

9) HEAT DETECTION, NATURAL SERVICE AND ARTIFICIAL INSEMINATION

Michel A. Wattiaux
Babcock Institute

INTRODUCTION

Efficiency of reproduction is one of the most critical aspects of a profitable herd. Economic losses resulting from delayed reproduction have multiple facets:

- The lifetime milk production of the cows is reduced because peak milk production does not occur as often and the dry periods are extended;
- The number of calves born per year decreases, giving fewer opportunities to cull cows with low milk production, and slowing the possible gain in the genetic value of a herd;
- The direct costs for treatment of reproductive disorders, breeding and veterinary fees are increased.

HEAT DETECTION

In order to maximize productive life, a cow must be bred within 80 to 90 days after calving. This will enable her to produce a new calf every 12.5 to 12.8 months. Longer calving intervals have detrimental effects on lifetime milk production.

Whether a producer uses artificial insemination or natural service, heat detection is a critical component of good reproductive management on the farm. In either case, recording of cows in heat and dates of services is necessary to predict future heat or calving dates and to manage the cows accordingly.

What is heat?

Heat is a period of acceptance for mating (sexual receptivity) that normally occurs in non-pregnant, pubescent heifers and non-pregnant cows. This period of receptivity may last from six to 30 hours and occurs every 21 days on the average. However, the interval between two heats may vary normally from 18 to 24 days.

Signs of heat

Detection of heat calls for acute observation. Most cows have a pattern of behavior that changes gradually from the beginning to the end of a heat. The best indicator that a cow is in heat is when she stands and allows herself to be mounted by herdmates or a bull (Figure 1). A series of signs that may help to identify cows that need to be observed closely are summarized in Table 1.



Figure 1: A cow is in heat when she stands immobile when mounted by another cow or bull. A cow that mounts another cow may or may not be in heat.

Table 1: Signs of estrus in dairy cows

STANDING HEAT

- Stands immobile when mounted.
- Displays signs associated with early and late heat.

EARLY AND LATE HEAT

- Bellows like a bull.
- Displays general signs of nervousness.
- Rushes forward as if attacking; head-to-head position with another cow is frequently seen.
- Butts or pushes against the sides of other cows.
- Sniffs the vulva or urine of other animals; this is sometimes followed by inversion of the nostrils.
- Cows circle each other, the one in heat attempting to rest her chin on the back of the other; this may or may not lead to mounting activity.
- Pink and swollen vulva and clear mucous discharge are visible.

INCIDENTAL SIGNS¹

- Depressed appetite and milk yield.
- Dirty animal (manure on flanks).
- Tailhead has roughened appearance with possible hair loss.

¹ Non-specific signs whose occurrence depends on a particular situation.

Daily patterns in signs of heat

The onset of heat activity follows a distinct pattern, with most activity occurring in the late evening, through the night, and in the early hours of the morning. Research shows that more than 70% of mounting activity takes place between 7:00 at night and 7:00 in the morning (Figure 2). In order to detect more than 90% of the heats in a herd, cows should be observed carefully in the early hours of the morning, the late hours of the evening, and at four- to five-hour intervals during the day.

Other factors influencing the expression of heat

Expression and detection of heat may be more or less easy depending on a number of factors. For example, the type of housing (stanchion barn, free stall, pasture, walking path along a fence, etc.) provides various degrees of ease for the cow to express signs of heat and for the producers to detect cows in heat. In larger herds, more than one cow may come in heat at the same time. When this occurs, the chance of detecting cows in heat increases dramatically because mounting activities also increase considerably. For example, two cows in heat at the same time (sexually active group) cause a tripling of mounting activity. In contrast, factors such as high temperature and humidity, wind, rain, snow, confined space, and conditions that may cause slipping, falling or hoof pain tend to inhibit the expression of heat.

