



UPPER LEVEL LESSON 1

Animal Health

State Standards:

<u>Subject</u>	<u>Anchor</u>	<u>Description</u>
Science	S8.B.2.1 S8.B.2.1.4 S8.B.2.2 S8.B.1.1	<ul style="list-style-type: none"> ◆ Explain the basic concepts of natural selection. ◆ Describe how selective breeding or biotechnology can change the genetic makeup of organism. ◆ Explain how a set of genetic instructions determines inherited traits of organisms. ◆ Recognize that the gene is the basic unit of inheritance, that there are dominant and recessive genes, and that traits are inherited. ◆ Describe and compare structural and functional similarities and differences that characterize diverse living things. ◆ Compare similarities and differences in internal structures of organisms (e.g. invertebrate/vertebrate, vascular/non-vascular, single-cell/multi-celled) and external structures (e.g. appendages, body segments, size, shape). ◆ Describe the structures of living things that help them function effectively in specific ways (e.g. adaptations, characteristics).
Reading	R8 1.1.8. A R8 1.6.8. A R8 1.8.8. A	<ul style="list-style-type: none"> ◆ Apply appropriate strategies to interpret and analyze authors purpose. ◆ Listen critically and respond to others in small or large group settings. ◆ Develop an inquiry based process in seeking knowledge.

Activating Strategy:

The activating strategy should take about 10 minutes of classroom, with four minute video included, to set stage for lesson.

Teachers should remind students that milk is an essential part of a balanced diet. The Food Guide Pyramid encourages teens and pre-teens to get at least three servings of milk a day. Milk comes from the cows that live on dairy farms. As the world's population has grown, dairy farmers have needed to supply more milk for a growing population. This lesson demonstrates some of the ways dairy farmers have been able to increase the amount of milk their cows can produce to feed a growing population, without compromising the high quality of care their cows receive.

Show Video Motivator

Approximate Length:

This lesson has two parts. Each part should take about 60 - 70 minutes of class time, with these segments:

Segment	Responsible	Segment	Responsible
1) Lesson Overview — 5 minutes	Teacher	4) Lab Exercise — 20 minutes	Students
2) Reading Passage — 10 minutes	Students	5) Lesson Review — 10 minutes	Class
3) Classroom Discussion — 10 min	Teacher/Class	6) Lesson Evaluation — 10 minutes	Teacher

Teacher can choose to teach one part or both parts of lesson. Lessons and parts can be taught during one large block or divided into periods over 2 - 4 days.



LESSON 1: DISCOVER DAIRY . . . *and Animal Health:*

Part I — Selective Breeding in Dairy Cows

Essential question:

How has genetic selection played a role in the amount of milk today's dairy cow produces?

Key to answering essential question:

Discuss genetic traits of dairy cow and how they play a role in milk production.

Practice the process of trait mating

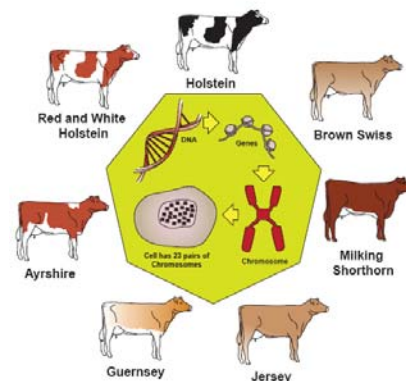
Recognize the purpose of artificial insemination.

Describe how farmers select bulls that improve upon cow's genetic traits.

Reading Passage: *(Give students 10 minutes to read over Page 1 of Reading Passage.)*

Classroom Discussion: *(Use transparency to walk through Reading Passage.)*

- ◆ Seven different breeds — each breed descends from a different region of the world, and each breed has its own unique characteristics and qualities. *Ask students which breed they are most familiar with.*
- ◆ Dairy farmers have built on those unique characteristics to improve the cow's productivity and longevity through selective breeding. *Ask students why greater longevity and productivity would be important to the farmer.*
- ◆ Selective breeding has played an important role in enabling cows to increase the amount of milk they can give. *Ask students how much more milk cows give today than they did in 1940.*
- ◆ Most dairy farmers use artificial insemination to impregnate their cows. Farmers select the bulls to breed their cows based on how well their genetic traits compliment the cow. *Ask students what artificial insemination has done to the genetic pool in dairy cows. (increased or decreased).*
- ◆ Using artificial insemination and selective breeding gives the farmer the ability to influence the genetic traits inherited by an offspring from a cow. *Ask students what traits dairy farmers want in a bull they choose to mate to their cow.*
- ◆ Many of the genetic traits used to select mates relate to how the animal appears – such as size and scale. Animals are also bred for traits relating to the cow's milk production. *Ask students why they think farmers breed their cows to give more milk.*
- ◆ Some of the traits relate specifically to the longevity of the animal. For example, a cow that has difficulty walking could be mated to a bull that corrects her feet and leg problems. *Ask students what other traits could be influenced by selective breeding.*



