

Lesson 2: Milk Quality & Safety: Keeping Milk Fresh

Lesson Introduction

Milk is one of the most regulated and safest foods available to consumers. It is also used to make a variety of dairy products such as cheese, yogurt, ice cream, and butter. Milk is tested for quality and safety at the farm level, in route to the dairy processing plant, and at several points during processing. It is tested to make sure it doesn't contain any harmful contaminants and is safe to drink.

In this lesson, students will learn about the various safety and sanitation procedures milk undergoes throughout the processing stages. They will also make butter from the cream of milk. Students will also learn about the career of a cheesemaker.

Lesson Objectives

- Students will explain various processes used to ensure milk quality and safety.
- Students will identify what parts of milk are used to produce certain dairy products.
- Students will calculate the experimental cream to butter ratio.
- Students will list the responsibilities and education of a cheesemaker.

Time: 60-75 minutes

Standards: See the [Discover Dairy website](#) for complete listing by grade level.

Vocabulary

- Dairy products, fortification, homogenization, pasteurization, processing plant, sanitation, and standardization

Materials Needed

- Computer
- Lesson Presentation: [PowerPoint](#), [Canva](#)
- Multimedia Projector and Screen
- Butter Lab Materials: jars, lids, rings, cream, measuring cups, bowls, and calculators
- Internet Access
- Pencils
- [Vocabulary sheet](#)
- [Discover Dairy and Milk Safety & Quality](#) Video
- [Artisan Cheesemaker](#) Video
- [Artisan Cheesemaker Career Spotlight](#)

Activities

- [Milk Safety & Quality Video Discussion Guide Fill in the Blank](#) and [Answer Key](#).
- [Milk Safety & Quality Video Discussion Guide Without Word Bank](#)
- [Artisan Cheesemaker Career Spotlight Video](#) and [Outline](#)
- [Butter Lab with Directions](#) and [Lab Sheet](#).
- [Kahoot! Game](#)

Procedure

Introduction (10 minutes)

- Go over the essential vocabulary terms and their meanings for this lesson. Use Lesson 2 PowerPoint slides 1-4 for the introduction and vocabulary.
- **Activating Strategy:** Let's discover how milk is tested to ensure its safety and quality by watching the video, [Discover Dairy and Milk Safety & Quality](#).

Keeping Milk Fresh (8-15 minutes)

- Introduction
- Discuss the processes to keep milk safe using slides 5-13.
- Visual Aides: Feel free to hand out or hang up the [NDC Milk Handout](#) or the [Farm to Table Infographic](#) as additional reading materials or support to the information discussed on these slides.
- Closure: We looked at the ways milk is kept safe during the production and processing of it. Explain to us one of these processes to keeping milk fresh.

Butter Lab (30-40 minutes)

- Do the Introduction and use slides 14-17 to guide the lab.
- Have the jars, lids, rings, cream, measuring cups, bowls, and calculator ready for students.
- Pass out the [Butter Lab Worksheet](#).
- Allow students class time to complete the Butter Lab with a partner.
- Walk around, offering help and answering questions as needed.
- Closure: Today you made butter from cream. During the lab, you compiled data to find the experimental ratio of cream to butter.
 - What was your experimental ratio of cream to butter?
 - What is the theoretical ratio of cream to butter?
 - How does your experimental ratio compare to the theoretical ratio.

Career Spotlight: Artisan Cheesemaker (8 minutes)

- Do the Introduction and use slides 18-22 to guide the discussion.
- Facilitate the Career Spotlight on Cheesemaker using the [Artisan Cheesemaker video](#) and discussion of responsibilities and education.
- Closure: Cheesemakers use science and creativity to produce high-quality cheeses for retail.
 - Tell us one responsibility of being a cheesemaker.
 - Are you interested in being a cheesemaker when you grow up?

Summative Activity (5 minutes)

- Do the Introduction and use the slides 23–24 to guide the activity.
- Facilitate the [Lesson 2 Kahoot Review](#) with students.
- Lesson Closure: Today you learned about the ways and procedures used to ensure milk is fresh and safe. Tell us one thing you learned today about “Keeping Milk Fresh”.