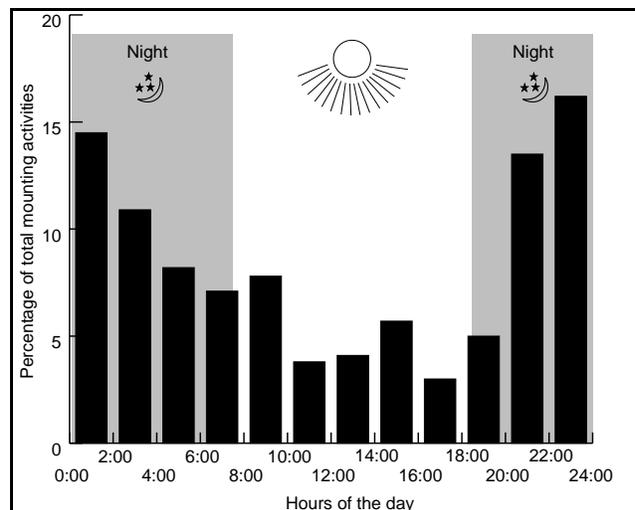


Figure 2: Most often, cows express signs of heat during the night.

Absence of heat

Heat may not be detected in cows for the following reasons:

- The cow is pregnant;
- The cow has calved and the heat cycle has not yet resumed (silent heat);

- The cow is anestrus because of poor nutrition, severe infection of the reproductive tract, or other complications after calving;
- The cow has cystic ovarian disease;
- The producer fails to detect a cow that actually came in heat.

ARTIFICIAL INSEMINATION

Artificial insemination is a technique by which semen is introduced artificially into the body of the uterus at the time of heat in an attempt to cause pregnancy.

The major advantages of artificial insemination may be summarized as follows:

- It provides the opportunity to choose sires that are proven to transmit desirable traits to the next generation;
- It eliminates the cost and danger of maintaining a bull on the farm;
- It minimizes the risk of spreading sexually transmitted diseases and genetic defects (e.g., mule foot);
- It has cumulative beneficial effects over the years.

Use of artificial insemination makes it necessary to develop a system to identify cows and record dates of heats and inseminations. Accurate recording is necessary to develop good reproductive management on the farm and it provides the data for breeding associations to keep accurate herd books.

NATURAL SERVICE

The use of bulls for natural service remains widespread even in areas where artificial insemination has proven to be very effective. Many farmers believe that pregnancy rates are higher when a bull is used than when artificial insemination is used. However, when heat detection is accurate and the insemination is properly performed, artificial insemination and

natural service give similar breeding success.

Continued use of natural service may seem to be a paradox considering the genetic advantages of artificial insemination. However, there are three situations when the use of natural service may be indicated:

- When personnel are unwilling or inadequately trained to perform the tasks associated with heat detection and the technique of artificial insemination, leading to extremely poor pregnancy rates;
- When long term genetic gain is of minor importance;
- When local conditions do not provide the infrastructure necessary for successful artificial insemination (access to semen, liquid nitrogen storage tanks, telephones, etc.).

Farmers with bulls on the farm should never forget that bulls have caused many fatal accidents. They represent a real danger (especially when believed to be safe) and must be handled firmly (with no signs of fear) and with extreme caution. In addition, bulls may spread sexually transmitted diseases (vibriosis and trichomoniasis). Infected cows may become infertile for up to four months; or, if they conceive, early embryonic death (a form of abortion) may occur.

TIMING OF SERVICE OR INSEMINATION

Artificial insemination or natural service lead to a pregnancy only if the spermatozoa are "at the right place at the right time." The egg is released from the ovary about 10 to 14 hours after the end of heat and can only survive unfertilized for six to 12 hours. In contrast, the spermatozoa may live up to 24 hours in the reproductive tract of a cow. A common recommendation for the best timing of artificial insemination is the "morning-evening" rule: cows observed

