

Milk: A Practical Application

Summary

The impact of the physical and chemical properties of milk and its use as an important food.

Main Core Tie

Food and Science

[Strand 8 Standard 2](#)

Background for Teachers

Milk contains 87 water as a solute in which is suspended and/or dissolved protein (3.5), fats (3.6), carbohydrates (4.9), vitamins, and minerals (0.7). The nature of water affects the nature of milk. Milk is one of our most nutrient-dense foods (see NATIONAL DAIRY COUNCIL FOOD COMPOSITION CARDS and NUTRIENT DENSITY in Resources). The young of any mammal survives for a time on no other food. Humans drink milk throughout their lives. Cow's milk and goats' milk are the most common ones for human consumption. Milk is an emulsion (see MILK DIAGRAM in Resources) and food processors are able to treat it in various ways to produce a variety of milk and milk products. Milk is not only a good source of food for mammals and other animals, it is a good source of food for microorganisms. Because of this, for food safety, milk is treated in special ways. Pasteurization is one example.

Intended Learning Outcomes

An in depth study of milk will help students understand how the high water content of milk affects the nature and use of this highly nutritious food source.

Instructional Procedures

See attachments below:

The students will take a PREASSESSMENT quiz to determine their current knowledge about milk. Remember, preassessments are never graded and guessing is not penalized.

The teacher will lead a class discussion which will identify the different components of milk and explain how these are dispersed in milk.

The students will complete Section 1 of MILK PRODUCTS LECTURE NOTES worksheet.

The teacher will lead a class discussion and identify the different milk products and their characteristics. The students will complete Section 2 of their study guide MILK PRODUCTS LECTURE NOTES worksheet during the discussion. With student help, the teacher will present a class demonstration to determine the effect of fat content on the stability of milk foams. The students will record results on MILK FOAMS worksheet.

The students will participate in a SCIENTIFIC LAB EXPERIENCE to make CONDENSED MILK using dried milk as a base. They will prepare the food products utilizing the same recipe-one with homemade condensed milk, and one with commercial condensed milk and compare results.

The students will participate in a SCIENTIFIC LAB EXPERIENCE making LAYERED COOKIES and compare the quality of the final products.

NOTE TO TEACHER: Demonstrate how to make condensed milk. Double the recipe for a class period. Half of the class units will use the condensed milk made during class and the other half of the class units will use commercially prepared condensed milk in the LAYERED COOKIES recipe. When the cookies are done, have the students trade half their final product with each other so that they all have some cookies made with both milk products. Have them evaluate the final products for appearance, texture, and taste. Discuss their opinions. If time gets short, remove the cookies from the

oven early and finish baking them in the microwave oven. This will allow time to complete this lab in one class period. Have the students microwave the cookies using full power for 45 seconds, check for doneness, and if not done, rotate baking dish 1/2 turn and repeat process until done. The use of the microwave oven changes the appearance and texture of the final products a little, so all units would need to use this technique in order to have comparable results.

Through class discussion on how to cook with milk, the students will identify techniques that can be used to cook milk without having it coagulate.

The teacher will explain how to heat milk without having it curdle. Students should understand the difference between coagulated and curdle.

If desired, the teacher may demonstrate these scientific principles of milk cookery or have the students make a PUDDING MADE WITH RENNET. Rennin is an enzyme which coagulates milk and is used primarily to make cheese.

Junket pudding using Rennet tablets (the commercial brand name) is a coagulated milk dessert often given to babies.

The purpose of this scientific lab activity is to show how enzymes react with the proteins in milk to produce a coagulation.

The students will use rennin to perform the lab SAY CHEESE to have the experience of making cheese.

The students will complete MILK STUDY GUIDE worksheet using any good textbook.

The students will participate in a SCIENTIFIC LAB EXPERIENCE.

Half of the units will make PUDDING. The goal is to make pudding without forming a skin on the surface or scorching the milk while cooking. An alternative lab might be making hot chocolate which would also achieve the same goal.

Half of the units will make CREAM OF TOMATO SOUP. The goal is to make the soup without curdling the milk.

The students will share the techniques they used to produce a satisfactory product and explain the chemical and physical properties in milk that cause skin to form and/or milk of curdle.

The teacher will review the concepts learned during the milk unit by having the students play a MILK REVIEW GAME.

NOTE TO TEACHER: The teacher needs to prepare numbered point cards before the review. Cut 3/5 cards in half and number them as follows: 5 one-point cards, 4 two-point cards, 3 three-point cards, 2 four-point cards, and 1 five-point card.

Have one member of a unit draw a point card, then read the first question. If the unit can answer the question correctly, the students in that unit receive the number of points on the card. Continue this procedure with each unit until all the questions are asked. As a summative evaluation, the students will utilize the principles of the physical and chemical properties of water by applying them to milk and milk products. The teacher may choose one or both of the following:

1. The students will complete a MILK UNIT TEST
2. The students will design and make posters and bulletin boards illustrating the chemical and physical properties of milk.

Authors

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