Career Spotlight

Artisan Cheesemaker

Summative Assessment

Students will complete the Butter Lab with a mastery level of 80% or higher.

Lesson 2 Milk Quality & Safety

Vocabulary Word Definitions

Dairy Products – foods made from milk

Fortification – the process of adding vitamins, such as Vitamins A and D, to milk before bottling it

Homogenization – the process of breaking up the fat globules in milk so cream does not separate in the milk

Pasteurization – the process of heating milk to high temperatures for a short amount of time to kill bacteria

Processing Plant – the place where milk undergoes procedures to ensure safety and bottled or made into dairy products

Sanitation – the process of cleaning something to ensure any dirt or harmful residues are removed

Standardization – the process of removing all the fat from the milk

Name: _____

Date: _____

Discover Dairy and Milk Quality & Safety Video Discussion Guide

Directions: Fill in the blanks as you watch the "Discover Dairy and Milk Quality and Safety" video.

1. Milk is tested up to _____ different times to ensure its safety.
2. Milk safety starts with _____ who really care about their _____.
3. The whole milking process takes place using modern _____ without human _____ ever touching the milk.
4. Because milk comes out of a cow _____, it is instantly _____ to _____ degrees to keep it fresh.
5. At the processing plant, milk goes through the process of pasteurization which heats the milk to _____ degrees for _____ seconds and then cools it back down to _____ degrees.
6. Pasteurization _____ any microorganisms like bacteria.
7. Milk is made up of mostly _____ and contains over thirteen essential _____ and minerals.
8. Milk can be transformed into other kinds of foods. For example, the protein in milk called casein is essential to making _____. The sugar in milk called lactose is key to producing _____. The fat in milk called cream is used to make both _____ and _____.



Name: _____

Date: _____

Discover Dairy and Milk Quality & Safety Video Discussion Guide

15 17 40 161.5 Butter Cheese Chilled
Cows Farmers Hands Ice Cream Kills Machines
Minerals Vitamins Warm Water Yogurt

Directions: Fill in the blanks as you watch the "Discover Dairy and Milk Quality and Safety" video.

1. Milk is tested up to _____ different times to ensure its safety.
2. Milk safety starts with _____ who really care about their _____.
3. The whole milking process takes place using modern _____ without human _____ ever touching the milk.
4. Because milk comes out of a cow _____, it is instantly _____ to _____ degrees to keep it fresh.
5. At the processing plant, milk goes through the process of pasteurization which heats the milk to _____ degrees for _____ seconds and then cools it back down to _____ degrees.
6. Pasteurization _____ any microorganisms like bacteria.
7. Milk is made up of mostly _____ and contains over thirteen essential _____ and _____.
8. Milk can be transformed into other kinds of foods. For example, the protein in milk called casein is essential to making _____. The sugar in milk called lactose is key to producing _____. The fat in milk called cream is used to make both _____ and _____.



Name: _____ **ANSWER KEY** _____

Date: _____

Discover Dairy and Milk Quality & Safety Video Discussion Guide

15 17 40 161.5 Butter Cheese Chilled
Cows Farmers Hands Ice Cream Kills Machines
Minerals Vitamins Warm Water Yogurt

Directions: Fill in the blanks as you watch the "Discover Dairy and Milk Quality and Safety" video.

1. Milk is tested up to _____ **17** _____ different times to ensure its safety.
2. Milk safety starts with _____ **farmers** _____ who really care about their _____ **cows** _____.
3. The whole milking process takes place using modern _____ **machines** _____ without human _____ **hands** _____ ever touching the milk.
4. Because milk comes out of a cow _____ **warm** _____, it is instantly _____ **chilled** _____ to _____ **40** _____ degrees to keep it fresh.
5. At the processing plant, milk goes through the process of pasteurization which heats the milk to _____ **161.5** _____ degrees for _____ **15** _____ seconds and then cools it back down to _____ **40** _____ degrees.
6. Pasteurization _____ **kills** _____ any microorganisms like bacteria.
7. Milk is made up of mostly _____ **water** _____ and contains over thirteen essential _____ **vitamins** _____ and _____ **minerals** _____.
8. Milk can be transformed into other kinds of foods. For example, the protein in milk called casein is essential to making _____ **cheese** _____. The sugar in milk called lactose is key to producing _____ **yogurt** _____. The fat in milk called cream is used to make both _____ **ice cream** _____ and _____ **butter** _____.



