

★ TEXAS FARM BUREAU'S ★
Be Ag Smart!

the Dairy CONNECTION

Be Ag Smart! The Dairy Connection has been developed and produced by Texas Farm Bureau Agriculture in the Classroom

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Teachers—For lesson plans, videos and other resources for your classroom, go to texasfarmbureau.org

How a Cow Makes Milk

Cows have a unique digestive system. Milk cows are ruminants having a large stomach with four separate compartments. This gives cows a decided advantage in digesting and utilizing parts of plants which are normally useless. Substances such as cellulose, found in grass and hay, and other waste products, such as cottonseed hulls and beet pulp, can be utilized by the dairy cow to make two highly nutritious products—milk and meat.

1 Cows swallow food, only partially chewing it.

2 The food first enters the biggest stomach compartment, the rumen. Here the food is mixed with bacteria to break it down into smaller pieces. This process is called fermentation.

3 Next, it moves on to the next compartment, the reticulum. Here the nutrients from the food are absorbed into the bloodstream.

4 The cow now burps up a small amount of food (cud) to chew again.

5 After chewing her cud, she swallows again and her cud goes into the third and fourth stomach compartments, the omasum and abomasum. Here additional digestion occurs and more nutrients are absorbed into the bloodstream.

6 Nutrients absorbed into the bloodstream are carried to the udder where the cow's body will put the nutrients together in another form to make milk. *About 500 gallons of blood need to pass through the udder to produce one gallon of milk.*

Labels: Rumen, Reticulum, Omasum, Abomasum, Udder

Texas Farm Bureau Graphic

How are cows milked?

Before milking machines were invented, farmers milked all their cows by hand. This may sound like fun, but it was hard work! To milk one cow, it could take up to 20 minutes. This made it hard for a farmer to own many cows. Other chores had to be done as well. Today, milking machines and milking parlors make it possible for one person to milk 100 cows in one hour. The cows' udders are cleaned and then a milking machine is attached. The machine uses a vacuum that acts like our hand motions that would be used to milk a cow. This stimulates the cow to allow the milk to be released, only taking about 10 minutes to milk. The milk is then pushed through pipes where it is cooled very quickly and then stored in a tank. Dairy cows are milked two or three times a day, depending on the dairy.



DAIRY BREEDS

There are many breeds of dairy cows that come in numerous colors and patterns. The most common is the Holstein, which is black and white. These cows are known for producing the most milk out of all breeds. Another common breed in Texas is the Jersey. They have a tan color and produce milk that is high in butterfat, which is used to make cheese and ice cream. When farmers choose what they want to raise on their dairy, they consider many options such as size of the cow, how much milk they can produce, if it is high in protein or butterfat and even how they would adapt to the climate of the farm's location.

HOLSTEIN



- Originated in Europe and was brought to the U.S. by Dutch settlers.
- Known for the highest milk production of all dairy breeds.
- The Holstein is the dominant dairy breed in the U.S.

JERSEY



- Originated from the island of Jersey, 15 miles off the coast of France.
- Jerseys produce more butterfat in their milk than other dairy breeds.

Dairy Farmers Recycle



Dairy farmers protect the land and water by using safe and effective practices. Manure from cows is collected in lagoons that are lined in heavy plastic. Here, the manure is turned into liquid. It is then used as a natural fertilizer on crops that feed the dairy cows. Plant scientists and engineers look at the land layout and needs of the plants to determine how much fertilizer to apply. The water on dairy farms is also recycled. The water used to clean stalls and milking parlors is also collected in the lagoons, to be added to the crop land.

What happens to milk after it comes from the cow?

First, the raw milk is **pasteurized**, where it is heated to kill bacteria and extend its shelf life—which keeps milk fresher for a longer period of time.

Homogenization is the next step. This process mixes and disperses the milkfat throughout milk to create a uniform mixture. This prevents the cream from rising to the top. Lastly, as part of the

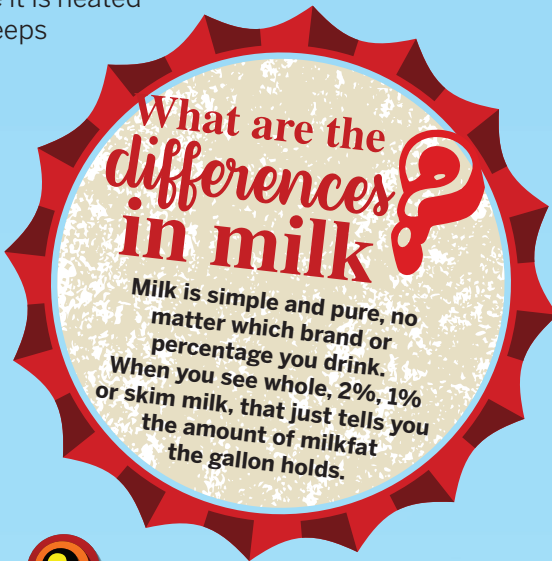
standardization process, cream is mixed in to the skimmed milk more consistently to create a variety of milkfat classifications, such as whole, reduced fat, lowfat and fat-free (also known as skim milk).

