Farm Animal Management @Purdue

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Estrus Detection in Farm Animals

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Introduction

Estrus or "heat" is a period during the reproductive cycle when female animals become sexually receptive, signaling they are ready for mating. In most cases, this can also be referred to as "standing heat" because the female will stand to be mated by the male (Figure 1).

Estrus is caused by estrogen being produced within developing follicles on the ovary, and ovulation usually occurs after the initial signs of estrus are detected. Duration of estrus and the time of ovulation in relationship to the onset of estrus vary with the species (Table 1). If behavioral or physical signs are not obvious, estrus may even pass unnoticed. Successful recognition of the signs of estrus for mating, just prior to the time of ovulation, can result in increased conception rates for the herd or flock.

When the reproductive success of a herd depends on the ability to detect estrus, as in an artificial insemination programs or hand mating, it is important to know what to look for, when to look, and how beneficial heat detection is to get animals bred in a timely manner.

Animals that cycle continuously throughout the year, such as swine and cattle, are termed polyestrous. Those animals with estrous cycles occurring only during certain seasons of the year, due to the amount of daylight, are termed seasonally polyestrous (Table 1). Seasonally polyestrous animals exhibit more than one estrous cycle within a certain season, until they become pregnant or until the anestrous period begins. Horses exhibit estrus during the spring and early summer, when day length is increasing, whereas sheep and goats exhibit estrus during the fall, when day length is decreasing.

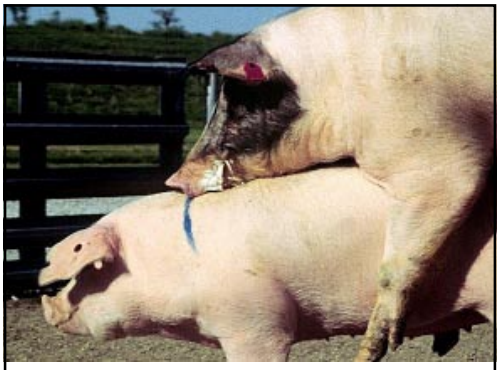

Figure 1: Sexually receptive female in "standing heat," being mounted by a boar.

Signs of Estrus

Each female exhibits signs of estrus for a certain amount of time during their estrous cycle. Duration of estrus and length of the reproductive cycle varies among species (Table 1). Perform heat detection when the animals are relaxing during normal activities; avoid times of increased excitement or stressful situations, such as feeding or milking. The best times to observe for signs of estrus are during the coolest times of the day, early in the morning, before feeding and milking, early afternoon, and late evening, after the animals are finished eating and before or after milking. Heat detection aids can be used to assist with heat detection, but should not be the only source used for reference, since these aids can be unreliable at times. Unfavorable

Table 1: Normal ranges of reproductive behavior.

Animal	Type of estrous cycle	Length of estrous cycle (days)	Duration of estrus	Time of ovulation
Cattle	Polyestrous	19-23 Average: 21	6-30 hours Average: 18 hrs	12 hours after end of estrus
Goat	Seasonal polyestrous in Fall	12-24 Average: 20	1-4 days Average: 39 hrs	30-36 hours after start of estrus
Sheep	Seasonal polyestrous in Fall	14-20 Average: 17	20-42 hours Average: 30 hrs	At or near the end of estrus
Horse	Seasonal polyestrous in Spring	10-37 Average: 21	2-6 days Average: 4 days	24 - 48 hours before the start of estrus to 24 hours after the end of estrus
Swine	Polyestrous	18-24 Average: 21	1-2 days Average: 36 hours	8-12 hours before the end of estrus or 37-40 hours after start of estrus

Source: Handbook of Livestock Management. Richard Battaglia.

weather, sudden weather changes, stresses, and nutritional problems can affect how estrus is displayed.

Many species exhibit similar signs of estrus. However, there are many signs of estrus that are species-specific. There are primary signs and secondary signs that signal the onset of estrus. Primary signs are the most reliable and secondary signs are less reliable because they vary in length and intensity and may be confused with the symptoms that are the indication of a minor health problem, such increased urination, isolation, and decreased feed intake, often observed with sick or diseased animals. It is easier to observe signs of estrus if there is a sexually active group of animals together, ones that are approaching heat. Other sexually active females in the group will allow you to observe if the individual is in standing heat when other sexually active females are present to mount her. Without this group, you can rely only on physical and behavioral signs demonstrated by that individual.

Cattle

The primary sign of heat occurs when the female stands immobile and allows other animals to mount her (Figure 2). The flanks may show dirt from the hooves of other cows mounting her, and saliva may be visible on her back, and hair may be missing or ruffled

Figure 2. Mounting behavior displayed by a female approaching estrus.

near the tail head from being frequently mounted by other cows.

