Marvelous Mozzarella

Purpose: Students will make fresh mozzarella cheese and discover the science (changing a liquid to a solid), art, and craft involved in the development of specialty cheese.

Background: Cheese is one of many products made from **milk**. The exact date of origin for cheese is unknown, but it has been found in Egyptian tombs and murals from 4,000 years ago. It is thought that cheese was discovered by accident when it was common to store milk in a container made from an animal stomach. The **enzyme rennet** is found in ruminant stomachs. When added to milk, it causes the milk to coagulate and separate curds (solid proteins) from whey (liquid). This means that if milk is stored in a ruminant stomach (a common practice before glass and plastic), the milk will turn into fresh cheese.

Today, the art of making cheese has become much more technical. Now there are hundreds of cheese varieties which can be grouped into eight categories including blue, hard, pasta filata, processed, semi-hard, semi-soft, soft and fresh, and soft-ripened. Currently, more than one-third of all milk produced each year in the United States is made into cheese.

Materials: 1 gallon milk, ½ cup water (split), 1 ½ tsp citric acid, Rennet, 1-3 tsp salt, large pot with lid, colander, microwave safe bowl, long knife to cut curds, slotted spoon, 2 small bowls, thermometer, measuring cups and spoons, stove or hot plate, microwave

Helpful Information:

Use whole or 2% milk. Do not use UHT (ultra-high temperature) pasteurized milk. Milk pasteurized at temperatures below 170° F will form the best curd. Non-chlorinated water is recommended to dissolve rennet tablets. Citric Acid can be found in most grocery stores with the home canning supplies. Rennet is available in liquid and tablet form. Follow the label directions for determining the quantity of rennet used per gallon of milk.

Activity:

1. In a small bowl, mix ¼ cup water and 1 ½ tsp citric acid.
2. In another small bowl, crush rennet tablet and stir in ¼ cup non-chlorinated water. (Skip this step if using liquid rennet.)
3. Pour 1 gallon of milk into a large pot and place on stove or hot plate on med-high heat. Attach a thermometer.
4. Add the citric acid and stir well. Continue heating the milk mixture until it reaches 90° F.
5. Once milk reaches 90° F, remove from heat, add rennet, and stir for 30 seconds.
6. Cover pot with lid and let set for 10 minutes.
7. Use knife to cut curd. If the curd clearly separates from the whey, cut the curd into a 1" checkerboard pattern. *If the curd is breaking into small pieces, see note.
8. Place pot back on the stove and heat to 105° F while slowly stirring the curds. Once it reaches temperature, take the pot off the burner, and stir for 2-5 minutes.
9. Place the colander inside a large bowl. With a slotted spoon, scoop the curds into the colander. Pour off any additional whey.

10. Transfer the cheese to the microwave safe bowl and microwave on high for 1 minute.
11. Drain off the whey, add 1 tsp salt, and knead cheese with a spoon.
12. Microwave two more times for 35 seconds each. Repeat the kneading process and drain off additional whey each time.
13. Knead quickly just like you would bread dough. It should be smooth and shiny. Add more salt (1-2 tsp) to taste during the final knead and stretch.
14. Form into a loaf for slicing. The mozzarella is ready to eat as soon as it cools slightly. It is recommended to provide crackers for the taste testing.

Note: If you purchased your milk from a grocery store, the curd will likely form smaller chunks in step 7. It will also be less stretchy and shiny in steps 12 and 13. Commercial dairy processing plants most often pasteurize their milk at a higher temperature than what is ideal for cheesemaking, but it still works for a classroom demonstration.

Resources:

- Florida Dairy Farmers
  - https://www.floridamilk.com/in-the-schools/dairy-curriculum/