SAY CHEESE!

To make cheese, milk is heated and mixed with a culture. Cultures contain different types of good bacteria that give various cheeses their distinct flavors, textures and colors. The culture makes the milk curdle, clumping the milk's proteins together to form lumpy curds and whey, which is the liquid part of the milk that remains.

The whey is drained from the curds. You can eat the curds as fresh cheese, or you can wait until the curds are aged.

The kind of milk used, the amount of fat in the milk, how the curds are used and whey are formed, and how the cheese is stored also account for different colors and tastes. Even the sizes and shapes of cheeses are different.



MOO MATH

1. Even cows need a break. A cow can produce milk for about 305 of the 365 days in a year. If she produces 144 cups of milk per day, how many cups does she produce in 305 days?

2. Many of us buy milk in gallon jugs. How many gallon jugs can that cow fill in a day if 1 gallon equals 16 cups?

3. Before milking machines were invented in 1894, a farmer could milk 6 cows per hour by hand. How long would the milking take if the farmer had 15 cows?

4. Farmers can now milk a cow in about 10 minutes with a milking machine. If a farmer has 6 milking machines going at once, how many cows can be milked in one hour?

5. There are about 9 million milk cows in the U.S. today and about 90% of them are the black and white Holstein breed. How many U.S. cows are Holsteins?



Milk and Yogurt

Milk

There are many different varieties of milk, all of which contain 9 essential nutrients and are a great way to get your 3-A-Day™ of dairy.

AN 8 OZ SERVING OF:



FAT-FREE MILK-
80 calories,
0 grams of fat



1% LOWFAT MILK-
100 calories,
2.5 grams of fat



2% REDUCED FAT MILK-
120 calories,
5 grams of fat



WHOLE MILK- 150
calories,
8 grams of fat



Other varieties of milk include:

- Evaporated Milk
- Evaporated Fat-Free Milk
- Sweetened Condensed Milk



FLAVORED MILK...
has a high proportion of
nutrients in relation to
their energy content.



Yogurt

Yogurt is a mixture of milk and cream fermented by a culture. The culture converts some of the lactose (milk sugar) into lactic acid.

Most people eat yogurt primarily for breakfast, as a snack or dessert, but yogurt can:

- Enhance flavor, nutrition and moisture in muffins
- Improve tenderness by marinating meats or poultry
- Be found in sauces or dips, sandwich fillings or desserts
- Be a low-calorie substitute for sour cream, cream cheese or mayonnaise



