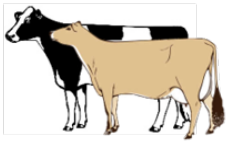

Lessons presented by
Oklahoma State University
Ferguson Family Dairy Visitor Center
With Southwest-Southland Dairy Farmers

Instructor	Jaycie Heath
Grade Level	6-8
Lesson Title	Dairy Processing (In Person)

TEACHER PREPARATION

Learning Goals & Standards/Performance Indicators

Learning Goals	Standards
1. Upon completion of this lesson students will be able to understand and describe milk processing steps.	1. 7. PS1.3 Gather and make sense of information to describe that synthetic materials come from natural resources and impact society. 2. SS: 6.4 The student will analyze the interactions of humans and their environment in the Western Hemisphere. a. 6.4.1 Describe the commercial agriculture and industrial regions that support human development b. 6.4.2 Evaluate the effects of human modification on the natural environment through transformation caused by subsistence and commercial agriculture, industry, demand for energy, and urbanization.

Resources and Materials

- ☐ The Story of Milk: From the Cow to the Cup
  - The Story of Milk
- ☐ Milk Made for You
- ☐ Moving Milk Through the Dairy Plant
- ☐ Southwest Southland Dairy Farmers- Milk at the Dairy
- ☐ Visuals in the center
- ☐ Student tour guides

Announcement and Other Preliminaries

1. Welcome students to the Ferguson Family Dairy, introduce self and what you do for the dairy, etc.

LESSON DELIVERY

Anticipatory Set

- Who can tell me why we process food? (Take a few student answers)
    - To make it safer
    - To clean it
    - To increase shelf life
- How do you think we process milk? (Take a few student answers)
- Today we will learn about the processing steps that milk takes to get from the dairy to your table.

Direct Instruction

1st Learning Goal: Upon completion of this lesson students will be able to understand and describe milk processing steps.	
Content Outline	**Instructional Strategies**

<u>At the Dairy</u>
• Dairy cows, like our Holsteins, can produce up to ten gallons of milk a day.
• Most dairies milk their cows 2-3 times a day, to empty their udders and keep the cows comfortable.
• The milk at the farm is called *raw milk* because it hasn't been processed for human consumption yet.
• As the cows are milked, the milk is immediately cooled.
  o Bulk milk tanks will cool milk from about 101* F to 34-36* F in a short period of time and will maintain that temperature until the milk leaves the farm.
  o An agitator in the bulk tank mixes the milk periodically to maintain even temperature throughout.
  o The milk is never exposed to outside air or airborne contaminants.
 	
<u>Leaving the Dairy</u>
 	
• Every day or two, milk is taken from the dairy in an insulated tanker truck to a dairy processing plant. Within the tanker the milk is kept at 38 degrees.
  o The tanker holds approximately 6000 gallons of milk and is always cleaned and sanitized before milk is loaded.
• The hauler checks the milk to make sure it meets certain standards of freshness and collects several samples from each farm milk tank.
• Once the milk arrives at the processing plant it is tested again before being unloaded.
 	
<u>Processing the Milk</u>
 	
• Milk is transported to one of several processing plants that manufacture products like cheese, ice cream, milk, yogurt, butter, or milk powder.
	• Including images or prerecorded videos of milking, tanker trucks, processing plants, separators, homogenizers/un-homogenized milk, pasteurizers, etc. will be vital to student understanding.
	• Including prerecorded video of our parlor and milk storage tanks could increase student understanding.
	• Show students to the viewing window of the robotic milker's storage tank.

- The milk samples are tested at a laboratory by lab technicians to make sure the milk is safe and fresh to be processed for us to drink.
    - One sample is immediately checked for temperature. If the temperature of the milk is above 40°F, the entire load is discarded.
    - Another sample is tested for bacteria and antibiotics. In the rare event that the tanker of milk tests positive, the entire load is discarded.
    - Milk is never unloaded until it passes all tests.
    - The technician also tests the butterfat content. Butterfat is also called cream.
- When milk passes "inspection," processing begins.
- Once the tank truck driver gets the okay from the lab, the pumping begins.
    - Milk is pumped into large, refrigerated storage tanks or silos.
- One of the first stops is the separator.

<u>The Separator</u>

- Milk is pumped into a separator that spins the milk to separate cream, which is lighter, from the skim.
    - What do we call milk that has the butterfat removed? Nonfat milk or skim milk
- The desired amount of cream can then be added back to the skim later to obtain milk standard for 1%, 2%, or whole milk which is 3.25% fat. Excess cream can then be used to make ice cream and butter.
- Some of the milk is even pumped to mixing tanks. Here other ingredients are added to make flavored milk.

<u>The Homogenizer</u>

- The milk is pumped into a homogenizer (Homogenized means the same all the way through) that breaks up the fat globules and makes them smaller.

- Milk is forced through very small holes under great pressure. - This breaks the butterfat particles into tiny, uniform pieces. - A protein coat surrounds each butterfat piece. This keeps the butterfat from clumping back together. - This makes the milk have consistent flavor when bottled. - If milk were not homogenized, the cream would rise to the top. You would have the shake or stir the milk before drinking it. <u>Pasteurization</u> - In 1865, a French scientist named Louis Pasteur discovered that heating liquids to high temperatures kills microorganisms. - Milk is pasteurized which kills bacteria that may be harmful to health. - Heating milk to 165* F for 15 seconds then quickly cooling it down to 35* F accomplishes this. - Pasteurization protects the purity and flavor of milk without influencing the nutrient value. <u>Preparing Milk for You</u> - Milk is always bottled in sterile containers that are fed down a conveyor belt to the filling station. - Containers (bottles or cartons, in some countries they even use plastic bags) are automatically filled with the proper amount of milk, sealed and capped. - Milk is stored in a refrigerated room that is kept at 36 degrees until it is ready to be transported to grocery stores or schools. - Refrigerated trucks are used to deliver bottled milk to its retail destination. - It takes only about two days from the time milk leaves the cow until it reaches the grocery store.	

• *Still, some milk doesn't get bottled for drinking, instead it's set aside for further processing to make ice cream, cheese, yogurt, butter, or other dairy products.*
 	
<u>Milk is Safe</u>
 	
• Milk is one of the safest food/drinks you can consume:
  o Human hands never touch the milk.
  o The milk is tested to make sure it is fresh and clean.
  o Milk is always kept cold as it travels from the cow to dairy processing plant and finally to the store or school.
  o These steps are important to make sure that milk is always safe and fresh for us to drink.	

1st Learning Goal: Upon completion of this lesson students will be able to understand and describe milk processing steps.
Learning Activity
• Students should be provided with a "map" of how milk moves through the processing steps. Each step should have space below an image for students to label and take notes about the processing step.
Assessment

• Students should be asked questions similar to the following:
  ○ Who tests the milk and takes samples? (The hauler and the lab)
  ○ What is pasteurization? (Rapid heating and cooling of milk to kill microorganisms)
  ○ What does Homogenized mean? (The same all the way through)

Closure

Closing Announcements/Reminders
• Answer any questions they may have • Show them the robot and viewing windows one more time • Thank students for coming to the Ferguson Family Dairy