

There are Microbes in my Food!

Summary

Yogurt production in the classroom acts as a living example of the use of microbes in food production.

Time Frame

1 class periods of 45 minutes each

Group Size

Large Groups

Materials

- 1 pint whole pasteurized milk
- 1 carton plain yogurt
- Fruits, jams, or other flavoring
- Powdered, skim milk
- Measuring spoons and cups
- Thermometer
- Hot plate
- Aluminum foil
- Oven resistant cups

Background for Teachers

Bacteria are simple, one-celled organisms and are among the smallest of all cells. Some kinds of bacteria cause deadly diseases; others are helpful in making food. Buttermilk, cheese, vinegar, and even chocolate are produced through the action of bacteria. Some bacteria cause a chemical change called fermentation. Fermentation changes the taste, smell, and form of animal and vegetable matter. Yeast used in bread production is an example of a fungus that causes fermentation. Yeast consume the sugars present in the bread dough and use the energy from the sugar for growth and reproduction. When the yeast consume sugar, it is broken down into carbon dioxide gas and alcohol. Little bubbles of carbon dioxide released from the yeast fill the dough and cause it to expand or “rise.” A slice of bread can be examined with the naked eye or with a magnifying glass to see the many small spaces made by the carbon dioxide.

Yogurt is a milk product in which the bacteria *streptococcus thermophilus* or *lactobacillus bulgaricus* have been added. Once added to the milk, these bacteria consume the milk sugars and undergo fermentation, much like the yeast in bread. The benefit of having a fermented milk product is that so much acid is produced by these organisms that few other potentially harmful microorganisms can grow in this material.

Although microorganisms can produce diseases, they can also be very beneficial to humans. These benefits stem from their ability to decompose as well as their use in food production. Many kinds of bacteria and fungi (e.g., yeast) are used in the production of food.

Intended Learning Outcomes

- Make and record observations.
- Know science information.
- Cite examples of how science affects life.

Instructional Procedures

As a whole class, add two tablespoons of powdered, skim milk to one pint of whole milk. Bring the mixture to a boil over medium heat for 30 seconds, stirring constantly. Cool to 46-60° C.

The source of bacteria used in the yogurt production will be the bacteria present in plain store bought yogurt. Place one to two teaspoons of the yogurt in the cool milk mixture.

Stir this mixture well using a spoon previously sterilized through boiling.

Pour the mixture into sterilized cups or dishes and cover them with aluminum foil.

Use one of these samples for observation purposes. Have the students record their observations of this material. Sample observation might include consistency, color, and smell. Incubate the mixture at 32-43° C for 9-15 hours until desired firmness is reached.

You may consider taking the mixture home and using your oven for incubation. A hot plate in a styrofoam cooler can also work as an incubator.

Have students observe the yogurt and record their observations.

How has this material changed during fermentation?

How is it different from the original materials?

Sugars and other flavors can be added to the mixture at this time, and the students can eat their product.

Have them record what their yogurt tastes like.

After their observations, have the students answer the following questions in their science journals:

What process caused a change in the original milk that you began with?

Why did you add a small amount of store-bought yogurt to your milk? What did this addition introduce into your milk mixture?

Why does the yogurt taste different from the original milk?

What changes occurred as the milk changed to yogurt? What caused these changes?

Why did the teacher keep the milk/yogurt mixture warm overnight?

Why does milk sour when it has been left in the refrigerator too long?

What other food products are the result of bacteria or fungal action?

Assessment Plan

Evaluate the answers to the questions in #13 that students recorded in their science journals.

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