Lab Exercise:

Teachers should prepare copies of the Animal Health Lab Component Part 1 materials to distribute to the class to prepare for this exercise. Students can complete the exercise in groups of two or as individuals. Teachers should explain lab after handing out materials.

LESSON 1: DISCOVER DAIRY . . . *and Animal Health:*

Part I Lab Explanation:

Farmers work with artificial insemination companies that have semen collected from a vast selection of bulls. Dairy Farmers work with a professional who helps find a perfect match for their cows. Through using this process of genetic selection, farmers have been able to dramatically improve both the productivity and longevity of cows in the past 50 years.

In this lab exercise, students should compare and contrast traits of three dairy cows and evaluate a list of dairy bulls to identify the right mate to balance each dairy cow's traits. Students should explain their bull choice for each cow to demonstrate that they understand the principles of selective breeding and how it relates to dairy cows.

The ideal Holstein cow should be tall and strong, with a deep body, a level back (or rump), and legs that have the appropriate angle from both the side and back view. Her udder, which holds the milk, should have a strong fore udder attachment, a high and wide rear udder, a strong udder cleft, close rear and front teat placements and average sized teats. She should also be positive in milk, fat and protein. Students should use this description of the ideal cow to identify which bull they could select to improve upon each cow's traits the most.

Give the students 10 - 15 minutes to evaluate the information and fill out Part I of the Lab Component. The teacher should facilitate classroom discussion around which bulls were selected and why. Ask the students how selecting a bull with a negative milk production score may affect the offspring. What about selecting a bull with poor feet and legs? In what other species — either on the farm or in the wild — do you think selective breeding is used?

Part I Lesson Review:

Teachers can asked the following questions to evaluate whether students understand how the principle of selective breeding is applied to dairy cows.

1. What are the two advancements that have played a key role in enabling dairy cows to quadruple their milk production in the past 70 years? Artificial Insemination & Selective Breeding
2. How does selective breeding work? It allows the farmer to use the principles of genetics — dominant and recessive genes — to breed for offspring that can produce more milk and live longer.
3. What are some traits that dairy farmers can use selective breeding to influence? The cow's feet and legs and her mobility, her size and scale, her appearance, the amount of milk she gives, component levels in the milk, the quality of her udder, and many more things can be influenced.
4. **REVIEW OF DOMINANT AND RECESSIVE GENES:** If having horns is a dominant trait in dairy cows, and the farmer breeds a cow with horns to a bull that was polled (or does not have horns), will the offspring have horns or not? Yes, the offspring will have horns. What if the farmer breeds the offspring to another polled bull (with no horns)? That offspring will not have horns.

Part I Lesson Evaluation: *If desired, teachers can use the Lesson 1 Part 1 section of the Discover Dairy post-test to evaluate students' ability to grasp lesson concepts. This test can also be used at unit end.*

LESSON 1: DISCOVER DAIRY . . . *and Animal Health:*

Part II — The Lifecycle of a Dairy Cow

Essential question:

How have nutrition and technology played a role in the amount of milk today's dairy cow can give?

Keys to answering essential question:

Understand the life cycle of a dairy cow.

Understand how the cow's nutrient needs and requirements change throughout her life.

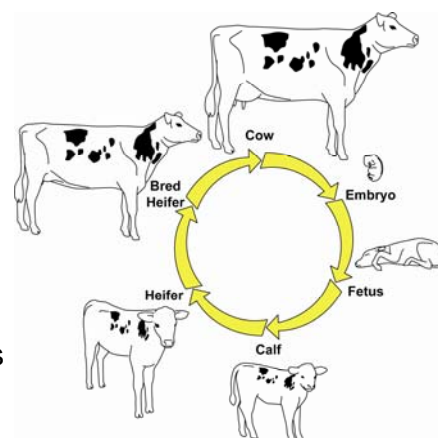
Understand how the farmer plays a role in providing the proper nutrition and care for the cow.

