



Dairy

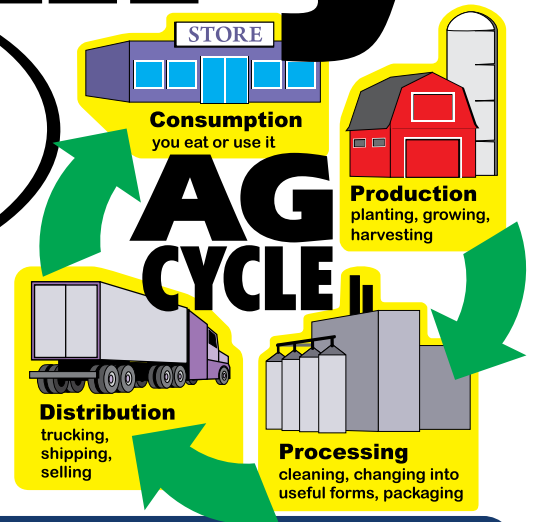
From Farm to You

Dairy Production

Even though North Dakota isn't a major dairy-producing state, the industry is important to our economy.

The Agriculture Cycle

Idea: Introduce this Ag Mag by talking about the Agriculture Cycle. Ask students to brainstorm dairy production, processing, distribution and consumption.



Incredible Dairy Facts

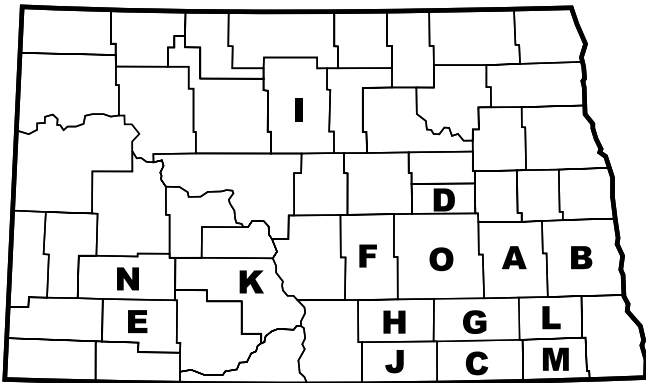
Use these words to fill in the blanks: **diet, pounds, trackers, fingerprint, hutches, birth, cows**

1. Female dairy animals that are called **cows** produce milk. The males are called bulls.
2. A cow produces milk after she has given **birth** to a calf. She can have her first calf when she's about 2 years old.
3. Milk is measured in **pounds** , and the average U.S. cow produces about 70 pounds (128 cups or 8 gallons) of milk each day.
4. Holsteins are one breed of dairy cattle. A Holstein cow's spots are like a **fingerprint** . No two cows have exactly the same pattern of spots.
5. Some cows wear activity **trackers** to record how much they eat, sleep and milk.
6. Newborn calves usually live in **hutches** that keep them healthy by providing warm, dry bedding; protection from the weather; and fresh air.
7. Dairy cows eat a **diet** called a total mixed ration. This includes hay and grains plus vitamins and minerals so cows have all the nutrients to produce wholesome milk.

Answers to Moo Math

- 144 cups per day X 300 days
= 43,200 cups of milk in a year
- 144 cups ÷ 16 cups per gallon
= 9 gallons per day
- 93,000 cows in 1980 – 10,000 cows now
= 83,000 more cows in 1980
- 48 cows ÷ 6 milking machines = 8 milking periods X 7 minutes per milking periods
= 56 minutes to milk 48 cows
- 9,000,000 X 0.90
= 8,100,000 Holsteins in the U.S.

Answers to North Dakota's Dairy Cows

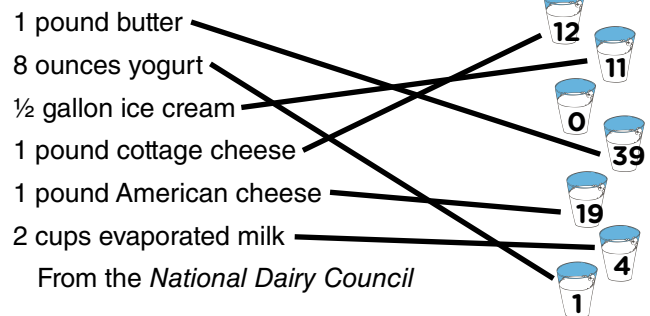


Idea: Have students design their own Holstein patterns. Provide each student with a cow outline, and have them put their names on the back. Using black paint and a sponge or their thumb, have students create a Holstein pattern on the cow outline. Once the cow paintings are dry, have students examine their cows and look for distinguishing patterns, such as a tic-tac-toe board or Big Dipper. Have students think of a name for their cow based on the pattern they identify. Have them write the name of the cow on the back of the paper. Hang all the cows around the room and see if students can identify their own cow by using her name to remember her pattern.