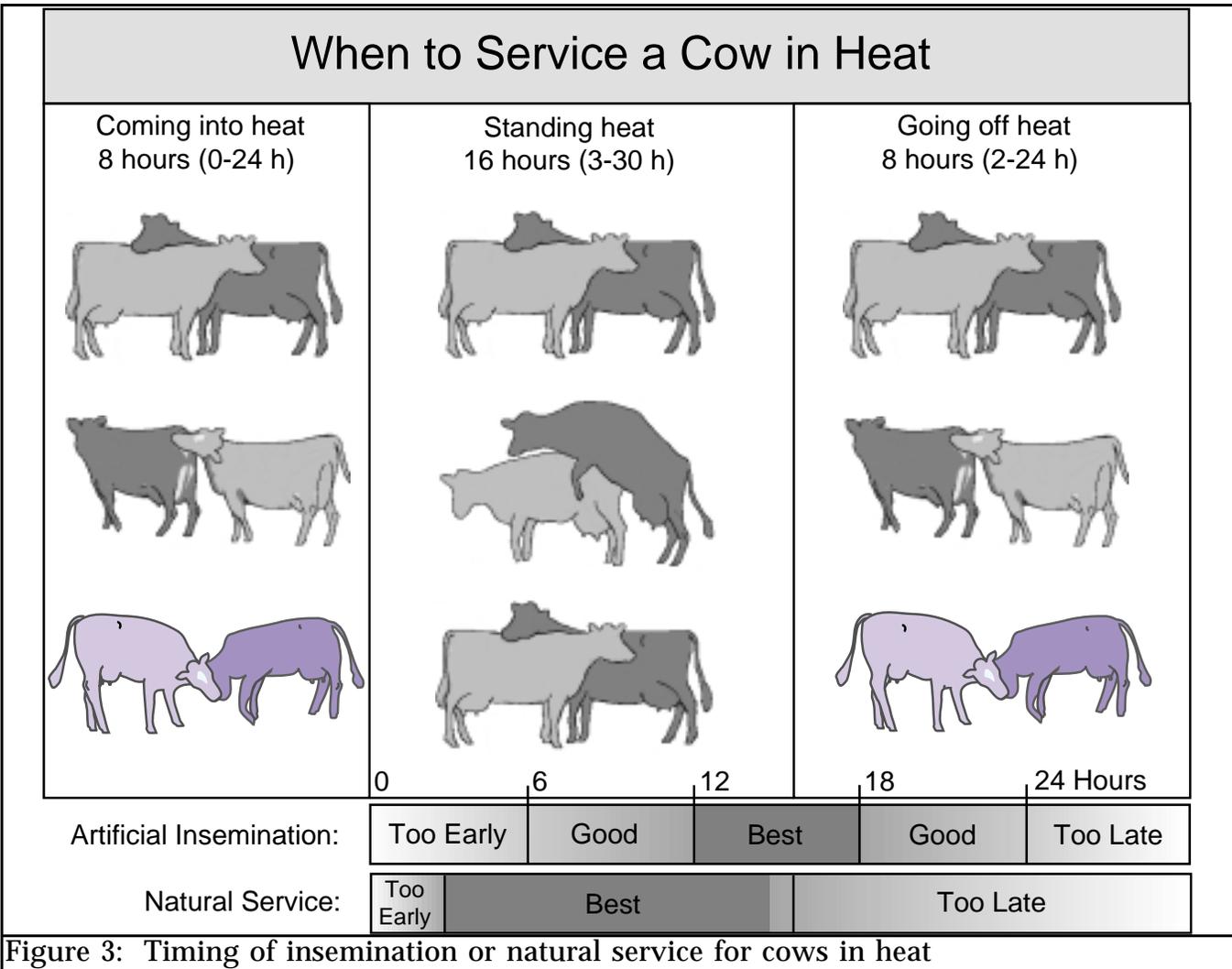


Figure 3: Timing of insemination or natural service for cows in heat

in heat in the morning are inseminated the same evening, and cows observed in heat in the afternoon are inseminated the next morning.

In the case of natural service, the cow and the bull may be allowed to mate starting a few hours after the cow accepts mounting until the cow refuses to be mounted (Figure 3).

CAUSES OF LOW CONCEPTION RATES

More than 90% of the cows in a herd should require fewer than three services to conceive. Possible causes of low conception rates (less than 50%) may fall into different categories:

- 1) **Problems related to heat detection:**
 - Not servicing a cow that is in heat;

- Servicing a cow that is not in heat;
- Improper timing of service;
- Misidentification of cows leading to errors in records;

2) **Problems related to natural service or artificial insemination:**

- A bull with a low fertility;
- Improper insemination techniques;

3) **Cow factors:**

- Infection of the reproductive tract;
- Hormonal disorders;
- Obstructed oviducts;
- Anatomical defects;
- Early embryonic death (cow becomes pregnant, but the pregnancy is not maintained);

- 4) **Problems related to nutrition** (see Dairy Essentials: "Reproduction and Nutrition").