspoon salt

1/4 teaspoon pepper

1/4 teaspoon ground nutmeg

1 jar (24 ounces) meatless pasta sauce

1. Preheat oven to 375°F. Cook and drain noodles according to package directions.
2. Mix eggs, spinach, cheeses and seasonings.
3. Pour 1 cup pasta sauce into an ungreased 13x9-in. baking dish. Spread 1/3 cup cheese mixture over each noodle; roll up and place over sauce, seam side down. Top with remaining sauce. Bake, covered, 20 minutes. Uncover; bake until heated through, 5-10 minutes.

Recipe: Ricotta, Kale and Artichoke Quiche

6 cups kale, about 6 to 8 large leaves finely chopped
 4 large, canned or frozen artichoke hearts (about 6 oz)
 1 medium onion, chopped
 1 clove garlic, minced
 1 tablespoon olive oil -
 Salt and pepper to taste
 1/2 tsp grated nutmeg
 1 tablespoon dried bread crumbs

For the Cheese Mixture

1 cup ricotta cheese
 3 large eggs
 1 cup milk
 1 cup cheddar cheese
 1 tablespoon flour
 Salt and pepper to taste

- 1 Wash clean, pat dry kale. Chop artichokes into thin slices.
- 2 Sauté onion and garlic in oil. Add the artichoke; sauté 1 minute Add kale. Cook 4 minutes. Season with salt and pepper to taste Set aside to cool slightly.
- 3 In a bowl add the ricotta and milk. Whisk until smooth. Add the eggs and whisk well making sure no lumps. Season with salt and pepper.
- 4 Place the cooked kale-onion-artichoke mixture into a pie dish; sprinkle with grated cheddar.
- 5 Evenly pour the ricotta mixture in the pie dish. Sprinkle nutmeg and breadcrumbs on top.
- 6 Bake in a preheated oven at 340°F for about 30 minutes.
- 7 Let the quiche rest for at least 20 minutes before you cut.

Recipe: Hot Whey Toddy (Whey may be frozen until used.)

1/2 cup maple syrup	A dash of cinnamon
1/2 cup water	3 cups whey (You can use any kind of whey for this –
2 or 3 lemon slices	sweet, acid, goat, sheep, etc.)
3 or 4 cloves	1/4 cup bourbon (optional)

1. Heat maple syrup and water with cloves, cinnamon, and lemon slices.
2. Strain whey through butter muslin. Strain the lemons and cloves through the same muslin.
3. Heat again and when very hot, add bourbon (or not). Drink and be merry.

Source: Jeri Case, 2018

On-Line Resources and References

- Center for Dairy Research, Madison, WI , www.cdr.wisc.edu
- Clemson Cooperative Extension
http://www.clemson.edu/extension/hgic/hot_topics/2017/12%20home_cheese_making_mozzarella.html
- Making Homemade Cheese, New Mexico State University, http://aces.nmsu.edu/pubs/_e/E-216.pdf
- Oregon State University (2002). Fresh cheese made safely. Pacific Northwest Extension publication. Available at: <http://extension.oregonstate.edu/lane/sites/default/files/documents/pnw0539.pdf>
- New England Cheese Making Co., <https://www.cheesemaking.com/learn/faq/milk.html>
- International Dairy Foods Association, <http://idfa.org/news-views/media-kits/milk/pasteurization>

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