



Florida's Milk Makers

Social Studies and Language Arts

Brief Description:

Students will explore the dairy industry of Florida, breeds of dairy cattle, and the composition of milk. Students will also design a demonstration, which explains why water weighs more than milk at equal volumes.

Objectives: Students will be able to:

1. Describe the importance of dairy in Florida.
2. Identify and distinguish between the five major breeds of dairy cattle and explain why these breeds were developed.
3. Present facts about dairy breeds and the Florida dairy industry in an oral presentation.
4. Use the Internet to obtain information about milk, Florida's dairy industry, and dairy products.
5. Describe the composition of milk.
6. Develop a demonstration that depicts why water weighs more than milk at equal volumes.

Time:

Activity One:

60-90 minutes for research, writing and map making

25-30 minutes for reporting

Activity Two

60-90 minutes for research and writing

25-30 minutes for reporting

Activity Three

A week in and out of class to develop demonstrations

45 minutes to present demonstrations

Materials:

- Copies of *Breeds Brainstorm* help sheet for each student
- Copies of *Dairy in Florida* and *Milk Composition* activity sheets for each student
- Access to Internet
- Pencils/pens
- Note Cards
- Construction Paper
- Markers
- Glue
- Scissors
- Craft Supplies
- Resources - Library, Internet, Encyclopedias, Dairy Books, Dairy Magazines, etc.
- PowerPoint *Florida's Dairy Industry*
- Demonstration materials as determined by the students

Preparation:

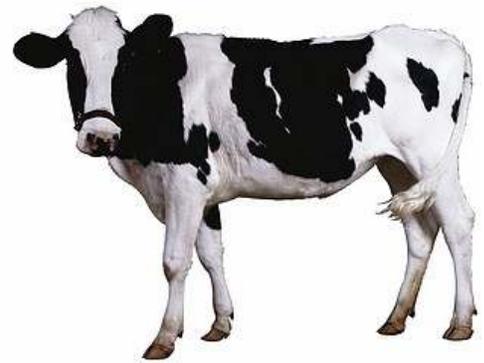
- Make copies of *Breeds Brainstorm* help sheet, *Dairy in Florida* and *Milk Composition* activity sheets for each student.
- Download *Florida's Dairy Industry* PowerPoint.

Life Skills:

1. Communicating and Relating to Others
2. Understanding Systems
3. Acquiring, Analyzing and Using Information
4. Working with Groups

Vocabulary:

- Breed
- Butterfat
- Composition
- Lactose
- Minerals
- Vitamins



Background:

Five Dairy Breeds

There are five major breeds of dairy cattle. They are: Ayrshire, Brown Swiss, Guernsey, Holstein and Jersey. Each breed has its own set of characteristics that have been developed to meet the needs of the people where they originated. Such characteristics include their **origin**; **color**; **weight at maturity** (adult weight, usually at 3 years old); **size of average calves at birth**; **use for milk, meat and/or draft**; **quantity of milk produced**; **percent of non-fat milk solids** (important for cheese and yogurt making) and **percent of butterfat in their milk**.

The most common breed is the **Holstein**. This "black and white" breed **produces more milk** than the other breeds on an average basis. Holsteins are large animals that were brought to America in 1852 from the Netherlands. Although most Holsteins are black and white, there are some that are red and white from a recessive gene.

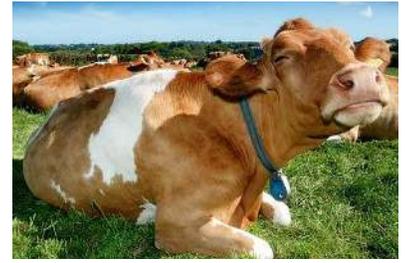
The **Jersey** breed is the smallest in stature. This breed came to North America in 1868 from the Isle of Jersey, a small island between England and France. Cows of this breed are generally a butterscotch color and are known for their high **butterfat** production. Butterfat, also known as milk fat, is the solid particles in milk that are separated out to make cream and butter. This property of milk gives products richer, creamier tastes.



provided by Hoard's Dairyman

Brown Swiss cattle are the oldest of the five. They are mocha-colored and were once considered **dual-purpose** cattle. This means they were used as work animals and for food products. Brown Swiss came from Switzerland in 1869 where they grazed in the high altitude of the mountains common to that area. Their early

The next breed is **Guernsey**. When Guernseys arrived in 1840, they were one of the first breeds that were brought to America. Like the Jersey, Guernseys were named after the Isle they came from, the Isle of Guernsey off the English Channel. Guernseys are golden colored with white markings. They are unique because they produce **milk golden in color**. At the turn of the last century up until World War II, "Golden Guernsey Milk" was widely promoted and sold for a premium.



Ayrshires are known for their stylish appearance. This red and white breed was brought to America from Scotland in 1822. They are a breed that is known for their hardiness and easy keeping. They can produce milk on even the most difficult of terrains, with the least feed per pound of milk.

