

Cheese Connoisseurs

6th to 12th Grade

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 when someone would store milk in a **ruminant stomach** (a common practice before glass and plastic), their milk would turn to 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.

Vocabulary: After reading this newsletter, grab a separate sheet of paper and write down all the words in bold. Then look up the definition of each word.

You may find some of the definitions in this newsletter!

Marvelous Mozzarella

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

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.

Let's Make Cheese!

Raving Ricotta

Materials:

- 1 cup heavy cream
- 4 cups whole milk
- ½ teaspoon salt
- 3 tbsp lemon juice or white vinegar
- saucepan
- strainer
- large bowl
- paper towels or cheesecloth

Activity:

1. Line it! Line a strainer with a couple layers of damp paper towels or cheesecloth, and set inside a large bowl.
2. Heat it! In a saucepan, combine heavy cream, milk and salt. Bring to a boil over medium-high heat.
3. Strain it! Once boiling, shut off heat, and stir in the lemon juice or vinegar. Remove from heat, and let sit for 10 minutes. Put it in a strainer, and drain for 20 minutes. Enjoy!

Did You Know?

Milk of all mammals, from the egg-laying platypus to the social-networking human, contains a mix of whey and casein proteins. In humans, the concentration of the two is almost evenly split, with 60% whey and 40% casein. In cows, caseins dominate, comprising nearly 80% of the milk proteins. These differences in proportions relate to different developmental needs of human and cow newborns. Whey proteins are easier to digest, and as a result, provide a more rapid source of amino acids.

After making cheese you can see first hand how important casein proteins are to the process! **Casein proteins are special. In milk, they just float around, invisible to the eye. But, the addition of acid or rennet, under the right conditions, causes them to clump together, forming curds. The key to making cheese.**

The names Bond, Peptide Bonds!

Proteins are extremely important to us. They are found throughout our bodies with over 40% found in skeletal muscle, 25% found in body organs and the rest mostly in the skin and blood. Proteins are made up of **amino acids**. Amino acids are **compounds**, a substance where two or more different elements are chemically bonded together. They all have nearly the same structure which you can see in the image below. There are 2 types of amino acids, essential which our body must acquire from the foods we eat, and nonessential which our bodies can make if we consume enough protein from our diet. Twenty different amino acids occur most commonly in the proteins of all life forms. What makes each amino acid unique is the “R” group which is also called a **side chain**. A **peptide** is 2 or more amino acids joined together by **peptide bonds (covalent bond)**. A **polypeptide** is a sequence or chain of many amino acids and a protein contains one or more polypeptide. This means that proteins are long chains of amino acids held together by peptide binds. One protein molecule can contain hundreds of amino acids. When a polypeptide folds, it becomes a protein and a change of only one amino acid in a polypeptide can change the entire protein.

Let's Make An Amino Acid

Instructions:

1. Give each student one copy of the *Amino Acid Chart*.
2. Project the *Amino Acid Diagram* on the board and review the basic concepts about amino acids found on both sides of the sheet.
3. Provide your class a selection of pop beads and round dot stickers.
4. Assign students to use the pop beads to make a model of the basic chemical structure of an amino acid. Project the example images included in the lesson plan to help students get started.
5. Once the students have a model made, assign each student a unique amino acid from their Amino Acid Chart. If you have more than 20 students, some amino acids will be made by more than one student or students can team up.
6. Connect each students' amino acid to make a peptide chain.
7. Move on to Proteins. This activity can be found on agclassroom.org. Lesson Plan title is “Enzymes and Bacteria are Whey Cool!”

Materials:

- Amino Acid Chart (worksheet)
- Amino Acid Diagram (worksheet)
- Pop Beads Set (Can order from Amazon)
- Round Dot Stickers

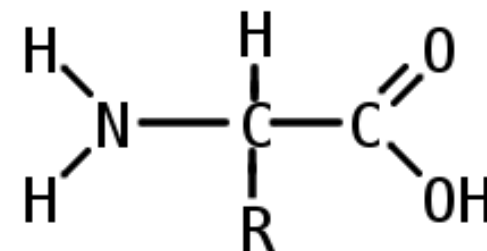
**Worksheets found on agclassroom.org,

Lesson:

“Enzymes and Bacteria are Whey Cool”

Did You Know?

- Casein proteins are unique to milk and provide infant mammals with essential amino acids, and also bind calcium and phosphorus required for skeletal growth.
- Milk contains several types of casein proteins, which are highly diverse both across and within mammal species.
- Hormones, antibodies, and enzymes are made of protein.



Label the above Amino Acid

1. Circle the Carboxyl group in red.
2. Circle the Amino group in blue.
3. Circle the “R” group in green.

How can we have all these cheese types with the same 4 ingredients?

Diversity In Cheese	Diversity In Us
Natural cheeses are made from the same four ingredients.	We are all made up of the pretty much the same things (ingredients), a brain, a heart, other organs, bones, muscles, skin, etc.
The processes cheese goes through and other ingredients that are added occur at different stages.	The processes we go through, like things that have happened to us, things we have learned or seen, the experiences we've had, occur at different stages in our lives.
The end results of all these processes are unique cheeses of different types, forms, and flavors.	The end result of all the things we go through like different cultures, upbringings, and experiences create unique people of different “types, forms, and flavors.”
You may appreciate cheese more once you understand the process of how it's made.	It's hard to truly appreciate someone until you know some of their history and their story! The things that have made them—who they are!
After the first try, you may think you don't like a type of cheese. Give it another try paired with another cheese or another type of food, and you may love it!	Sometimes, after first impressions, we may think we won't like someone. Give them another try! Once you get to know each other, the possibilities are endless. You might become an awesome pairing of different flavors that brings out the best in one another. Humans are made for interdependent, which means mutually dependent; depending on each other.
One of the most important ingredients in a kitchen is curiosity. A chef follows that curiosity to understand the flavors of the ingredients they use. They take the time to understand where their ingredients come from, where they've been, and the processes they have gone through.	After meeting someone new, we may not know the best ways to interact with them especially if we come from different places, have different backgrounds, or viewpoints. This is a skill that can be learned. One of the ways to get a better understanding of someone is to take the time to learn where they come from, where they've been, and the experiences (processes) they have gone through.

Diversi-Cheese

If you were a cheese what type of cheese would you be? (Ex. Cheddar Cheese)

Think of a slogan or creative reason why you would be that type of cheese? (Ex. I would be Cheddar Cheese because it's a classic and goes well with anything!)

For more dairy activities visit agtag.org and floridamilk.com!



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