

Build a Herd

Grade Level(s)

4th grade

Estimated Time

30 minutes

Purpose

Students will explore genes and heredity in the context of beef cattle.

Materials

▪Links:

Website with virtual resources- www.linncoag.com -2020/21 virtual learning-down tab-December

Instructional video- <https://www.youtube.com/watch?v=V3QSnCV3ytl>

Ball Family FarmChat-<https://www.youtube.com/watch?v=aMOhN22VgDg>

My Family's Beef Farm Book

Read-aloud video

<https://www.youtube.com/watch?v=4ERBJq8C3OI&list=PL6fqYHxqQAn2WEXg3TElq3YSXqsQg2Woa&index=6>

Print <https://www.yumpu.com/en/document/read/63054644/my-family-s-beef-farm>

▪Worksheets:

Build a cow worksheet

PowerPoint presentation

▪Other:

Quarters

Vocabulary

Trait – a genetically determined characteristic

Gene – a unit of heredity that is transferred from a parent to offspring and is held to determine some characteristic of the offspring.

Inherit – derive a quality or characteristic genetically from one's parent or ancestors

Heredity – the passing on of physical or mental characteristics genetically from one generation to another.

Dominant – A trait that can be expressed when just one copy of the gene is present

Recessive – A trait that can be expressed only when two copies of the gene is present
Hereford – an English breed of beef cattle with a red body and white face and stomach
Angus – A Scottish breed of beef cattle known for their good meat quality
Linked genes – genes that are inherited together or do not assort independently
Phenotype – physical features of an animal

Interest Approach – Engagement

Ask students: “does chocolate milk come from a brown cow? If it doesn’t, why not? Because genetically, coat color doesn’t reflect body color (or the color of milk). Most of the characteristics of cattle are inherited from their mom and dad. If we want chocolate milk, we must add syrup. What are some characteristics of humans that are inherited? What characteristics might cattle inherit?”

Background - Agricultural Connections

The study of genetics and heredity are incredibly important to agriculturalists. For centuries, farmers and ranchers have selected plant varieties and livestock for specific beneficial traits. Livestock producers select for animals with increased milk production, ample muscle mass or structural correctness, among other things. Selecting for these traits allows farmers to produce a higher quality and more abundant food supply.

Most plants and animals have two of every kind of gene. One comes from their mother, and one comes from their father. Only one gene from each parent is passed to each offspring for a particular trait. There are different forms of a gene that are referred to as alleles. Alleles are forms of the same gene with small differences in their DNA sequence. These small differences contribute to each organism’s unique physical features, which are called “phenotypes.”

Alleles can be either dominant or recessive. Dominant alleles overpower recessive alleles and are always expressed in offspring. Recessive alleles are only expressed if a recessive allele is inherited from both parents, because they are overpowered by even one dominant allele. For example, the allele in cattle that causes horns to grow is recessive. The hornless, or polled, allele is dominant, so more cattle are polled than horned. Dominant alleles are denoted by an uppercase letter, and recessive alleles are denoted by a lower case letter. When both dominant and recessive genes are present (one parent contributed a dominant gene and one contributed a recessive gene), the condition is called “heterozygous.” This would look like an “Aa.” When both genes are either dominant or recessive, the condition is called “homozygous.” This would look like “aa” or “AA.”

Understanding genetics is crucial for farmers. Beef producers try to breed for good characteristics, such as good marbling (intramuscular fat that contributes tenderness, juiciness and flavor), abundant muscle mass, and structural correctness. Beef producers try not to breed cattle to have horns, because they can be dangerous, be small bodied, or have bad temperament. Breeders also have to pay attention to any genetic diseases that may be passed on from dams and sires to offspring.

There are several beef breeds that have distinguishing characteristics that are transferrable to their offspring. Angus cattle are generally smaller bodied, less muscular cattle with good marbling and poor disposition. They are polled and either all red or all black. Hereford cattle are reddish brown, with a white face and underbelly. They are larger framed with abundant muscle, but have less marbling than Angus cattle. Herefords can be either polled or horned, and have calm dispositions. Angus and Hereford cattle are often bred together to get the best of both worlds: a large bodied, heavily muscled animal with good meat characteristics. A Black Angus-Hereford cross can be identified by a white face and all black body, usually with no horns, which is usually called a Black Baldy. These are usually a product of an Angus cow bred with a Hereford bull. Crossbred cattle have been shown to have up to 20% more lifetime productivity over purebreds, which leads to an economic advantage for farmers.

Procedures

1. Watch the instructional video provided above.
2. Read or listen to the story My Family's Beef Farm- reviewing the key concepts.
3. Pull up the PowerPoint and discuss the slides, encourage conversation about the different traits. Emphasize that traits are passed down by the mom and dad to the offspring. *Don't worry if you are not an expert on the PowerPoint content. I will review in the instructional video.
 - Farmers can breed for certain traits, choosing a cow and bull with those traits.
 - Farmers are looking for easy calving, good marbling (meat), strong and sturdy bones/frame, etc.
 - Dairy and beef cattle have unique breeds. A few breeds, like shorthorn, can be found in both beef and dairy.
4. Pass out the Build a Herd worksheet and quarters. You can have students do this in small groups or individually.
 - a. Flip the coin to determine what genes your offspring will carry. Possible breeds for today's activity include Herford, Black Angus, Red Angus, Red and White Simmental and Black and White Simmental.
 - b. Flip for the following traits: gender, horned/polled (horned=naturally born with horns and polled=naturally born without horns), black coat/red coat, solid coat/spotted coat, north/south breed.
 - c. Color a picture of your calf with your selected traits.
5. Watch "The Ball FarmChat" video provided above. Students will be introduced to my dad and twin sister.
 - What did you learn from the FarmChat? How does the Ball Family care for their cows? What kind of cows do they raise?
6. Review quiz:
 - Beef & dairy cattle produce the same products? FALSE (dairy specialize in milk and beef specialize in meat, but we can produce meat from both dairy and beef).
 - Dairy cows produce milk, cheese, yogurt, ice cream and cottage cheese? TRUE
 - Beef cattle produce hamburgers, steaks, beef stew. TRUE
 - Are beef & dairy cattle ruminants? TRUE (Ruminants are animals that eat grass).

- In Iowa, farmers only raise beef animals? FALSE (They also raise dairy, pigs, goats, sheep, etc.)
- Cattle can eat forage like grass and hay? TRUE (They are ruminants)
- All cattle are mammals, who produce milk for her baby? TRUE (Beef cattle provide milk for only their babies. Where dairy cattle produce milk for their babies and for us!)

Organization Affiliation

Original lesson plan can be found on the Iowa Agriculture literacy Foundation website.

Agriculture Literacy Outcomes

Identify examples of how the knowledge of inherited traits is applied to farmed plants and animals in order to meet specific objectives (i.e., increased yields, better nutrition, etc.)

Provide examples of science being applied in farming for food, clothing and shelter products.

Iowa/ Common Core Standards

3-LS3-1. Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. [Clarification Statement: Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings. Emphasis is on organisms other than humans.] [Assessment Boundary: Assessment does not include genetic mechanisms of inheritance and prediction of traits. Assessment is limited to non-human examples.]

3-LS3-2. Use evidence to support the explanation that traits can be influenced by the environment. [Clarification Statement: Examples of the environment affecting a trait could include normally tall plants grown with insufficient water are stunted; and, a pet dog that is given too much food and little exercise may become overweight.]

3-LS4-2. Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. [Clarification Statement: Examples of cause and effect relationships could be plants that have larger thorns than other plants may be less likely to be eaten by predators; and, animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave offspring.]

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