Products

Since the beginning of civilizations, dairy animals have provided humans with a nutritional product called milk. Dairy animals could be cattle, goats, camels, llamas, sheep, yaks, water buffalo and other mammals. This is still true today. As time passed, the fluid milk dairy cows produced began to take new forms. These new forms were called **dairy products**. Along with milk, dairy products have played an important role in the history of America since 1611, when the first cows were brought to Jamestown, Virginia. (The cattle brought in 1611 were not any given breed. Breeds did not develop for another two centuries.)

As technology improved, doctors began to realize how important dairy products were in the human diet. They found it contained calcium, a mineral that builds strong bones and teeth. They also discovered it could help prevent **osteoporosis**, a serious health problem that affects the bones of older women.

Today, many dairy products are available. Visiting a local grocery store will present one with the many choices that are available for consumers to meet their daily requirement of dairy products.

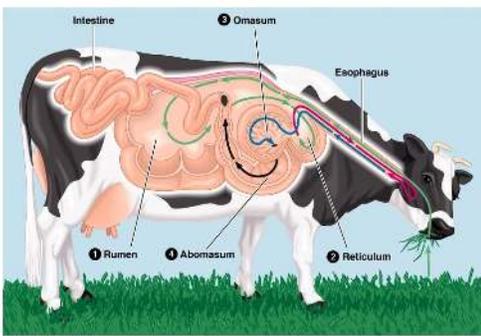
Fluid Milk

Fluid milk is used in many ways. After the cow is milked, the milk flows to a refrigerated tank where it is cooled. Once the tank is full, a milk truck picks the milk up from the dairy and transports it to a processing plant. Here it is either processed for fluid milk consumption in the immediate area, processed into dairy products or sent out of state as an export.



In Florida, most of the milk produced is used for fluid consumption. Some plants, such as Publix Processing Plant in Lakeland, take the milk they are delivered and turn it into products such as sour cream, ice cream, yogurt, frozen yogurt and cottage cheese. Hard cheese, however, is a product that is not made in Florida.

Ruminant Animals



Ruminant animals are able to graze and consume many plant materials and food processing by-products, which are inedible or unpalatable to humans. Ruminant animals possess a stomach with 4 compartments (rumen, reticulum, omasum, abomasum). The rumen contains microorganisms, which are capable of breaking down foods high in fiber (grasses, hays). Ruminant animals are capable of regurgitating (causing partially digested food to come back up to the mouth) their food for further chewing. Food is also fermented in the rumen. Animals like cattle, sheep, goats, giraffes and deer are ruminants.

Animal Feeds

Animal feeds are classified as either roughages or concentrates. *Roughages* are feedstuffs that are high in fiber and low in energy. Roughages include grasses and hays. Ruminants are capable of utilizing roughages because they have microorganisms that can breakdown the tough components of fiber. Monogastrics do not have a rumen nor the microorganisms to breakdown the fiber and, therefore, cannot efficiently use roughages. *Concentrates* are feedstuffs that are low in fiber and high in energy. These generally consist of grains, animal and plant by-products. The diet of monogastrics mainly consists of concentrates such as corn or soybean meal. Horses are capable of utilizing roughages due to the microbial digestion that takes place in the cecum.

Minimizing Waste

Cattle eat many food by-products that are considered inedible for humans. Cottonseed hulls, old bread and candy, and citrus pulp would fill landfills if not eaten by cows. Cows are some of the world's best recyclers.

Introduction:

1. Explain to the class that the dairy industry is a very important agricultural industry here in Florida. Share the statistics on *Florida's Dairy Industry* PowerPoint.
2. Ask the students:
 - *When you think of a dairy cow, what do you picture? (*Answers will vary.*) Have students describe their image of a dairy cow, if they have one. (*Answers will vary.*)
 - *Did you know that there are five major breeds of dairy cattle?
3. Identify these locations on a globe or map.
4. Each breed has different characteristics that distinguish it from each other. You are probably most familiar with the Holstein dairy cow. Ask:
 - *Do you know a characteristic of this breed? (*They are the black and white cattle and they are also the dairy cattle that produce the most milk. The Holstein breed is the most popular breed in the United States and they are a favorite here in Florida.*)
5. Inform the students this unit is about Florida's milk makers. But before we get started, you are going to give them a puzzle to figure out.
6. Hand out the *Milk Puzzler Sheet*. Instruct the students that for homework tonight (or class-work) they are to try to solve this puzzle. Tomorrow when they return to class they should show you their sheet, if they think they have it solved. Ask them not to share their answers and indicate that they will be receiving a series of clues to solve the puzzle as they explore this unit and the next one on dairy products. (The milk puzzle is: Milk weighs 8.6 pounds per gallon and water weighs 8.3 pounds per gallon. Why does water weigh more than milk?)
Instruct the student that if they think they have an answer write it down and show it to you (the teacher) before they leave for the day.



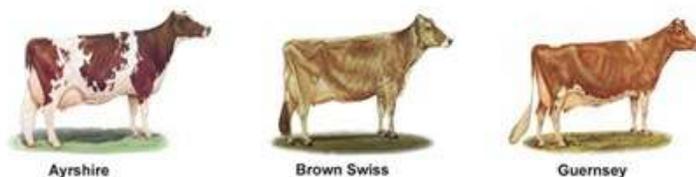
Milk Puzzler

The amount of time needed for the activities of this unit will vary between classes, grade levels, and school buildings. Therefore, all of the clues are given on the teacher instruction page. Each clue should be given at the beginning or end of the day as the next hint for the puzzle, throughout this unit for the next four days, until the majority of the class has it figured out.

