University of Idaho
College of Agriculture

Cooperative Extension Service
Agricultural Experiment Station

Current Information Series No. 830

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Visual Heat Detection Management in Dairy Cattle

Dean E. Falk and Dennis G. Falk

Estrus is defined as a recurrent state of sexual excitement during which the female will accept the male and is capable of conceiving. The common term used to describe estrus or the estrous cycle is "heat." The term heat and estrus will be used interchangeably throughout this publication.

Reproductive management is a major problem in many dairy herds. The problem is characterized by low breeding efficiency and open (non-pregnant) cows and heifers. Because the causes of reproductive failure are generally concealed and difficult to correct, they can be serious and frustrating to management. Gross milk income is reduced because cows spend less time at peak production. Fewer calves are born when calving intervals are lengthened. Production costs increase because of more inseminations per pregnancy, and medications and veterinary service costs often increase.

The following would be desired goals with a good reproductive management program:

1. Detect 90 percent of all heat periods.
2. 12.5- to 13-month calving interval.
3. 1.5 services per conception.
4. 70 percent of cows settled at first service.

Reproductive management is important in the cycle of events for a dairy cow and to achieve maximum milk production per day of life. Fig. 1 illustrates this concept. In simplest terms, all the events shown are influenced by when the cow conceives.

Proper heat detection is absolutely necessary when cows are being bred artificially. Two major problem areas that affect reproductive efficiency are missed or unobserved heat and heat detection accuracy or errors. Heat detection error is when a cow is identified in heat and is inseminated, but actually is not in heat. Heat detection errors would also include inaccurately estimating onset or end of a heat period. This results in poor timing of insemination and ultimately affects conception rate.

Estrous Cycle

The estrous cycle is an interval of four hormone phases. Certain physical and behavioral symptoms occur during this cycle. The average length of the heat cycle is 21 days. Cycles can vary several days, but 84 percent will fall within the range of 18 to 24 days. Following are short descriptions of each phase:

Estrus (heat) — The average length of heat is 18 hours, but heat can vary from a few hours to over 24 hours. Ovulation usually occurs 10 to 14 hours after end of heat.

Metestrus — This is a 3- to 4-day period following estrus. During this phase, many dairy animals will show a bloody discharge from the vulva. This bleeding means the cow was in heat 2 to 4 days earlier and that estrus can be anticipated in 16 to 19 days.

Diestrus — This is a 12- to 15-day period following metestrus. During this period, the corpus luteum is active and producing the hormone progesterone.

Proestrus — This phase is characterized by regression of the corpus luteum and by lower progesterone

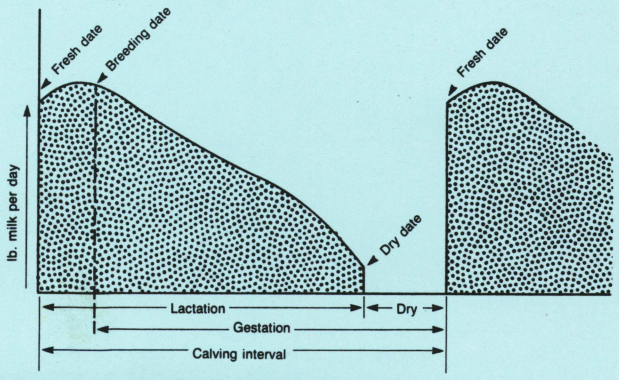

Fig. 1. Cycle of events in the dairy cow.

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levels. A follicle grows rapidly and secretes estrogen in increasing amounts at this time.

Although the mechanisms that control estrus are complex and not entirely understood, Fig. 2 summarizes diagrammatically the events associated with the estrous cycle.

Symptoms of Estrus

Detecting heat accurately is one of the most important jobs on dairy farms. The person responsible must be highly dependable and extremely knowledgeable about cow behavior. In addition, this person must have the available time and willingness to spend the time to do an accurate job of heat detection.

