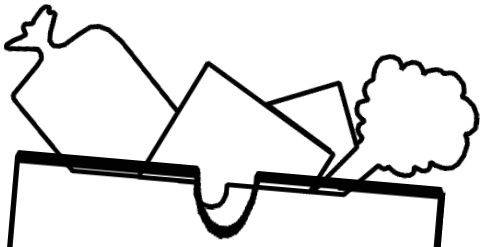
## *Rennet Cultured Cheese*

This cheese can be made without the calcium chloride or the starter culture (bacteria). However you will end up with a softer cheese with little flavor. The calcium chloride helps to firm the cheese curds and the culture (with aging) gives the cheese its flavor.



**Materials**

- starter culture, available from Utah AITC, $10 for two crock pot batches or order mozzarella cheese kit from the New England Cheesemaking Co. www.cheesemaking.com
- crock pot
- rennet
- *vinegar or optional*, bacteria starter & calcium chloride
- eyedropper
- cheese cloth
- thermometer
- large spoon
- large knife
- colander
- 4 cups powdered milk
- salt
- *optional*, half & half, herbs, crackers

Procedures

1. Mix dry milk to make 1 gallon minus one cup. Use water from tap running at approx. 85-90° F.

2. Cool in 1 gallon (or larger) crock pot to 85° F.

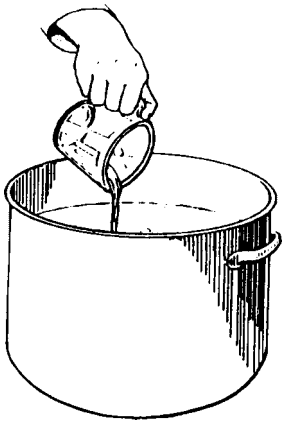
3. Why is it important that the temperature of the milk stay at 85° F? (This is the optimal temperature for this bacteria culture to act. A hotter temperature can kill the culture, and a cooler temperature can stop the action completely.)

4. *Optional.* Add one packet direct set starter culture. (Order from Utah AITC or New England Cheese Company). Let milk set at 80° F for 30 min. If you choose not to add the culture, add 1/3 cup of vinegar. The crockpot is well enough insulated to keep temperature constant, there is no need to turn it on yet.

Discussion

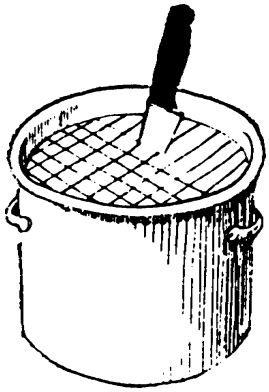
At this point, if you added bacteria, the bacteria are converting milk sugar to lactic acid (like in yogurt). This creates an acidic environment which makes rennet more effective when added later. (If you added the vinegar this should be will be sufficient to thicken the milk when the rennet is added). You may want to mention that a cow's stomach, where rennet is found, is an acidic environment, just as in humans.

5. Bring temperature back up if it has decreased. Turn crock pot on and heat milk to 80° F to 90° F. Turn off crock pot. Rennet coagulates milk best at 90° F and when ripened (acidified) by culture bacteria. Do not heat milk above 90° F especially if you have added starter culture.



6. *Optional.* Add calcium chloride. For each gallon of milk used, add 1/2 teaspoon of liquid calcium chloride diluted in 2 tablespoons water. Mix thoroughly into milk just before adding rennet. The protein in pasteurized milk has been altered. Calcium chloride prevents development of poor quality curd (soft).

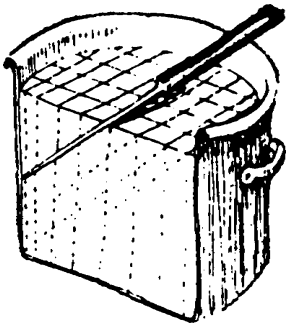
7. Add rennet. Always dilute rennet in cool water before adding to milk. For one gallon of milk, use 1/2 rennet tablet dissolved into 1/4 cup cool water. Stir dissolved rennet gently into milk in up and down motions for one minute.



8. Cover and allow milk to set 30-45 minutes or until the milk forms a solid curd that shows a "clean break." To test for a "clean break," a knife into the curd at an angle. If the curd breaks cleanly around the knife, the curd is ready. If the curd is more like a soft yogurt, wait a little longer.