Once the puzzle is solved, an activity will follow in **Activity Three**.

Activity One:

1. Divide students into five groups.
2. Assign each group a breed. Group 1-Ayrshire, etc.
3. Instruct each group to research their breed by taking notes for an oral presentation and making a map of the country from which their breed originated.
4. Pass out the *Breeds Brainstorm* sheet, note cards, construction paper, markers, craft supplies, glue, and scissors to each group. Make sure the students have pencils/pens.
5. Have students use the library and Internet resources available to them to research their breed.
6. Students should use the topics on the help sheet to guide their research.
7. Have students use construction paper, markers, glue, scissors and craft supplies to make the map.
8. When groups have completed their research and map, have the groups present their information.



Activity Two:

1. Explain to students that since they now know about dairy cows in general, they will research to find the significance of the dairy industry to Florida. (They will need Internet access for this activity.)
2. Hand out the *Dairy in Florida* activity sheets to each student. Make sure the students also have paper and pencils/pens.
3. Go over the directions with students and allow time for them to complete their activity sheet. An answer sheet is not provided because these figures change significantly from year to year and it will mislead the teacher to provide answers that are correct as of the day this publication is written but out of date the next month.

4. Discuss the findings with the students by asking these questions:
 - *Were you aware of the different breeds of dairy cattle? (*Answers will vary.*)
 - *Which breed were you most familiar with? Least familiar with? (*Answers will vary.*)
 - *What dairy products, besides milk, does Florida produce? (*sour cream, ice cream, yogurt, frozen yogurt and cottage cheese*)
 - *What role does the dairy industry play in Florida's economy? (*It contributed \$545 million in milk cash receipts in 2011.*)
5. Have the groups compile the information from the presentations and the maps into a display. You can use the information from the note cards.



Activity Three:

1. Hand out the ***Milk Composition*** activity sheet. Have the students create a pie graph that depicts the composition of milk.
2. Complete the ***Milk Puzzler*** activity. Once the student have figured out why water weighs more than milk ask them to design a demonstration that will explain this phenomenon. Keep the students in their groups to plan and conduct the demonstrations. This demonstration should include each component that makes up whole milk. Start with a glass of water.
3. Have the students read the nutritional label on milk at home or in the school cafeteria to determine exactly which vitamins and minerals are in milk. (***Milk is very low in iron, has a little sodium, is high in calcium, has some vitamin C, is naturally high in vitamin D, and Vitamin A is added.***) A neat website for your students is www.whereismymilkfrom.com where students can put in the code from their milk containers and find out which state their milk came from.
4. If they have trouble getting started here are a few suggestions:
 - A. To demonstrate what the milk sugar will do, substitute table sugar. When table sugar is added to the water it immediately sinks to the bottom. It will eventually dissolve but does weigh more than water.
 - B. To demonstrate what the various minerals may be in milk, add representative samples of items made from those minerals that the students think may be in milk. For example, the mineral present in greatest quantity is calcium. Chalk contains calcium; so do egg shells, and oyster shells. Eggshells will need to be finely ground and wet so that the surface tension of the water does not cause them to float.

- C. Vinegar or lemon juice will cause the milk protein (casein) to curdle and they may then observe whether it floats or sinks. Skimmed milk is necessary for this demonstration so that the fat in the milk does not alter the results. (About 2 Tbsp. of vinegar to one cup of skimmed milk will provide quick results.)
- D. The vitamins found in milk are mainly fat-soluble vitamins A & D (they need fat or oil in the food consumed in order to be available to the consumer) so they will float like the butterfat.
- E. Real cream, butter or oil will suffice to demonstrate that the oil floats, is lighter than the water and influences the weight of the milk.

Alternatives or Variations:

1. For activity three, instead of having each group design and demonstrate demonstrations for each ingredient, ask each group to design the demonstrations and write a report for all, but only demonstrate one example. Assign each group a different ingredient: vitamins, protein, butterfat, minerals, and milk sugar.
2. Have the students research a single dairy product using the Internet and the Florida Department of Agriculture and Consumer Services website listed in the reference section; and write a report on its significance to Florida's consumers, nutritional value and prospects for the future.
3. Have the students create graphs and charts on a single commodity from the data given. Manipulate it in various ways.
4. If students are very interested in the milk versus water activity, they can take it further by trying to predict the actual weight of the fat as a percentage of the milk to accomplish the weight differential.
5. Other forms of milk and dairy products such as skimmed milk, 1% milk, 2% milk, light cream, heavy cream, etc. can also be weighed and compared due to the varying amounts of fat content found in each.

Evaluation Options:

1. Utilize the completion and accuracy of assigned work to assess understanding of content and ability to perform operations.
2. Evaluate the students' demonstrations in activity three for creativity, accuracy in accomplishing the demonstration, and effectiveness of presentation.
3. Utilize the pre- and post-tests to assess content understandings.