From the *National Dairy Council*

Dairy Processing

Answers to How Much Milk Does It Take?



Idea: Make a Polymer – The first plastics were made from natural sources such as milk, trees and plants. Plastics are made through a process called polymerization. In this process, molecules called monomers combine with each other to form larger molecules called polymers. These unique man-made polymer chains give plastics their special characteristics.

Materials:

- 1 cup milk
- 2 tablespoons white vinegar

Instructions:

Warm milk in a pan. Stir in vinegar. A white rubbery material forms. Take this out, wash it under the tap and shape it into objects such as marbles. Leave it for a few days, and the material will harden.

Discuss:

Explain to the students how the vinegar and milk react to coagulate casein. Protein molecules in the milk, which are so long they can bend, join to make the casein rubbery. As the material dries, the casein molecules shrink, making it hard.

Adapted from *Cycling Back to Nature with Biodegradable Polymers*, National 4-H Council

Idea: Study the science of milk and dairy processing by making cottage cheese. See <http://ksagclassroom.org/kslesson/lets-make/>.

Career Corner

Idea: Brainstorm with students other careers related to the dairy industry, or have students list all the careers they can think of related to dairy production, processing, distribution and consumption. Each student could select and explore one career area.

Idea: Learn more about Maartje Murphy's Cows and Co Creamery and Duchess Gelato at <https://cowsandcocreamery.com/>, including a video at <https://www.youtube.com/watch?v=MS6hZNSlaRE&t=134s>.

Dairy Distribution

Answers to The Journey of Milk

5. The milk is tested for quality and homogenized and pasteurized if it's to be sold as liquid milk.
2. Cows are housed in comfortable stalls and milked 2 or 3 times each day.
9. Finally, you enjoy the taste and nutrition of dairy foods.
6. Some of the milk is processed into cheese, yogurt, ice cream and other dairy products.
4. The milk is transported in a refrigerated tanker truck to the processing plant.
7. The dairy products are delivered with refrigerated trucks to stores, schools and restaurants.
1. First, cows eat a balanced and nutritious diet, drink lots of water and receive special care from their farmer-owners so they can produce milk.
8. You purchase dairy products at the store, at school or at a restaurant.
3. The milk is pumped into a refrigerated storage tank on the farm.

Dairy Consumption

Idea: About 90% of all American dairy cows are Holsteins. However, six other breeds also are raised for milking in the U.S. Have students go to www.midwest-dairy.com/farm-life/dairy-cows/ and write a descriptive paragraph explaining the difference between a Holstein and one of the other breeds.

Idea: Have students explore the dairy section and the games, activity sheets, videos and songs in the Kids section of www.MyPlate.gov.

Idea: Have students bring Nutrition Facts labels from dairy products, and review them together.

Idea: Have students compare the labels of butter and margarine. What are the differences? What are the similarities?

Idea: Homemade Butter

Ingredients and Equipment:

- ½ cup whipping cream
- Salt
- Crackers
- Plastic jar or container

Procedure:

Pour whipping cream into a clean plastic jar. Screw the lid on tightly. Shake the jar vigorously.

Idea: Squeeze Freeze

Supplies:

- Liquid measuring cup
- Measuring spoons
 - tablespoon, ½ teaspoon
- Paper towels

Needed for each child:

- Small zip-lock plastic bag
- Large zip-lock plastic bag
- Plastic spoon
- ½ cup whole milk
- 1 tablespoon sugar
- ½ teaspoon vanilla
- Ice, crushed or cubes
- 1 tablespoon salt

Setup:

Sugar and vanilla can be put in small plastic bag ahead of time. Salt can be put in large plastic bag ahead of time.

