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ESTRUS DETECTION

As per The American Heritage® Stedman's Medical Dictionary, estrus may be defined as "The periodic state of sexual excitement in the female of most mammals, excluding humans, that immediately precedes ovulation and during which the female is most receptive to mating." The reproductive efficiency depends on, how soon after calving, the cow come into heat and success of first or subsequent insemination. The ultimate goal of heat detection is to predict actual time of ovulation.

Methods of estrus detection

1. Record systems: All heats, including those observed in the early post-partum period, must be recorded and record systems should be used on a daily basis.

(i) Breeding wheel or Herdex record system: These are the wall-mounted reproductive, record systems use colour-coded pins or markings to point out reproductive events for each animal.

(ii) Heat expectancy chart: These are specially designed calendars showing 21 day estrous cycle so that upcoming heat can be predictable.

(iii) Computer generated action list: Some softwares are available which make a list of animals those need special consideration or action on a definite period.

(iv) Heat symptoms (Visual Observation): The animals are visually observed for the specific signs of heat and the signs are different in different species. A best and most common method of estrus detection may be a direct visual observation of the cow standing firm while being mounted by other cow.

2. Rectal examination:

Rectal examination is the most efficient method for examination of reproductive tract and by palpation the internal signs of heat are recorded. During estrus certain cyclic changes occur in the tract and these may be:

Cervix: soft and relaxed; os of cervix- open.

Uterus: The uterus is erect, tonic and turgid at estrus. Uterine tone can be classified as: i. uterus flaccid uterus (-), ii. Uterus exhibiting mild response to manipulation (weak tone; +), iii. Curled and turgid uterus (moderate tone; ++), iv. Uterus very much curled, turgid, ovaries not easily approachable (intense tone; +++).

Ovaries: Well developed graffian follicle (fluctuating fluid filled structure) is palpable on either of the ovaries (mostly right ovary).

3. Methods for mount detection (Heat detection aids):

(i) Painted/Chalked Tailheads; This is mainly used by the dairy industry to locate riding cows in large, confined herds. Tail heads are marked daily by an AI technician. If the chalk is rubbed off by the next observation, this indicates the cow was ridden and is possibly in heat. Different colours of chalk are usually used to mark different strings of production. Marking the tail head with chalk, paint, or crayon and observing for evidence of rubbed off or smeared markings are less expensive than Kamar detectors and have gained popularity in larger herds. This system works most effectively in loose-housing arrangements where cattle can be restrained in self-locking head gates to be marked or observed for evidence of smeared or rubbed-off markings, which indicate the animal was mounted.

(ii) Kamar Heat-Mount Detector: These devices are glued just cranial to the base of the tail. Pressure from the brisket of a mounting animal requires approximately 3 seconds turning the detector from white to red from a small storage chamber into a bigger visible plastic compartment. This timing mechanism helps distinguish between true standing heat versus false mounting activity.

False positive consequences are more common when cattle or buffalo are restricted in crowded pens or when infested with external parasites rub or scratch their backs.

(iii) Bovine Beacon: Glued to tail head of cow. It contains fluorescent dye that glows in the dark when cow is mounted by another cow.

(iv). Novel estrus detection strip: It consists, a reflective material covered by a low-sheen black acrylic paint. The strip is applied to the sacrum and when the cow is mounted the black covering is rubbed off. The reflective strip can be observed by using video camera.

(iv). Chin-ball markers on vasectomised bulls: One of the most effective ways of determining heat is to attach this halter device under the chin of a vasectomised bull. The marker consists of a paint reservoir with a steel ball valve, similar to a ballpoint pen. When bull rides another animal, the chin ball marker is activated, and paint marks are left on the in-heat animal's back.

(v) Heat Watch or ShowHeat: The Heat Watch system for electronically monitoring mounting activity has been commercially marketed since 1995. This system provides continuous, radiotelometric monitoring of mounting activity and automated identification of animals.

(vi) Video recording system: This system has been used widely to monitor estrus behaviour, provided the animal must be identifiable and must be allowed to interact in a loose-housing system. This system will be successful only if the videotapes are reviewed daily, especially after the herd has been monitored in the evening. Major disadvantages are the cost of initial investments for installment of the device and time to review the recordings.

4. Activity monitors (Pedometer): An important external indicator for incidence of estrus is restlessness and consequently spend more time to walk and standing instead of resting. Electronic pedometers are available for automatically recording activity. Activity is measured by

a mercury switch that is turned off and on by movement of the cow. The overall movement as well as activity of estrus buffalo is increased up to 40% as compared to normal buffalo.

5. Conductivity of vaginal fluids: Conductivity of vaginal mucus changes with the stage of estrous cycle. Electrical resistance of reproductive tissues and their secretions has been measured and used as a means of estrus detection and for timing of insemination. The electrical resistance of reproductive tract secretions is highest during the luteal phase and declines during the follicular phase of the estrous cycle. The lowest resistance readings occur coincident with the LH surge, a few hours after the estrogen peak and onset of estrus. After the LH surge, "electrical resistance increases. This tool is labour intensive; washed in disinfectant, and dried prior it is used in another cow. Without proper cleanliness, the device could spread disease among animals. The probe is expensive.

6. Heat detector animals:

(i) Vasectomised or surgically altered bull: Either a vasectomised bull or bull with a deviated penis from its original line (surgically altered) could be an efficient heat detector. These animals are prepared with a chin-ball marker which marks the rump of cows and buffalo those were mounted during estrus. Bull with surgically deviated penis to prevent intromission may be more expensive than vasectomised bull, however, this method is favoured since vasectomised bulls can copulate with cows and there may be chances of disease spread.

(ii) Female with Testosterone treatment/androgenized: Non-lactating culled cows or heifers, even freemartin heifers can be utilized for the testosterone treatment to make heat detector animals.

7. Laboratory methods:

(i) Progesterone concentrations: Progesterone level decreased during estrus period and its concentrations remains low and varies between 0.20-0.50 ng/ml (always less than 1ng/ml) This can be detected either by RIA or ELISA method to predict the timing of AI

(ii) Endometrial biopsy: Phosphates activity increases its peak and persists even 1-2 hours after onset of estrus.

(iii) Cervical mucus fern pattern test: Vaginal mucous shows typical fern pattern at the time of estrus. The fern pattern is seen in Crystoscope (developed by Scientists of IVRI, Izatnagar). It is available in market with different names e.g. Lykascop (Lyka Health Care Ltd). The fern pattern can be classified into three types:

Typical: Clear fern leaf like pattern with well marked branches and has bright and thick boundaries.

Atypical: Mixed type appearance. Fern branches remain discontinuous and are not projected further into branches.

Nil type: No fern like appearance.

(iv). Vaginal pH fluctuates throughout the estrous cycle but is lowest, 7.32, on the day of estrus in cattle.

8. Other methods:

(i) Ultrasound scanning: Echo-texture of reproductive organs and presence of mature ovulatory follicle on any one of the ovary are the characteristic features of estrus cow and buffalo.

(ii) Mechanical nose: Direct electronic sensing system can be used to detect a particular pheromones secreted by the animals during estrus period. In the near future trained sniffing dogs may be used for this purpose.

(iv). Estrous synchronization: A definite time of insemination/breeding can be expected by use of estrous synchronization protocols. This will be discussed in the next chapter.