Knowing the heat signs or symptoms is the first step in improving heat detection. The indicators of heat can be divided into two categories — physical and behavioral.

Physical Indicators

1. A clean mucus discharge. This indicates a cow may be approaching heat, in heat or just past heat. The mucus is clear and slippery and is discharged in large amounts.
2. The vulva may be slightly swollen and more moist and reddish in appearance than usual.
3. The pin bones and rump area may be smeared with mucus or ruffled. Switching of the tail smears mucus on the rump region. Other cows may also leave saliva smears on the rump of estrus cows from licking before mounting. Ruffled hair on the rump or tailhead may indicate the cow was mounted by others. With intense bulling activity, the hair may be rubbed totally off the tail head and pin bone area.
4. A bloody discharge is sometimes observed. This would indicate the cow was in heat 2 to 4 days previously and should be observed for her next estrus in 16 to 19 days.

Behavioral Indicators

1. The cow stands to be mounted by other cows. This is the most reliable sign. However, the cow must stand voluntarily.
2. The cow aggressively attempts to mount other cows. Studies show that, 6 to 10 hours before actual standing heat, many cows become extremely active in seeking out and interacting with cows currently in heat.
3. The cow in heat will be nervous. She may refuse to eat, will walk more than usual and her milk production will be reduced. She may also exhibit a general excited behavior such as bawling and aggressively butting other cows.
4. The cow will also exhibit such behavior as allowing other cows to rest their chins on her rump, tail raising, licking the vulva and excessive urination.
5. Some cows in heat will allow a person to walk directly behind them without turning to face the person.

The ultimate goal of heat observation is to determine that a cow is actually in estrus and receptive to another cow's mount. This is the key observation. All other behavioral and physical symptoms listed are indicators to help determine when true standing heat occurred or is occurring.

Proper heat detection is important for timing the artificial insemination service to achieve optimum conception rates. The following statements review important factors involved:

1. Spermatozoa remain viable in the female reproductive tract 24 to 30 hours.
2. The fertile life of ovum after ovulation is 6 to 10 hours.
3. Ovulation usually occurs about 10 hours after the end of heat or 24 to 30 hours after the initiation of standing heat.

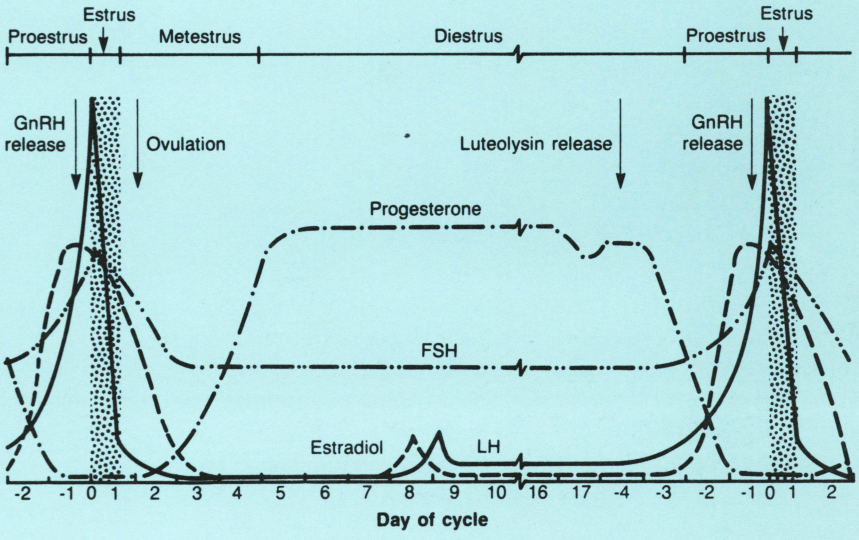

Fig. 2. Diagrammatical summary of morphological and endrocrinological events involved with the estrous cycle of the cow.[1]

[1]Source: Dairy Breeding Efficiency, WREP 41

4. The length of heat is variable from a few hours to more than 24 hours. Studies indicate heavily lactating cows will not express heat as intensely as or for as long as heifers.

