



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

Instructor	Jaycie Heath
Grade Level	9-12
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. <u>AFNR AS.01.01.01.a, AS.01.01.02.a</u> Identify the major uses of dairy cattle in the United States. 2. <u>AFNR FPP.01.01.01.a</u> Trace the steps milk undergoes when it leaves the dairy.
Resources and Materials	
<input type="checkbox"/> The Story of Milk: From the Cow to the Cup <ul style="list-style-type: none"> ○ The Story of Milk <input type="checkbox"/> Milk Made for You <input type="checkbox"/> Moving Milk Through the Dairy Plant <input type="checkbox"/> Southwest Southland Dairy Farmers- Milk at the Dairy <input type="checkbox"/> Visuals in the center <input type="checkbox"/> 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

<ul style="list-style-type: none"> • Who can tell me why we process food? (Take a few student answers) <ul style="list-style-type: none"> ○ 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

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At the Dairy

- 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.
 - 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.
 - An agitator in the bulk tank mixes the milk periodically to maintain even temperature throughout.
 - The milk is never exposed to outside air or airborne contaminants.

Leaving the Dairy

- 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.
 - 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.

Processing the Milk

- Milk is transported to one of several processing plants that manufacture products

- 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.

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like cheese, ice cream, milk, yogurt, butter, or milk powder.

- 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.

The Separator

- 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.

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The Homogenizer

- 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 to shake or stir the milk before drinking it.

Pasteurization

- 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.

Preparing Milk for You

- 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.

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- 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.*

Milk is Safe

- Milk is one of the safest food/drinks you can consume:
 - Human hands never touch the milk.
 - The milk is tested to make sure it is fresh and clean.
 - Milk is always kept cold as it travels from the cow to dairy processing plant and finally to the store or school.
 - These steps are important to make sure that milk is always safe and fresh for us to drink.

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