Secondary behavioral signs that are exhibited prior to standing heat include: trying to mount other animals not in heat, increased urination, isolation from the herd, and social behaviors such as laying her head upon the backs of other animals. She may show signs of nervousness and restlessness such as walking along fences, bawling, and decreased milk production from less time spent eating.

Figure 3. Red, swollen vulva of a female in heat. Excess mucus discharge is noticed on the ventral end of the vulva.

Physical signs that indicate estrus include the vulva becoming red and swollen (Figure 3) and excess mucus discharge.

Goats

The signs of estrus for goats are very similar to the signs observed with cattle. Goats do not mount, or stand to be mounted as often as cattle do, but will demonstrate this behavior when they are in heat, such as seeking out the male. Other behavior signs of estrus include constant vocalizations, loss of appetite, restlessness, and social behaviors such as rubbing up against herd-mates. Physical signs that are demonstrated during estrus include redness and swelling around the vulva, and a thin mucous discharge from the vulva.

Sheep

The expression of estrus in the ewe is not as easily detected when she has been separated from the ram for a period of time. When the ewe cannot hear, smell, or see the ram, this causes diminished estrus behavior. Ewes experiencing estrus behavior will search-out the ram and stand to be mounted by him or other ewes, but not as often as cattle. Characteristic behavior for the ewe is rapid tail movement or raised tail in the presence of the ram. She will demonstrate secondary estrus behaviors such as nervousness, walking the fence or increased vocalizations for the ram, and a decrease in milk production and appetite. Physical characteristics include a reddened, swollen vulva, but this is often difficult to detect because of wool and small size of the vulva.

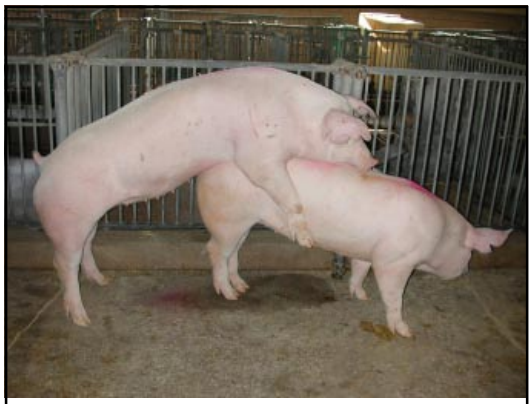

Figure 4. Estrus behavior displayed by two females approaching estrus.

Horses

Expression of estrus is most easily determined by using a "teasing" system, which involves introducing the stallion to the mare, allowing handlers to observe the mare's reactions. The stallion may begin nuzzling, sniffing, and biting the mare to test her level of receptivity. These same actions may or may not be returned by the mare. By observing her reactions, handlers will be able to recognize when she is ready to accept the stallion, the primary indication that she is in heat. Other primary signs of estrus include "winking" of the vulva, squatting or lowering of the pelvis, lifting of the tail, and frequent urination. Secondary behavioral signs include social behavior such as seeking-out the company of other mares, geldings, and handlers.

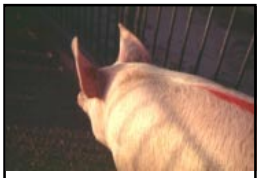

Figure 5. Erect ears of a sow in heat.

Swine

As with most other species, the primary sign of estrus occurs when the female stands immobile while another sow or boar mounts her (Figures 1 & 4). Secondary behavioral signs demonstrate increased nervous activity such as showing an increased interest in pen mates, demonstrating male-like behaviors such as mounting and nudging other females (Figure 4), and increased movement within the pen or crate. The herds-person might notice increased vocalizations, erect ears (Figure 5), a desire to seek-out the boar, and a loss of appetite. Noticeable physical changes include a red, swollen vulva, and an increase in vaginal secretions.

Detection Aids

Beyond personal observation and sound record keeping, there are various methods used to detect estrus in the herd. Marker animals are one method of detection aid, and there are different marking devices that can be implemented. Marker animals are usually males that have been altered in some way, so they cannot mate, but they still have the

desire to mate, resulting in a visual mark from the marking device left on the female in estrus. Teaser animals are another detection aid, involving surgical alteration of the male, causing them to be sterile. The most common surgical method is a vasectomy, removing a section of the vas deferens, preventing

Figure 6. Gromer bull attempting to mount female in estrus. The penis has been altered so he cannot successfully mate with the female.

sperm passage, but sill allowing transmission of sexually transmitted diseases. Another type of aid is "Gomer" animals, which are altered so that they cannot make sexual contact with the female. This can include surgical or non-surgical alteration of the penis (Figure 6) or use of infertile females

Figure 7. Chin-ball marking device positioned under bull's chin.

treated with male hormones. Electronic heat-detection aids can measure when pressure is applied to the female's back, when activity level increases, when hormone levels change, or when milk production changes, to determine a female experiencing estrus.

