4-H Animal Science Lesson Plan
Reproduction
Level 3

Is It Time to Breed, Heat Detection?

Goal (Learning Objective):
Youth will gain a basic understanding of what is taking place in the female (as far as the physical signs) and tools that help with heat detection for each of the species.

Supplies Needed:
- Gain access to internet links suggested below for pictures/videos of animals displaying physical heat behavior.
- Gather heat detection tools from a livestock supplier or use pictures included in the lesson to pass around to youth.
- Use the resources in the lesson to be able to briefly explain that there are ways to influence when females come into heat (Estrus Synchronization).
- Pictures of beef, sheep, swine and goats.

Pre-Lesson Preparation:
- Research what the signs of heat are for each of the species (information is found in the resource listed in this lesson). Refer back to the Reproduction & Puberty lesson plan if needed.
- Research the heat time and explain how reproduction occurs in a window (this is briefly covered for each species in the Background information section and the handout included in the lesson).
- Read the labels of the heat detection tools to understand the mechanism so that you can explain it to the youth.
    - A pad is placed on the cow above her tail head. When she comes into heat, other females will notice this and begin mounting her, causing the pad to be rubbed. As the pad is rubbed it changes color, indicating that she is in heat.
    - A chin ball marker is placed on a gomer bull and when he detects heat and mounts a cow a mark is left on her tail head.
- Read and understand (so you can explain) how we can manipulate (with use of hormones) when females come into heat. At this point you are just indicating this; the topic will be further explored in a later lesson. (Discuss the information in the hormone lesson).

Lesson Directions/Outline:

Background information

For all species males have a constant supply of testosterone (male sex hormone) making them able to breed at any time. Males observe the physical display of heat as well as have the ability to detect pheromones and display the Flemhen response (video

demonstrating this can be found at: http://www.bigstockphoto.com/video-74980339/flehmen-response-in-a-mature-bull,-behavior-allows-him-to-detect-if-female-is-in/)

Beef: There are 6 physical signs of heat or estrus (period of sexual receptivity in female) that can be observed (Beef Resource Handbook, 6-3). Cows will show heat for 14-20 hours and 10-16 hours after the last sign of heat she'll ovulate, however sperm should already be present in the female tract. During that 14-20 hour window is when the female should be bred by a bull or AI. If using AI implement the AM/PM rule: if showing heat in the morning breed at night and if showing heat in the evening breed in the morning. For rebreeding of cows, give her approximately 60 days after calving before trying to rebreed. Heat detection in cows can be accomplished through observation, use of gomer bulls, detector pads, and Androgenized cows. For estrus synching of a herd, the hormone prostaglandin is used and available commercially.

- Gomer bulls: bulls that have been altered so they cannot breed but can still detect if a cow is in heat
- Androgenized cows: cows that have had their behavior altered by an injection of male hormones, which causes them to detect heat more like a bull. Free Martin heifers (heifer calf born twin to bull calf and will not be able to reproduce) can be used in this way as well without alteration

Sheep: Estrus lasts 20-42 hours, with ovulation occurring in the late period. Sheep are seasonal breeders so may only come into heat at certain times of year (influenced by daylight length). The ewe's eyes are stimulated by light, when there is less light during a day the brain pathways involved in reproduction are less active allowing for the release of Melatonin (sleep hormone) which stimulates the release of GnRH (defined in Hormone lesson) and initiates heat. Breed sheep in the fall (September through December) or spring (January through March), placing rams with the ewes 148 days before you want lambing to happen. Manipulation is not as regular of a practice with sheep. Signs of heat are harder to detect in sheep (Sheep Resource Handbook, 3 and 11).

Goats: There are 6 physical signs of heat in does (Goat Resource Handbook, 4). Does need to be watched closely. Watch for at least a half hour in the morning, afternoon, and at night when they are not eating. Detection aids can be utilized as well such as a teaser wether, which is a boar goat that has been vasectomized, meaning the testicles of the male have been altered to make it sterile. The teaser can wear a marking harness which will mark does that he has detected are in heat and has mounted.

Swine: There are 6 physical signs of heat in sows (Swine Resource Handbook, 18-1). Heat detection can be accomplished by applying back pressure to the female. If the female is in heat, when pressure is applied to her top, she will push back. Exposing the female to a boar with a fenced barrier will cause her to become excited if she is in heat. Females will show heat for 50-60 hours, slightly less for gilts. Ovulation will occur 35-45 hours after the last sign of heat and will take 1-7 hours. Sperm will survive in the female tract for 24-72 hours in all species, so sperm for the sow needs to be present prior to ovulation, 12-24 hours after physical heat begins to show. With sows a second breeding

12-24 hours after the first is standard practice. Commercial forms of swine specific prostaglandin (defined in Hormone lesson) are available for estrus synching.