Thus, current recommendations are to breed cows during the last half of the heat cycle. This will provide the best opportunity for conception. Breeding during this period will improve the odds that spermatozoa will unite with a viable ovum at the proper time and place. Fig. 3 illustrates these relationships.

Improving Reproductive Efficiency

A good dairy cattle reproductive program starts with a reliable identification system. Good systems include: (1) neck chains, (2) ear tags, (3) leg bands and (4) number or freeze brands. No one identification system is perfect. Accuracy is improved with any system when the operator makes certain the number is read and written correctly.

Record systems are required for successful heat detection and a sound breeding program. Records should include all heat dates, breeding dates, pregnancy exams and any treatments administered. To be useful, these records must be kept current and the information must be used to monitor the herd's status. If several people are responsible for heat detection and artificial insemination, be sure that the records and communication channels are open, accessible and used by all personnel.

Research has shown success in detecting heat is directly related to the effort expended. Knowing the signs of heat will not help if the cows are not observed frequently and at times when no other activities such as feeding and alley scraping are occurring.

Select times away from normal activities to observe for heat. The best times usually are early in the morning before milking, at noon and in the evening after milking and feeding. Choose a good vantage point and allot a minimum of 20 to 30 minutes for each observation period. In warm weather, most mounting behavior occurs at night when it is cooler. Therefore, artificial light should be available for night heat checks to be productive.

Heat Detection Aids

Some cows in heat always will be overlooked unless you have 24-hour observation, but a number of aids have been developed to assist in detecting heat.

Heat Mount Detectors

When properly placed on the rump of the cow, a heat mount detector turns red upon impact when mounted by another cow. This type of device, if used properly, can improve heat detection. It has disadvantages, however, including cost and labor and premature activation by choice, force or accident. Some may drop off. Incorrect positioning results in lack of activation when cows are mounted.

Dairy managers should accurately record those cows with detectors or additionally mark the cow with a crayon or tail band, for example. A cow so marked but without a detector should be checked closely for heat symptoms because mount detectors can be knocked off during heat.

Marking Crayon or Tail Chalking

A streak of marking crayon or livestock marker over the tailhead is an inexpensive and effective heat detection aid. When a cow so marked is in heat and mounted by others, the crayon streak is smeared or can even be nearly rubbed off. If the marking crayon is only slightly smeared, observe carefully for other symptoms. For this method to be successful, the crayon should be applied regularly. This method is especially useful in facilities with lockup stanchions.

An advantage of crayon marking is that the cow doing the mounting will also be identified because her brisket will be colored. Often these cows are approaching heat, so observers can check records to see if a heat is due.

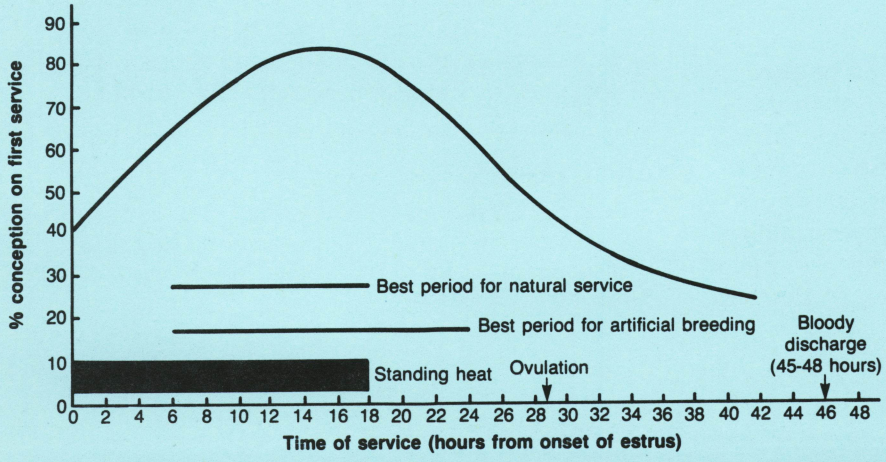

Fig. 3. Approximate chances for conception at the various insemination intervals in reference to the onset of estrus.[1]

[1]Source: Dairy Breeding Efficiency, WREP 41

Tail painting with enamel paint has also been successful for some dairy producers. Enamel paint may be more durable, thereby requiring less frequent reapplication. Some users suggest enamel may be more advantageous in wet weather.