Reading Passage: *(Give students 10 minutes to read over Page 2 of Reading Passage.)*

Instruction: *(Use transparency to review the reading passage)*

Teacher should review the different stages of a cow's life and how the farmer plays a role in each stage.

- ◆ **Embryo** – the first step in the life cycle of a cow is the embryo, which is the organism that results from a successful mating of a male sperm and a female ovary. *Ask the students how the cow's gestation period compares to a human's.*
- ◆ **Fetus** – A fetus is what the offspring is called in between the embryonic stage and when it is born. *Ask the students why the fetal stage is important to the animal's development.*
- ◆ **Calf** – A baby cow is called a calf. A calf weighs about 100 pounds when it is born. Female calves will grow into cows someday. Male calves become bulls. *Ask the students why it is important to feed the calf colostrum right after it is born.*
- ◆ **Heifer** – A heifer is a cow that hasn't given birth yet. *Ask the students why a heifer can eat more grass-based foods than a baby calf can.*
- ◆ **Bred Heifer** – When the heifer is 14 months old, she is mated with a bull and becomes pregnant. At about two years of age, she has her first calf and becomes a cow. *Ask the students why it is important that a heifer have a calf.*
- ◆ **Mature Cow** – Cows typically give milk for 10 months out of the year, with a two month break before each time she has a baby. They typically produce offspring once every year. *Ask students why they think it's important for a cow to have a two-month break before she has her calf.*

**Follow-up Questions:**

- ◆ *Ask students what role they think the farmer plays in taking care of the calves, heifers and cows.*
- ◆ *Ask students what are some basic needs the cow has in each stage of her life.*
- ◆ *Ask students how those needs compare to the needs of a human.*

Lab Exercise:

Teachers should prepare copies of the Animal Health Lab Component Part 2 materials to distribute to the class to prepare for this exercise. Students can complete the exercise in groups of two or as individuals.

LESSON 1: DISCOVER DAIRY . . . *and Animal Health:*

Part II Lab:

The following items are needed for exercise (per student or group)

- 2 celery sticks
- 2 carrots
- 2 cheese sticks
- One 10 oz. cup of orange juice

Lab Explanation: Teacher should explain that a healthy, well-cared-for cow will give more milk. The way farmers care for their cows and how they feed them has helped to increase the amount of milk cows give over the past 50 years.

- ◆ Just like our diets, a cow's diet must be balanced based on her stage of life. For instance, a baby calf requires higher energy foods to fuel her rapid growth.
- ◆ A cow that has just given birth requires higher levels of certain nutrients to replenish her body. Farmers must adjust rations to accommodate those needs.
- ◆ Farmers work closely with an animal nutritionist and use a variety of feed products to balance cows' diets to meet their precise nutrient needs using a variety of feed products.
- ◆ Farmers use a large feeding scale to make sure each cow gets the right amount of each feed. Those feeds are blended together to provide a balanced diet.

During the lab, students should use the carrots, celery, cheese and orange juice to balance a diet to meet the required nutrients listed on the lab page. They should use a weight scale to measure the right amount of each feed. If they don't have a weight scale, they can use measuring cups to determine the amount.

Part II Lesson Review:

Teachers can ask the following questions to evaluate whether students understand how the cow's life cycle is similar to ours and why a balanced diet is needed to support growth and development.

1. Name three of the six stages a cow passes through during her life cycle: Embryo, Fetus, Calf, Heifer, Bred Heifer, and Mature Cow are the six stages in a cow's life cycle. How does that compare to the stages in our life cycle? Humans also start out as embryos and become fetuses. Students should discuss different stages in human life.
2. What role does colostrum play in a calf's development? It is the first milk produced by the mother after she has given birth and provides essential antibodies needed to aid the calf's immune system.
3. How long does a cow carry her calf before giving birth? About 9 1/2 months, the same length of time that a human carries her baby.
4. Why is it important that a calf or cow gets a balanced diet of food? To provide the right amount of nutrients to aid in her growth and development and to meet her nutrient needs for her current stage of life.
5. How much feed does a mature cow eat every day? About 90 pounds of feed. How much water does she drink? About 40 gallons of water.

