

Genetics

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Goal (learning objective)

Youth will learn beginning genetics concepts including terminology and the heritability of various traits.

Supplies

- A chalkboard or dry erase board
- Chalk or dry erase marker
- Photocopies of the following handouts:
 - a. Handout 1 - “Inheritance of Horns” (enough for group)
 - b. Handout 2 - “Cow with Horns” (3 copies, cut out)
 - c. Handout 3 - “Cow without Horns” (5 copies, cut out)
- Paper (enough for group)
- Temporary adhesive or painter’s tape
- Computer
- Projector
- Screen (or wall to project on)

Pre-lesson preparation

- Read/review lesson
- Practice drawing a Punnett Square (a square diagram that is composed of a grid of usually four boxes to determine the possible genotypes of an offspring arising from a particular cross or breeding event)
- Review PowerPoint supplement (the PowerPoint is key to helping youth to learn the terminology and concepts)
- Read/review terminology and concepts for each species (these are found in the PowerPoint)

Lesson directions and outline

Begin by asking youth to give a definition of heredity. After several youth have had the chance, share the following information with the youth:

Understanding the basics of genetics and the principles of inheritance is important and necessary to improve livestock. Characteristics are passed from generation to generation, a process known as heredity (genetics). Each animal receives half of its inheritance from the male and half from the female. The differences between animals is a result of two factors, heredity (genetics) and environment. Both affect the performance of all animals.

Traits of economic importance:

- Reproductive performance - Fertility level, birthing ease, maternal ability
- Growth rate and feed efficiency
- Conformation traits
- Carcass traits

Conducting the activity (DO)

1. One potential way to teach this lesson would be to assign it to an older youth to prepare and present using the PowerPoint. Whoever teaches this lesson should not read each slide word for word. The best way would be for the presenter to summarize the information on each slide. Information included in the PowerPoint: Terminology, dominant and recessive genes, traits of economic importance and inherited defects. **Remember this is a Level 2 lesson so some of the information may be hard for a younger member to understand.**
2. Ask for a volunteer to distribute Handout 1.
3. Using the chalk board (or dry erase board) draw a Punnett Square. Start with both the sire and dam being homozygous polled (PP), showing that all offspring would be polled (sample of what the Punnett Square will look like is below). The capital letter P stands for the dominant gene. A small letter p stands for the recessive gene.

Example of a Punnett Square:

		P	DAM	P
P		PP		PP
SIRE				
P		PP		PP

In this square since both parents are homozygous polled, capital PP. In this genetic combination all the resulting offspring will be homozygous polled (PP).

4. When both parents are heterozygous polled, meaning they each have the dominant polled gene, capital P and they both have the recessive horned gene, small p, the genetic make-up of each of these parents is Pp. Draw this square to determine how many offspring will be homozygous polled (PP), how many offspring will be heterozygous polled (Pp) and how many will be homozygous horned (pp).
5. Drawing a Punnett Square with the sire homozygous polled (PP) and the dam heterozygous polled (Pp). Draw another square with the sire homozygous polled (PP) and dam homozygous horned

(pp). Have the youth discuss other potential gene combinations that could be drawn. Draw them as a group. Discuss how this works with other genetic traits (carcass traits, growth, etc.)

What did we learn? (REFLECT)

- Ask: What is genetics? (The science that studies how animals inherit characteristics or traits from parents and pass these traits to offspring).
- Ask: What are some genetics terms? (reference back to PowerPoint)
- Ask: How does genetics help us improve certain traits in livestock? (Can directly select for traits that improve the value of livestock and livestock products).

Why is that important? (APPLY)

- Ask: Why is it important to understand the inheritance of certain genetic traits? (so as to avoid selecting traits that could have detrimental health effects).
- Ask: How were your genetics inherited? (Half from mom half from dad).
- Ask: How does understanding genetics help in human health? (Helps with preventing passing of genetic diseases as well as what health concerns individuals should be aware of for themselves. Has influence on the treatment of certain diseases).

Resources

- Ensminger, M.E. (1991). *The stockman's handbook*, 7th Edition. Prentice Hall.
- Moser, D.W. (n.d.). *Genetic defects in beef cattle: an update*. Retrieved from: <http://www.asi.k-state.edu/doc/agents/gendefects.pdf>
- Ohio State University Extension. (2011). Reproduction and Genetics. *Beef resource handbook* (pages 6-10 through 6-13).
- Ohio State University Extension. (2008). Reproduction. *Goat resource handbook* (pages 44-48).
- Ohio State University Extension. (2011). Reproduction and Genetics. *Sheep resource handbook for market and breeding projects* (pages 125-130).
- Ohio State University Extension. (2000). Genetics. *Swine resource handbook for market and breeding projects* (pages 17-1 through 17-6).

Inheritance of Horns