9. Cut the curd with a long-blade stainless steel knife. Cut 1-inch slices of curd all the way across the pot. Rotate the pot 90° and repeat. Now follow the same lines and cut the curd diagonally, at an angle 45° F to the counter. You are trying to make small blocks.

10. Turn crock pot on high and heat curd 2° F every 5 minutes to 100-115° F. If curd is heating too rapidly, decrease heat to low. To ensure even heating and to prevent the curd from matting together, continuously stir the curd slowly and GENTLY while heating. As you find larger pieces, cut them to uniform size. It is helpful to keep a large bowl close by and scoop out whey (liquid portion) as the curd shrinks and separates from



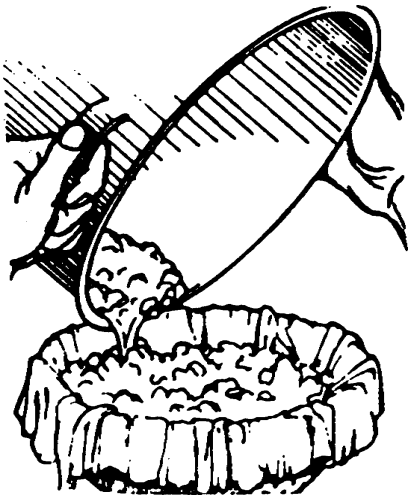
the whey. You may want to mention the nursery rhyme Miss Muffet to remind students that they are familiar with the terms "curds and whey."

11. Line a colander with fine cheesecloth and pour the curds and whey into the colander. Allow to drain approximately 5 minutes. Rinse the bag of curd in cool water. This removes some of the whey and leaves a cheese that is not sour.

12. Drain the curd for one hour or until the whey stops dripping.

13. Break up the curd. Remove the cheese from the cheesecloth and place in bowl. Break-up mass of curd gently with clean hands or a fork. Do gently so as not to break the curd.

14. Mix in 1/2 teaspoon salt. If you added a starter culture and calcium chloride place the curds in cheese cloth under pressure; a plate with books on top will work or a gallon jug full of water. Allow the curds to drain completely. Place the cheese in a refrigerator. For a more solid brick, continue the pressure by adding more books or some other weight. Store in a refrigerator at least for a couple of days. If you did not use a starter culture, allow the curds to drain completely then cut up or use a fork to make the cheese curds look like cottage cheese. Add a small amount of cream or whole milk for a creamier consistency. Flavor with herbs and serve with crackers.

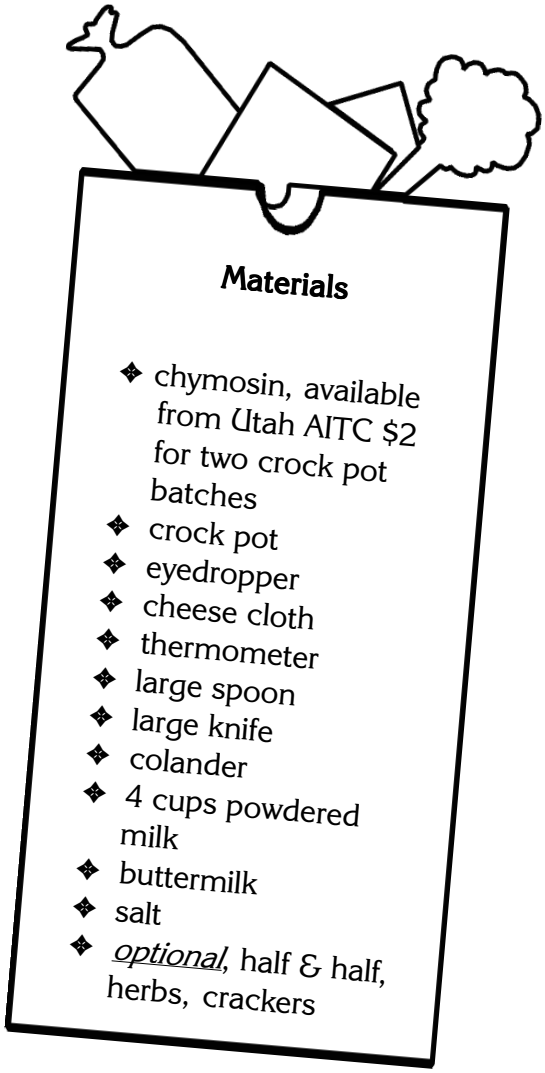


## Biotech Cheese

The company which genetically engineered the bacteria to produce the enzyme named the enzyme chymosin. When the bacteria make chymosin it is called a recombinant enzyme, or recombinant Chymosin (rtChymosin). ChyMax and Maxiren are two brand names given to rtChymosin produced by different companies.