Procedure:

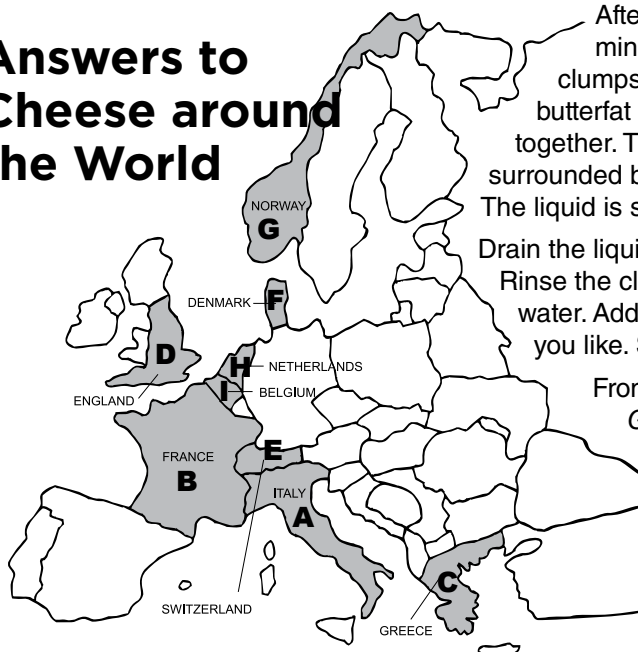
Give each child a small bag containing the sugar and vanilla. Have each child hold open the bag while an adult pours in the ½ cup whole milk. Remove as much air from the bag as possible. Seal bag. It is important bag is sealed properly.

Have the children drop the small bag into the large plastic bag with the salt in it. Add 18-20 ice cubes or crushed ice. Remove as much air as possible from the large bag. Seal properly.

Children should knead the bags about 10 minutes. When a soft ice cream is formed, give spoons to eat out of the bag.

Note: It is important to use whole milk. Other types of milk take too long to freeze. Salt also is very important. Without it, the ice cream will not freeze. One pint of half and half can be added to a gallon of whole milk. This makes the ice cream richer, and it will freeze faster.

Answers to Cheese around the World



After about 10 minutes, yellow clumps will form as the butterfat particles stick together. The clumps will be surrounded by a white liquid. The liquid is sweet buttermilk. Drain the liquid from the clumps. Rinse the clumps under cold water. Add a pinch of salt if you like. Serve on crackers.

From *Dairy Helper's Guide, 4-H Cooperative Curriculum System*

Answers to Undeniably Dairy

Circle the correct spelling of the words that describe the essential nutrients in dairy products and what they do for you.

(Calcium) or **Calsium** – helps build strong bones and teeth

Vitamin D – helps your body (adsorb or **(absorb)**) calcium to build strong bones and teeth

(Phosphorus) or **Fosforus** – strengthens bones and generates energy in cells

Pantothenic Acid – helps your body use (carbohadrates or **(carbohydrates)**) fats and protein for fuel

(Protein) or **Proteen** – builds and repairs muscles

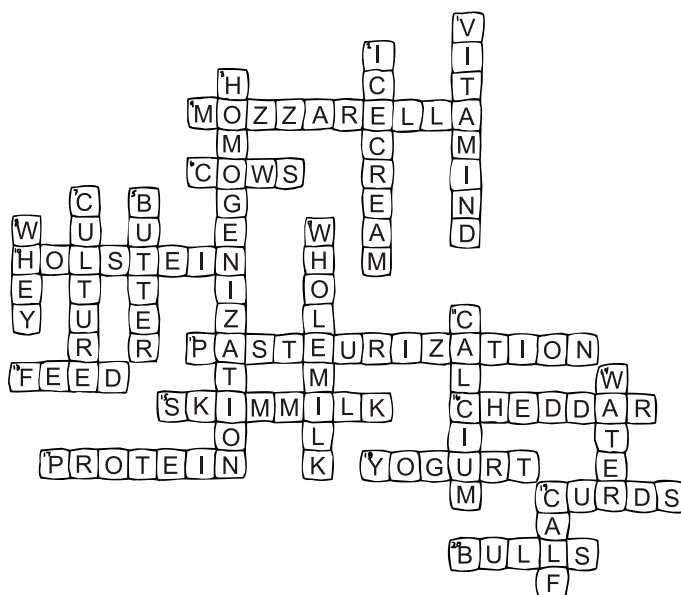
Riboflavin – helps change food to **(energy)** or enjerjy)