Lesson 2: Milk Quality & Safety

Butter Lab Directions

Introduction

Milk can be transformed into other kinds of foods called dairy products. For example, the fat or cream can be separated from milk and used to make ice cream and butter.

In this lab, students will make butter from the cream of milk. Students will use measuring cups and digital scales to compare the experimental cream to butter ratio in this lab with the theoretical ratio.

Materials Needed

- Mason jars (pint sized) with lids and rings
- Heavy whipping cream
- Digital scales
- Measuring cup
- Bowls and spoons
- Calculators
- Pencils

Procedure

1. Assign students to lab partners.
2. Have students get jars, lids, rings, cream, measuring cups, bowls, and calculator for themselves.
3. Pass out the Butter Lab Sheet.
4. Allow students class time to complete the lab.
5. Walk around, answering questions and offering help as needed.
6. Do closure activity.
7. Collect the Butter Lab Sheet.

Closure

Today you made butter from cream. During the lab, you compiled data to find the experimental ratio of cream to butter. How does your experimental ratio compare to the theoretical ratio?

Summative Assessment

Students will complete the Butter Lab Sheet with a mastery level of 80% or higher.

Name: _____

Date: _____

Discover Dairy and Milk Safety Butter Lab Worksheet

Directions: Follow the lab procedure, then fill in the data for sections 1 to 4.

Lab Procedure

1. Weigh your jar (no lid). In your jar, add 1 cup of heavy cream. Weigh your jar again.
2. Place the lid and ring tightly. Take turns with your partner shaking the jar.
3. Open jar after every 3 minutes to look at what is happening.
4. Continue until the butter has separated from the remaining buttermilk.
5. Pour off buttermilk. Use a spoon and press into a solid ball. Pour off buttermilk again.
6. Weigh your butter and subtract from the original cream.
7. Rinse your butter in cold water and pat dry. Since it is unsalted butter, store in a refrigerator. Unsalted butter has a short shelf life because it contains no preservatives (salt). If you want, you can blend salt into your butter.

Directions: Record data and answer the questions below in the spaces provided.

1. Cream Weight _____ oz.

Butter Weight _____oz.

Cream - Butter = Buttermilk

Buttermilk Weight _____oz.

What percent of the cream was turned into butter? _____

2.What is the weight of the starting weight of the cream? _____

What is the weight of your butter? _____

What is the ratio of cream to butter (in fractions)? _____

Convert this fraction to a decimal (thousandth place). _____

Discover Dairy and Milk Safety

Butter Lab Worksheet

3. Theoretically speaking, it takes about 32 ounces of cream to make just one pound of butter.

What is the number of ounces in the cream? _____

How many ounces are in a pound of butter? _____

What is the ratio of cream to butter (in fraction)? _____

Convert this fraction to a decimal (thousandth place). _____

4. Using the information above, how does your experimental ratio compare to the theoretical ratio?

Lesson 2: Milk Quality & Safety

Career Spotlight: Artisan Cheesemaker

Description

Cheesemaking is both a science and an art. Cheesemakers use science to change milk into cheese. They lead the safe production of high-quality cheeses for retail. Cheesemakers perform a variety of tasks

involving production, assembling, disassembling, operating, inspecting, cleaning, sanitizing, and maintaining equipment. These jobs require attention to detail, strong communication and problem-solving skills, a passion for cheesemaking and a commitment to consistently producing high quality products.



Common Responsibilities

- Set up and operate equipment that mixes ingredients used in the making of cheese
- Clean and sterilize work areas and equipment used
- Examine, test, and inspect product during the cheesemaking process
- Record data and results of measurements and tests completed throughout the cheesemaking process

Education/Training Requirements

High school diploma or equivalent and post-secondary certificate or apprenticeship (required)