

TEXAS FARM BUREAU'S

BE AG SMART

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/aitc

HOW A COW MAKES MILK

Cows have a unique digestive system. Cattle are ruminants, which means they have a large stomach with four separate compartments. This gives cows a decided advantage in digesting and utilizing parts of plants that 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

The food moves on to the next compartment, the **reticulum**. Here the nutrients from the food are absorbed into the bloodstream.

4

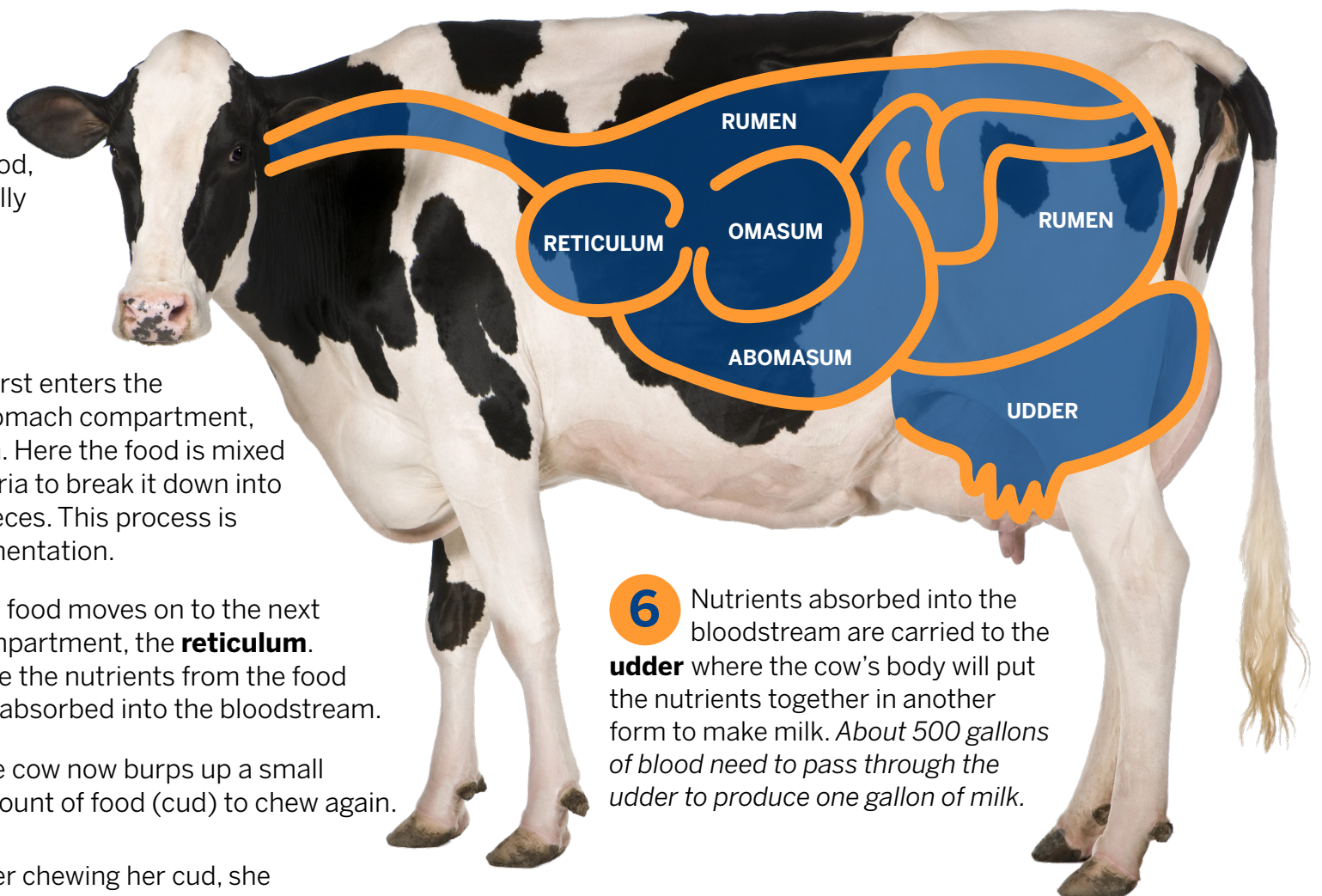
The cow now burps up a small amount of food (cud) to chew again.

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.*



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.

DID YOU KNOW? The robotic dairy technology is a system that allows cows to set their own milking schedule. When the cow is ready to be milked, she walks to the robot. The robot cleans her teats, and then lasers locate each teat and attach the milking cups. As the milk is collected, the robot collects data to send back to the farmer about the quality and quantity.



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 and added to the crop land.

WHAT HAPPENS TO MILK AFTER IT COMES FROM THE COW?



PASTEURIZATION

The first step is for the milk to be pasteurized. This process kills the bacteria and extends its shelf life, which allows the milk to be fresher for a longer period of time.

HOMOGENIZATION

The next step is for the milk to be homogenized. The milk is mixed, and the milkfat is dispersed throughout to create a uniform mixture. This prevents the cream from rising to the top.



STANDARDIZATION

Lastly, the milk is standardized by mixing cream into the skimmed milk more consistently to create a variety of milkfat classifications such as whole, reduced fat, low-fat, and fat-free (also known as skim milk).

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?

