



Making Cheese with a Twist

For many, the word biotechnology means some ‘new fangled, harmful products made by mad scientists.’ However, the word means ‘useful products made using living organisms.’ And using this definition, products like cheese, bread, wine, beer, and a host of other products like yogurt fit the characterization. But wait a minute. Many of these products go way back in time. The ancient Egyptians started artificially selecting grains that would make better breads. The Romans were pretty successful making wines. And what about cheeses that dairy civilizations started producing to allow them to store their product for longer periods than they could store raw milk?

With these questions and ideas, we can start an investigation into how we have moved from the old definition to the new definition, which is to ‘make useful products using cells and molecules.’ There is no better way than to produce some products in the classroom and we start with bread and cheese. But there is a twist, and that is that the recipes are in cups and tablespoons. This is a science lab and we have pipets, beakers, and graduated cylinders. We measure in degrees Celsius, not Fahrenheit. The recipe for cheese that follows, requires the students to convert quantities and temperatures. We do take some liberties when making the bread by using a bread maker, however the recipes found in the bread maker cookbook must be converted as well.

Class: Biotechnology or a Biotechnology Unit in Biology

Grades: 9-12

Unit: Introduction to Biotechnology

Topic: Cheese with a Twist

Duration of Lesson: 2 days @ 60 minutes

General Objectives:

- Students will be able to demonstrate and discuss how civilizations have discovered ways to make life better by producing new foods.
- Students will be able to explain the difference between the old and new definitions of Biotechnology.

Specific Objectives:

Students will be able to:

* Dairy Lesson supported by a grant from the Massachusetts Dairy Promotion Board
Submitted by Cynthia Jensen, Gateway Regional School District





- Convert standard cooking measurements into metric measurements.
- Use equipment and lab ware found in a classroom to produce foods that will be healthy and tasty.
- Discuss (as they eat) the ways our foods have changed.

Massachusetts State Standards

- S1S1
- S1S4
- 1.2, 1.3

Day 1-Methods/Lesson Procedure:

1. Review the two definitions of biotechnology.
2. Discuss various civilizations and their food contributions.
3. Review basic molecular principles like protein denaturation.
4. Explain the lab procedure.
5. Students make cheese and bread.

Day 1-Materials:

LCD, key clicker, recipes, cheesecloth, milk, lemons, thermometer, beakers, pipets, graduated cylinders, hot plate, rubber bands, herb mixture, stirring rods, laptops or conversion charts from texts.

Materials for bread recipe will depend on which one is selected.

Day 2-Methods/Lesson Plan Procedure:

1. Explain the various stations. Each is from a different time in history and perhaps a different civilization. A card (*) is placed at each station with questions and a plate of food. Their bread is at one and cheese at another.
2. Students travel from station to station eating, thinking, discussing, and writing.

Assignment: On day two, answer questions from each station.

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Assessment: Each student group will work cooperatively to complete their food product.

On day 2, each student will complete questions from each food station.

* Some examples of cards can be found at Access Excellence

<http://www.accessexcellence.org/RC/AB/BA/DODpub/dodles1a.php>

Lemon Cheese

15 minutes-100 degrees F

-2 lemons-approx. 1 cup of lemon juice

-1 quart of milk

Indirectly heat 1 quart of milk to 100 ° F. Add the juice from two lemons and stir well. Let the milk set for 15 minutes. If using goat's milk, heat to 145 before adding lemon juice.

1-2 hours-cheesecloth colander

Pour curds into cheesecloth-lined colander. Tie the four corners of the cheesecloth into a knot and hang bag to drain for 1-2 hours or until curds have stopped draining. Save the whey. It can be used in cooking, such as baking bread. Chilled with mint leaves added, it makes a refreshing summertime drink.

Mixing, salting, spicing

Salt herbs

Take the cheese out of the cheesecloth. You may have to scrape some off the cloth. The cheese can be lightly salted and herbs added if desired. The yield should be about 6-8 ounces of lemon cheese for each quart of milk.

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