Cattle

One marking device involves the use of colored paint, dyes, oil, or grease smeared on the brisket or attached to the collar or halter of the bull or gomer animal. A chin-ball marker placed under the chin of the bull (Figure 7), causes paint to be smeared on the back of the cow if mounted, working similar to a ballpoint pen.

Figure 8. Heat patch with visible color change.

Another detection aid is a pressure-sensitive heat-mount detector, such as KaMar® heat detectors. This device contains a red dye, and is glued on the tail-head between the pins and hooks of the cow (Figure 8). If the cow is mounted, pressure on the device causes the dyes to mix, creating a visible color change, indicating the female has been mounted. These can be incorrectly triggered or lost, resulting in false readings. Electronic pressure-sensitive devices, such at Heatwatch™, are also mounted on the tail-head, and can be used to record the number of occurrences that the female was mounted, and the time that has elapsed since the first mounting. The information can be sent to a computer database, where managers can monitor individual cows and create reports from the data.

With large dairy herds, tail painting or tail chalking is becoming very common. This consists of covering the tail-head with bright colored tail paint or chalk, followed by close observation of the marking, noting signs of it being rubbed off or smudged. Reapplication may be necessary, and false readings can occur if smearing occurs from contact with low tree branches or from lying in free stalls.

Dairy farmers are using electronic pedometers or motion sensors that are attached on the neck of foreleg of females approaching estrus. The sensor indicates increasing activity levels associated with estrus by measuring changes in the amount of walking activity.

Another method is the use of milk or blood progesterone kits, which measure progesterone levels in the female. By referring to individual cow records, one can determine which cows are approaching or will soon be in heat. Performing the progesterone test on these females prior to the onset of estrus allows one to determine the amount of progesterone in the blood or milk, and identify cows that should be watched for signs of being in heat. High levels of progesterone indicate that the cow is not in heat, and low levels of progesterone indicate that the cow may be in estrus, or near estrus.

Goats

Tests can be performed by the herdsman to determine if the doe is in heat. One test involves rubbing the doe's back, to observe her reaction. If her tail begins to twitch faster, indicating an excitatory response, then she may be in estrus. Another test involves taking a rag that has been rubbed on the buck, so that it has his scent, and presenting it to the doe. If the doe becomes attracted to it and gets excited by the smell of the rag, then she may be in estrus.

Figure 9. Herdsman demonstrating back pressure test.

Sheep

A marking harness can be placed on the ram, or a teaser ram. The harness is similar to the chin-ball marker used for cattle. It has a colored crayon that is situated over the sternum of the ram so that it will mark the ewes' rump as he attempts to breed.

Horses

Not as common in the equine industry, but still available, is the use of a marking harness to detect estrus in free-ranging mares. This type of detection aid for horses has not had much success and is not widely used.

Swine

A herds-person can perform a back pressure test, simulating the action or feeling of a boar mounting the sow (Figure 9). This test consists of applying stimulation to the females' back, flanks, and underline, while observing her reaction to the pressure. If the sow stands rigid and "locks up," in expectation of being mounted and bred by a boar, then she is in estrus. If she makes an attempt to run away when the pressure is applied, then she is not experiencing estrus. Along with standing immobile for the back pressure test, her ears may also stand erect, or they will twitch if she is a floppy-eared breed. The presence of a boar when this test is performed provides improved accuracy of heat detection. This test explains why it may be difficult to move sows in estrus, if they stand still when pressure is applied to their backs.

Figure 10. Presence of boar in adjacent pen can affect the onset of estrus and ability to detect estrus in surrounding females.

Facility Design

Facility design is important for heat detection because the breeding environment needs to be stress-free and allow for normal everyday activities within the herd. The facility should also allow for easy handling and management of breeding stock. Proximity of females to males should be considered (Figure 10), since this can affect sexual development and the onset of estrus. Males and females should also be easily accessed to allow for easy estrus detection and mating to occur.

Pen size, pre-cautionary safety concerns for employees, and the ability of females and males to intermingle should all be considered. Floors should be slip-free by providing mats or grooves in concrete floors that can be dusted with limestone to allow for better traction on slick surfaces. Allow good footing and minimize injuries, so that breeding efficiency is maximized. Animal movement is also an important consideration in the breeding facility, especially in confinement swine operations, to decrease labor of moving sows and/or boars during breeding or estrus detection.

Conclusion

Estrus detection in farm animals is dependent upon the observer paying close attention to the behavior and physical changes of the female experiencing estrus. Aids are available to assist the herds-person checking for signs of heat, but these aids should never be the sole indicator of estrus, because they can be unreliable. The best method of estrus detection is by observing primary signs exhibited by the female in response to the male. Estrus detection is a valuable tool for use in artificial insemination techniques, hand mating, and for use of predicting parturition dates.

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