Conducting the activity

- 1. Go through the signs of heat, pass out and explain any heat detector tools you were able to acquire.
- Play Matching Game: Have a picture of each species on a table. Have youth first match each detection tool to the correct species. Then have them repeat with the physical signs of heat. You could have the signs written on little pieces of paper so youth can pick up one and place it on the correct species. Keep in mind some signs are the same for multiple species.

What did we learn?

- Ask: Can a female become pregnant at any time?
- Ask: What are some signs of heat?
- Ask: What can we do to manipulate estrus?

Why is this important?

How does heat or estrus affect herd production overall?
How does management practice come into play with heat detection?

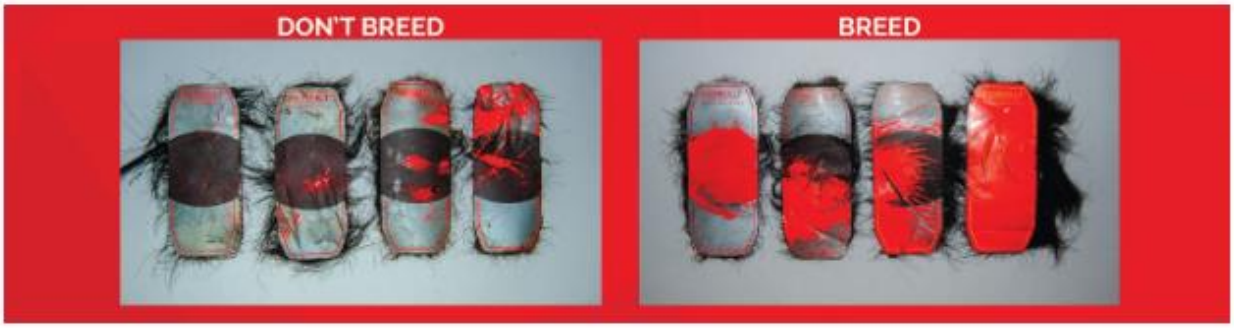
References/Resources:

Sheep Resource Handbook for Market and Breeding Projects, chapter 3, pages 33-34 and chapter 11, pages 120-121, Ohio State University Extension
Goat Resource Handbook for Goat, chapter 4, pages
Swine Resource Handbook for Market and Breeding Projects, chapter 18, pages 18-1 through 18-3, Ohio State University Extension
Beef Resource Handbook, chapter 6-3 through 6-5, Ohio State University Extension
Table 1. Signs of heat
Hormones Control Everything (Level 3)

https://content.ces.ncsu.edu/heat-detection-and-breeding-in-meat-goats
https://extension.psu.edu/programs/courses/swine/reproduction/breeding-management/cycles-and-heat-determination
https://www.agriland.ie/farming-news/5-no-nonsense-heat-detection-aids/
Pictures:
http://www.selectsires.com/products/heatdetect/estrotect.html
http://www.sheepcanada.com/what-a-marking-harness-can-tell-you/

Heat Detection Aids

Heat detection pads: these work by being placed on the tail head of female cows. When the female comes into heat, other females or Gomer bulls will mount her which will cause rubbing of the pad that removes the black layer and revealing a colored layer. The more color visible, the more confirmed that female is in heat.



Chin ball marker: worn by a Gomer bull, the chin piece has marking paint or chalk that will rub on the tail head of a female as he's mounting her.

Sheep breeding harness: similar concept to chin ball marker, however this confirms the buck did in fact mount and breed an ewe.

Table 1. Signs of heat

Species	Physical Sign of Heat	Breeding Cycle	Detection Tool	Length of Heat Signs (Estrus)	When to Breed
Beef	Standing for mounting by others Mounting others Disinterested in feed Head up, sniffing Vocal and walking fence line Red, swollen vulva.	18-21 days	Detector pads Gomer bulls with chin markers Androgenized females	14-20 hours	12 hours after standing heat
Swine	Increased activity (walking fence, mounting others) More vocal Swollen vulva with sticky discharge More erect ears Stands for back pressure	17-25 days	Applied pressure to back that results in sow pushing back Exposure to boar through fence	50-60 hours	12-24 hours after onset of estrus, then again in another 12-24 hours
Sheep	Seeks out ram Stands for mounting by ram and others	16-17 days Season influenced	Ram wearing Breeding Harness	20-42 hours	Towards end of estrus
Goat	Stands for mounting by others Flagging (rapid tail wagging) Mounts other goats Walking fence lines, vocal, frequent urination Clear mucous discharge from vagina Swollen, red, wet vulva	18-22 days Season influenced	Teaser whether or Vasectomized buck wearing marking harness	24-48 hours	12-18 hours after onset of estrus