Marker Animals

Hormone implanted steers, androgenized cows, cystic cows and altered bulls with or without chin-ball halters have been used with varying success. Consult your veterinarian for hormone treatment.

Progesterone Assay

A new management tool is available to help monitor several aspects of reproduction. Several companies are marketing milk progesterone assay kits that are designed for use on the farm or at the local veterinary clinic. Milk progesterone testing could be used to verify suspected heats, to identify cows not pregnant 21 days after breeding, to monitor estrus detection, to identify disorders and to evaluate treatments. Milk progesterone is useful in determining the accuracy of heat detection and finding hard-to-catch cows.

Estrus Synchronization Systems

Estrus synchronization systems can be important estrus management tools for dairy producers. These systems can be classified as prostaglandin, steroid or combination-based products. Postaglandins regress active corpus luteums in cycling animals, causing estrus 1 to 5 days after administration. Steroid products sychronize estrus by preventing heat until removal of steroid administration. The animals come into heat 1 to 2 days after removal of supplemental steroid. The steroid products are not cleared for use in lactating dairy cattle.

Synchronization systems control when animals will exhibit estrus, thus allowing maximum opportunity to observe cows in heat. In addition, they can be used on individual animals or groups to help manage a reproductive program.

Heat Detection Probes

Another new management tool that can be used is the heat detection probe. When the cow is in heat, the volume and ionic composition of the cervical-vaginal mucus changes. The probe monitors these changes by measuring the resistance to a current between two electrodes. Cows must be probed daily because readings must be based on the cow's individual history. Field studies of the probes are currently being conducted.

Visual Observation the Key

All these methods simply aid in heat detection. No attempt should be made to have them replace frequent visual observation for standing heat.

Other management systems can be used to improve heat detection. One method is to leave cows in heat in the herd to stimulate detection of heat in others. Cows coming into heat, those in heat and those going out of heat form sexually active groups. Because of this, each cow should be studied carefully. Research shows that heat activity is increased when more cows are in heat at the same time. Another management aid is to place questionable heat cows in a corral of cows that are unfamiliar to her. Often this will stimulate activity.

Moving groups of cows from one area to another sometimes stimulates activity. A good example would be moving cows from concrete free stalls to a dirt exercise lot. The dirt lot offers another advantage, because footing will affect the expression of heat. Cows will mount more frequently when on firm footing, and they prefer dirt over concrete. Often heat activity and duration are longer for cows on dirt than for those on concrete. Apparently cows that have fallen show less interest in mounting.

Adequate visual observation is the key to successful heat detection. The goal is to develop a program that will:

1. Observe the maximum number of standing heats and cows eligible for insemination.
2. Use secondary and behavioral signs and aids to identify those cows not in standing heat that would not conceive if bred.

This subject is also discussed in a 12-minute videotape available from the University of Idaho. The program focuses on how to determine visually when and if a cow is in heat. It provides basic information on the heat cycle in dairy cows, offers tips on the best times to watch for cows in heat and illustrates physical and behavioral clues to estrus. It also shows how to use some simple heat detection aids and provides some tips on keeping records. The program, *Heat Detection in Dairy Cows*, can be obtained through an Extension dairy specialist or Extension county office in Idaho.

About the Authors

Dean E. Falk is an Extension dairy specialist at the University of Idaho District 3 Office in Twin Falls. Dennis G. Falk is manager/cattle operations at the University of Idaho in Moscow.

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1,000, August 1988

35 cents per copy