**Why is making chymosin important?**

Milk fed calves are slaughtered to use their stomachs as a supply of rennin for cheese manufacturing. The number and age of calves sent to slaughter houses vary from year to year, so the supply and quality of rennin vary as well. Scientists now grow the new organism that carries the enzyme-producing gene so the enzyme can be extracted and purified and concentrated. This creates an endless supply of good quality product.

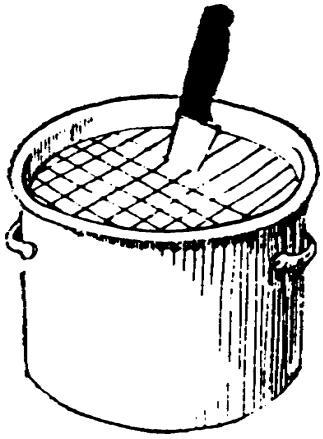



Preparation

1. See how much your crock pot holds. Use an empty gallon milk jug, fill jug with water pour it into crock pot.
2. Adjust amounts of milk to be used accordingly. You want 3 parts milk (use powdered milk reconstituted at approximately 90-95° F, 35-40° C, to save time in not heating the milk (heating cold milk takes a long time), 1 part buttermilk, use 12 cups milk ( 3 quarts) and 4 cups buttermilk (1 quart) or use 9 cups milk and 3 cups buttermilk for smaller crock pot.
3. Check the temperature range of your crock pot to see how hot it gets on low and high settings.
4. Warm milk and buttermilk as much as possible to save class time.

Procedure

1. In crock pot measure 12 cups milk ( 3 quarts) and 4 cups buttermilk (1 quart).

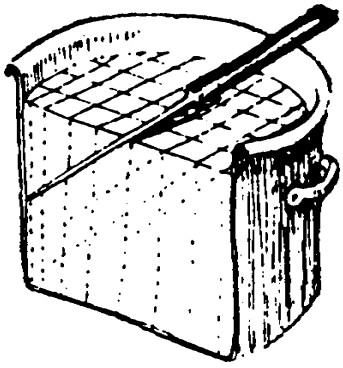


2. Heat to 90° F and turn off crock pot.

3. Add 10 drops chymosin. Stir very slowly 2 - 3 minutes in one direction. If students stir counter-clockwise, it slows down the enzyme action.

4. Let mixture sit 10-20 minutes to set up (pudding consistency). If mixture is not thick enough to cut, let it incubate longer. Check temperature and warm to 90° F if necessary.

5. Using a large knife, cut the curd by cutting 1- inch slices across curd, and then cutting again at 90° angle to the first cuts. See the graphic on page 39.

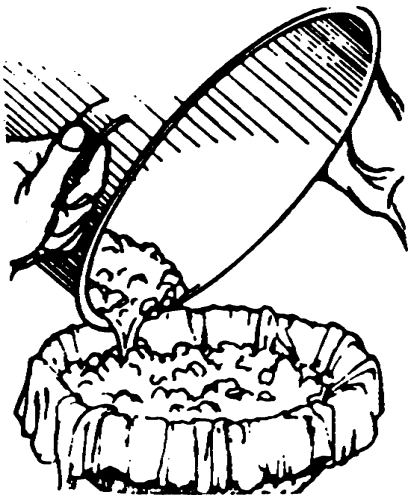


6. Bring the temperature up to 102° F - 105° F while stirring slowly in one direction, and whey will form.

7. Turn off the heat and stir this mixture for about 5 minutes after the temperature is reached. Do not let the temperature go over 105° F.

8. Put cheese cloth into colander and put colander over sink or container to catch whey.

9. Pour mixture into a colander to drain.



10. Wrap cheesecloth around curds, and press whey out. You can weight it down with a milk jug filled with water if desired.

11. When the whey stops draining, cut or break up the cheese with a fork, and salt. Add a small amount of cream or whole milk for a creamier consistency. You can flavor the curds with different herbs and then serve the cheese on crackers.