Other Cultured Dairy Goods:
Buttermilk

Texas Farm Bureau Graphic



MILK'S KEY VITAMINS

CALCIUM

Helps build strong bones and teeth

PROTEIN

Helps build and maintain lean muscle

VITAMIN A

Supports good vision

VITAMIN D

Supports a healthy heart

VITAMIN B-12

Works closely with folate to make red blood cells

POTASSIUM

Helps regulate the balance of fluids in your body

RIBOFLAVIN

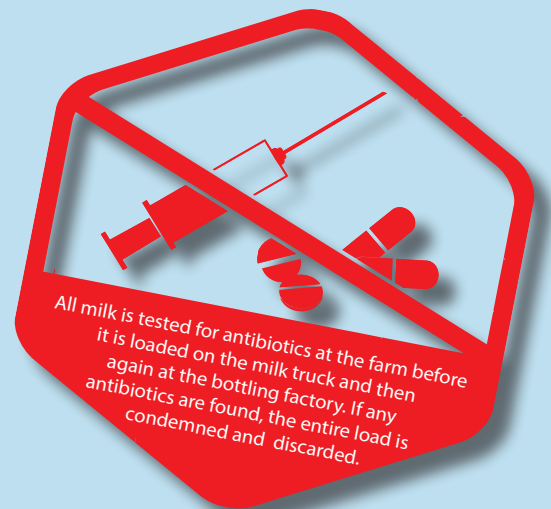
Helps convert food into energy

NIACIN

Helps enzymes function normally

PHOSPHORUS

Works with calcium and vitamin D to help keep bones strong



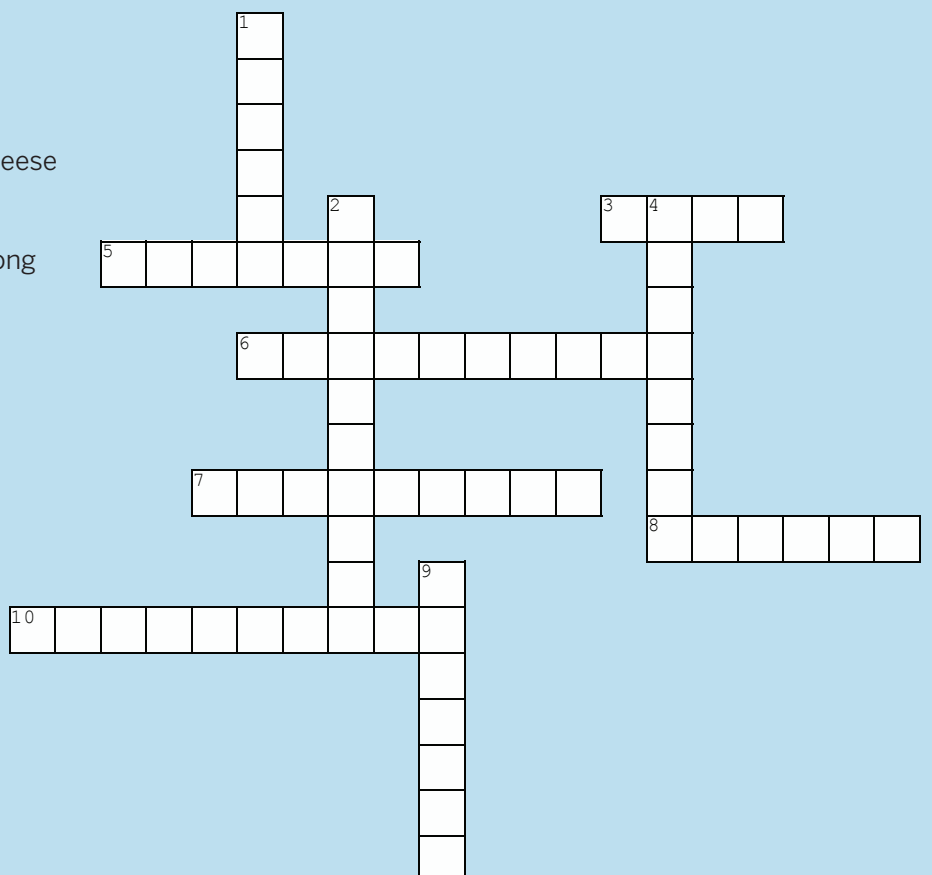
CROSSWORD FUN!

ACROSS

- The liquid part of milk that remains after the making of cheese
- Helps build and maintain lean muscle
- Works with calcium and Vitamin D to help keep bones strong
- Helps regulate the balance of fluids in your body
- Helps enzymes function normally in your body
- Top dairy-producing state in America

DOWN

- A mixture of cream and milk fermented by a culture
- Helps convert food into energy
- The most common dairy breed in the United States
- Helps build strong bones and teeth



Fill in the Blank Fun!



Label these dairy-related pictures using the titles below.

Consumer—Now that you know where dairy products come from, you can enjoy them even more! Remember to eat at least three servings of dairy foods every day!

Processing—The milk is tested and packaged at the milk processing plant.

Feeding—Dairy farmers feed and care for their cows.

Grocery Store—From the milk processing plant, milk and other dairy products are moved to grocery stores where you may purchase them.

Milking—Farmers milk cows twice every day by machine.

Testing—Milk is tested again and again to ensure it is safe for humans.

Refrigerator—Keep your dairy foods cold in your refrigerator at home.

Cooling—The cow's milk is stored in the bulk tank where it is kept cool and fresh.

Hauling—Milk is transported from the farm to the dairy processing plant by refrigerated trucks.

Top States

Label and color these top dairy-producing states on the map below.

1. California
2. Wisconsin
3. Idaho
4. New York
5. Texas



ICE CREAM



Did you Know?



- It takes 10 pounds of milk to make 1 pound of cheese.
- On average, Americans eat about 34 pounds of cheese per year. That's more than one ton in a year!
- A dairy cow can produce 6 gallons of milk in a day.
- There are 8 grams of protein in an 8-ounce glass of milk—that's more protein than an egg!
- 4 million gallons of yogurt is needed for McDonald's in one year.
- 170,000 cows are needed to make enough cheese for Pizza Hut for one year.
- It takes 12 pounds of milk to make one gallon of ice cream.

Materials

- The recipe is for one student so everyone can have their own bag
- Measuring cups and spoons
 - ½ cup milk
 - ½ teaspoon vanilla
 - 1 tablespoon sugar
 - 4 cups crushed ice, regular will work as well
 - 4 tablespoons salt, rock salt is best
 - 2 quart Ziploc bags
 - 1 gallon Ziploc freezer bag

Directions

1. Place the milk, vanilla and sugar into one of the quart-sized bags. Seal the bag, trying to get the most air out as possible.
2. Place this bag inside the other quart-sized bag and seal again.
3. Put the bag of liquid inside the gallon-sized bag and fill with ice. Sprinkle salt on the ice.
4. Squeeze the air out of the bag and close.
5. Shake and massage the bag, letting your liquid get surrounded by ice. In about five minutes, the liquid should turn to ice cream.
6. Take out the quart bag, wiping it off. Cut off a bottom corner and squeeze into a bowl or eat out of the bag.

1. 43,920 Cups
2. 2,745 gallons
3. 2.5 hours
4. 60 cows
5. 81,000,000

- DOWN
1. Yogurt
2. Riboflavin
3. Calcium

- ACROSS
3. Whey
5. Protein
6. Phosphorus
7. Potassium
8. Niacin
10. California

Crossword Puzzle Answers: Moo Math Answers:



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