Vitamin B12 – builds red blood cells that carry (oxigen or **(oxygen)**) to body tissues

Vitamin A – helps maintain (vishon or **(vision)**) and skin

Niacin – helps digest sugars and fatty **(acids)** or asids)

Answers to Crossword Puzzle



Teacher Resources

www.discoverdairy.com

Elementary lessons include:

- Animal Health
- Milk Quality and Safety
- Dairy in Our Environment
- Dairy in Our Community
- Dairy and Good Nutrition

www.midwestdairy.com

- Lessons on making butter, Greek yogurt, ricotta cheese and whipped cream
- Lessons on Healthy Farming, Healthy You; Healthy Bodies, Healthy Cows; Bone Health; and Soil for Ag
- Activities including vowel match and scavenger hunt
- Videos on a variety of topics
- Learn about the dairy farmers who produce delicious milk and dairy products, take a tour of a working dairy farm or explore commonly asked questions about dairy nutrition and life on the farm

www.drink-milk.com

- Dairy farming, foods and nutrition activities, videos and more

National Agriculture in the Classroom Agricultural Literacy Curriculum Matrix

- Cheesemaking: From Liquid to Solid – <https://agclassroom.org/matrix/lesson/813/>
- A Day Without Dairy – <https://agclassroom.org/matrix/lesson/255/>
- FoodMASTER: Milk and Cheese – <https://agclassroom.org/matrix/lesson/260/>
- The Ultimate Efficient Recycler – <https://agclassroom.org/matrix/lesson/254/>
- Whipping Butter into Shape – <https://agclassroom.org/matrix/lesson/625/>

Books

- Cows by Cari Meister, Jump!
- Extra Cheese, Please! Mozzarella's Journey from Cow to Pizza by Cris Peterson, Boyds Mills Press
- Farming by Gail Gibbons, Holiday House
- From Milk to Ice Cream by Stacy Taus-Bolstad, Lerner Publishing Group
- From The Farm To The Table: Dairy by Kathy Coatney, CreateSpace Independent Publishing Platform
- Kowz and Co. by Nancy Gray, Liebl Printing Company
- Tales of the Dairy Godmother: Chuck's Ice Cream Wish by Viola Butler, Feeding Minds Press
- The Milk Makers by Gail Gibbons, Holiday House

Videos

- Piet van Bedaf: ND Dairy Farmer – many short videos from Maartje Murphy's brother about the work on their dairy farm, <https://www.youtube.com/@pietvanbedaf-nddairyfarmer9047>
- One-of-a-Kind Dairy, 3:11 – Agweek, the Qual family dairy at Libson, ND, www.youtube.com/watch?v=oc9L5nCNAOg&t=3s
- New Technologies at North Dakota's Northern Lights Dairy, 1:24 – ND Livestock Alliance, www.youtube.com/watch?v=o4HcGNb1kOw
- The Journey of Milk, 4:09 – Dairy MAX, www.youtube.com/watch?v=nx0KYWxrO1k
- Cows! Learning about Cows for Kids, 2:33 – KLT Wild, www.youtube.com/watch?v=UWmbg16ywD8

Standards and Benchmarks

English Language Arts and Literacy Content Standards for Reading Informational/Nonfiction Text

- Gr.3, RI.2 Determine the main idea of a text and recount the key details to explain how they support the main idea.
- Gr.3, RI.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.
- Gr.4, RI.1 Refer to details and examples in a text (textual evidence) when explaining what the text says explicitly and when drawing inferences from the text. Summarize the text.
- Gr.4, RI.2 Determine the main idea of a text and explain how it is supported by key details.
- Gr.5, RI.2 Determine two or more main ideas of a text and explain how they are supported by key details.
- Gr.5, RI.3 Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.
- 3.F.10 Determine the meaning of multiple-meaning words and phrases, choosing from a range of strategies with varying texts (e.g., synonyms, antonyms, homophones, homographs).
- Craft and Structure
- Gr.3, RI.4; Gr.4, RI.4.; Gr.5, RI.4 Determine the meaning of general academic and domain specific words and phrases in a text relevant to grades 3, 4 and 5 topics or subject areas.