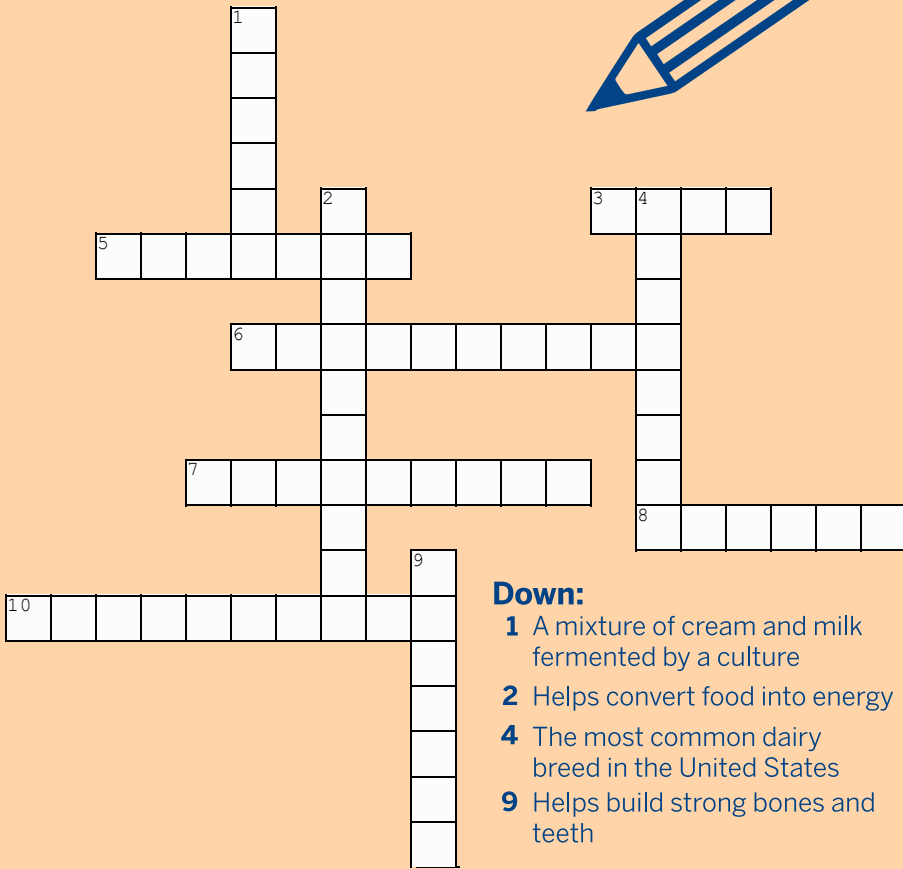
3 Before milking machines were invented in 1894, a farmer could milk 3 cows per hour by hand. How long would the milking take if the farmer had 15 cows?

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?

CROSSWORD FUN!

Across:

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



Down:

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

PRODUCTS MADE WITH MILK



1 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, how the whey is formed, and how the cheese is stored also account for different colors and tastes. Even the sizes and shapes of cheeses are different.

WHAT ARE THE DIFFERENCES IN MILK?

Milk is simple and pure, no matter which brand or percent you drink. When you see Whole, 2%, 1% or Skim milk, that just tells you the amount of milkfat the gallon holds.



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



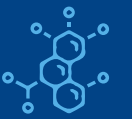
POTASSIUM

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 keep bones strong

2 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.

DID YOU KNOW 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 VARIETIES OF MILK INCLUDE:

Sweetened Condensed Milk
Evaporated Fat-Free Milk
Evaporated Milk



DIFFERENT TYPES OF 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

FILL IN THE BLANK FUN!

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: Cows are milked two to three times every day by a machine.

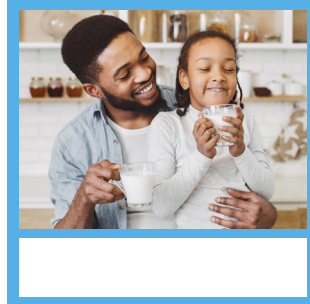
Testing: Milk is tested again and again to ensure it is safe for humans.

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.

Label these dairy-related pictures using the titles above.



TOP STATES

Texas consistently ranks in the top five for milk production. California and Wisconsin also consistently rank in the top five.

Label and color these states on the map.

TEXAS

CALIFORNIA

WISCONSIN



LET'S MAKE ICE CREAM!



MATERIALS

- Measuring cups and spoons
- ½ cup milk
- ½ teaspoon vanilla
- 1 tablespoon sugar
- 4 cups crushed or regular ice
- 4 tablespoons salt (*rock salt is best*)
- 2 quart Ziploc bags
- 1 gallon Ziploc freezer bag

The recipe is for one student, so everyone can have their own bag

DIRECTIONS

- 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.
- Place this bag inside the other quart-sized bag and seal again.
- Put the bag of liquid inside the gallon-sized bag and fill with ice. Sprinkle salt on the ice.
- Squeeze the air out of the bag and close.
- Shake and massage the bag, letting your liquid get surrounded by ice. In about five minutes, the liquid should turn to ice cream.
- Take out the quart bag, wiping it off. Cut off a bottom corner and squeeze into a bowl or eat out of the bag.

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.
- **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.



All milk is tested for antibiotics at the farm before it is loaded on the milk truck and then again at the bottling factory. If any antibiotics are found, the entire load is condemned and discarded.

Map Math Answers:
1. 98 cows
2. 2,745 gallons
3. 5 hours
4. 60 cows

Crossword Answers:
Across
3. Whey, 5. Protein, 6. Phosphorus
Down
7. Potassium, 8. Nicotin, 10. California
1. Yogurt, 2. Riboflavin
4. Helstein, 9. Calcium



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