North Dakota Mathematics Content Standards

Number and Operations in Base Ten

- 5.NBT.5 Fluently multiply multi-digit whole numbers using strategies flexibly, including the standard algorithm. Mastery of the standard multiplication algorithm is expected at this stage.
- 5.NBT.6 Using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division, find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors.
- 3.NO.NBT.3 Add and subtract within 100,000 using place value strategies, algorithms, and/or the relationship between addition and subtraction.

Measurement and Data

- 3.MD.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units.
- 3.GM.M.3 Tell and write time to the nearest minute and measure time intervals in minutes.

Health Content Standards

1: GROWTH AND DEVELOPMENT

Body Systems

- 5.1.2 Explain the maintenance of human body systems (e.g., skeletal: choose foods high in calcium and vitamin D, be physically active)

6: CONSUMER HEALTH

- 4.6.1 Describe the characteristics of valid health information, products, and services (e.g., choose my plate.gov, USDA, FDA, nutrition labels, CDC)

Science Content Standards

From Molecules to Organisms: Structures and Processes

- Performance Standard 4-LS1-1 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

Matter and its Interactions

- Performance Standard 5-PS1-4 Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

Social Studies Standards

Economic Standards: Exchange and Markets

- E.3_5.1 Utilize fundamental principles and concepts of economics to understand economic activity (e.g., needs and wants, goods and services, opportunity cost).
- E.3_5.2 Describe how goods and services are produced and distributed.
- E.3_5.4 Describe the necessity and impact of community services.
- E.3_5.5 Describe and analyze how North Dakota's location, culture, and natural resources influence its economic decisions and development.

Geography Standards

- G.3_5.2 Use geographic tools and technologies to acquire, process, and report information from a spatial perspective.

North Dakota Agriculture in the Classroom Activities

This **Ag Mag** is just one of the North Dakota Agriculture in the Classroom Council projects. Each issue of the Ag Mag focuses on an agricultural commodity or topic and includes fun activities, bold graphics, interesting information and challenging problems. Send feedback and suggestions for future Ag Mag issues to:

Becky Koch
NDSU Agriculture Communication
701-866-6162
becky.koch@ndsu.edu

Another council teacher resource is **Project Food, Land & People (FLP)**. Using the national FLP curriculum, ND Ag in the Classroom provides 600-level credit workshops for teachers to instruct them in integrating hands-on lessons that promote the development of critical thinking skills so students can better understand the interrelationships among the environment, agriculture and people of the world. Teachers are encouraged to adapt their lessons to include North Dakota products and resources.

Project Food, Land & People's 55 lessons include:

- Amazing Grazing
- Cows or Condos?
- By the Way
- Seed Surprises
- Schoolground Caretakers
- Could It Be Something They Ate?
- What Piece of the Pie?
- and many more.

For information, contact:

Jill Vigesaa
N.D. Farm Bureau Foundation
701-799-5488
jill.vigesaa@gmail.com

The ND Geographic Alliance conducts a two-day **Agricultural Tour for Teachers**. The tour includes farm and field visits, tours of agricultural processing plants to see what happens to products following the farm production cycle, and discussions with people involved in the global marketing of North Dakota farm products.

For information, contact:

Jeffrey Beck
North Dakota Geographic Alliance
701-240-9231
jeff.beck@minot.k12.nd.us

Educators may apply for **mini-grants for up to \$500** for use in programs that promote agricultural literacy. The Agriculture in the Classroom Council, working with the ND FFA Foundation, offers these funds for agriculture-related projects, units and lessons used for school-age children. The mini-grants fund hands-on activities that develop and enrich understanding of agriculture as the source of food and/or fiber in our society. Individuals or groups such as teachers, 4-H leaders, commodity groups and others interested in teaching young people about the importance of North Dakota agriculture are welcome to apply.

Examples of programs that may be funded: farm safety programs, agricultural festivals, an elementary classroom visiting a nearby farm and ag career awareness day. Grant funds can be used for printing, curriculum, guest speakers, materials, food, supplies, etc. More ideas and an application are at www.ndffaafoundation.com/ applications.

For information, contact:

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EXTENSION

Ag Mag Production by North Dakota State University Agriculture
Communication: Tennille Altepeter, Teacher Reviewer; Becky Koch, Editor;
David Haasser, Graphic Designer