Detecting Estrus In Dairy Cattle

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Estrus is Latin for desire and is often referred to as heat or bulling. Estrus is when the female of a species is receptive to the sexual advances of the male. In the cow, periods of estrus usually last for about 18 hours and normally recur in cycles of about 21 days. However, nearly one-third of observed heats may last less than 12 hours and some are as short as 7 hours.

There are several behavioral and physical characteristics of estrus, including the following:
- Standing to be mounted.
- Rough hair on the tailhead from being mounted.
- Increased restlessness and bawling.
- Increased interaction with other cows (mounting, nudging, sniffing, etc.).
- Raised tailhead and swollen vulva.
- Clear mucus discharge from the vulva.
- Decreased appetite and decreased milk production.

Anestrus

The major problem for dairy producers is not estrus but anestrus. Anestrus is the lack of estrous activity. Keep in mind, however, that anestrus is normal during these three reproductive stages: 1) prior to reaching puberty; 2) during pregnancy; and 3) for a short period after calving (postpartum anestrus).

Prepuberal anestrus is usually not a problem in dairy heifers. It is most economical for a heifer to have her first calf at 24 months of age. Considering the normal gestation length of about 9 months, heifers must conceive by no later than 15 months of age. Well-fed dairy heifers normally reach puberty before 12 months of age (depending upon breed); however, undernourishment can delay puberty.

Pregnancy is a desirable anestrous condition, but failure to recognize that a cow is pregnant can lead you to believe she is simply not showing estrus and has a reproductive problem. Too frequently, cows culled for reproductive problems have been discovered at slaughter to be pregnant. A routine health and pregnancy detection program will limit these mistakes and losses.

The postpartum anestrous period is the time after parturition that is necessary for recuperation and reorganization of the brain and reproductive organs. Dairy cows will normally ovulate within 3 weeks after calving. However, this first ovulation is not normally accompanied by behavioral estrus.

The corpus luteum resulting from first ovulation usually has a short lifespan, and the cow will ovulate again in 15 to 21 days. Forty to 80 percent of dairy cattle will show estrus at second ovulation. By 60 to 70 days postpartum, nearly all cows should have ovulated three times and shown estrus at least once.
Financial Losses

After a dairy cow calves, she produces milk in a predictable pattern called a lactation curve. As shown in the graph on page 4, a cow's milk production is highest in early lactation and then declines steadily.

Each new lactation must be initiated by calving. Therefore, to maintain a yearly milk production cycle, a cow must maintain a yearly pregnancy cycle. Pregnancy in dairy cattle averages 280 days. If you maintain a yearly calving cycle, that leaves only 85 days from the time that a cow calves until she must conceive again.

Because a cow requires a fairly constant level of feed for maintenance, whether she is producing milk or not (the dry period), you would expect a point somewhere in late lactation when it costs more to feed a cow than there is income from the sale of her milk. At this break-even point, the cow could be dried off and her udder allowed to recover for the next lactation.

Dairy economists have studied various lengths of lactation with differing lengths of dry periods to determine the most profitable combination. In the average dairy cow, this optimum combination is 305 days in lactation with 60 days dry, adding up to a 365-day (12-month) milk production cycle.

Other studies have shown that cows which first calved at 24 months produced the most milk per day of life. Therefore, it has been widely recommended to calve dairy heifers at 24 months and to maintain a 12-month calving interval thereafter.

Based on milk income and feed expense, economists have further calculated that each day that a dairy cow remains open beyond day 85 postpartum, the producer will lose about $3 of potential profit.

A cow's estrus cycle averages 21 days. Therefore, missing one estrus period will delay breeding for 21 days. This will result in a $63 loss of potential profit per estrus cycle.

The average number of days open in Alabama herds in the Dairy Herd Improvement (DHI) program is 138 days or 53 days more than optimum. In the average DHI herd of 128 cows, this represents more than $20,000 in potential profit lost per herd per year.

Herd on DHI performance testing are usually considered—as a group—to be above average in management and performance. Assuming that other herds in Alabama are at least no better than those in DHI, missed estrus periods are causing more than $7.5 million of potential income to be lost annually by Alabama dairy producers.

Reasons For Not Detecting Estrus

Studies show that inadequate estrus detection is the major cause of extended intervals from calving to first breeding. In one study, dairy producers observed 1.7 estruses per cow but missed an additional 1.9 heats resulting in 40 extra days open.

About 10 percent of the reasons for undetected estrus is attributed to cow problems while 90 percent can be attributed to people problems. A summary of these problems are as follows:

Cow Problems
- Static or non-functional ovaries.
- Luteal cysts.
- Pyometra resulting in a retained corpus luteum.
- Weak or subtle signs of estrus.
- Short duration of behavioral estrus.
- Displaying estrus only at night.
- Irregular estrous intervals (not at a 21-day interval).

People Problems
- Too few observations for estrous activity per day (need at least two).
- Observations at the wrong time of day (should be early morning and late evening).
- Observations during the wrong phase of the daily routine (best to observe when cows are loafing or on pasture, not while being fed or milked).
- Too little time spent per observation (at least 20 to 30 minutes needed each time).
• Lack of knowledge of primary/secondary signs of estrus [see Table 1]

Continuous observation of dairy cattle has shown that nearly 70 percent of estrous activity occurs between 7 p.m. and 6 a.m. when producers are least likely to observe the cows. Less than one-fourth of the activity will occur in the feeding area. Very little will occur in the collecting area where most observations are made. The greatest activity can be seen in the freestall, loafing, and pasture areas.

Several managerial and environmental factors affect estrus detection. Larger herds increase the chance that more cows will be in estrus at the same time. Increased group activity encourages estrous activity and makes estrus easier to detect. However, larger herds usually result in less time spent observing each cow.

There are no conclusive effects of housing (tie-stall versus free-stall); however, secure footing is vital. Several studies show a dramatic increase in mounting activity in cows immediately after they have been moved to a dry dirt lot with solid footing.

Cows that calve in the spring usually have a longer interval until the first estrus, presumably because they resume ovarian activity during the warmer summer months when signs of estrus are less intense.

Increasing Estrus Detection

Several methods have been developed to increase the detection of estrus. These can be grouped into two categories: 1) methods that increase the detection of naturally occurring estrus; and 2) methods that induce estrus at a predetermined time when observation efforts can be intensified. They are listed in Tables 1 and 2.

Table 1. Methods To Increase Detection Of Naturally Occurring Estrus.

<table>
<thead>
<tr>
<th>Method</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Increase intensity and accuracy.</td>
<td>Inexpensive, very effective.</td>
<td>Requires a commitment of personnel and of human observation time.</td>
</tr>
<tr>
<td>2) Observe estrus in early post-partum and record on 21-day calendar.</td>
<td>Allows anticipation of subsequent heat periods for closer observation.</td>
<td>Some additional record-keeping, more time spent if in tight seasonal calving.</td>
</tr>
<tr>
<td>3) Palpation of the ovaries for follicles and corpora lutea.</td>
<td>Indicates ovarian activity with or without observed estrus.</td>
<td>Training or professional help required.</td>
</tr>
<tr>
<td>4) Surgically altered bull with marking harness.</td>
<td>Prevents natural service or transmission of reproductive diseases.</td>
<td>Frequent infections and side affects, maintaining potentially dangerous bull.</td>
</tr>
<tr>
<td>5) Hormone-treated (andro-genized) female (or steer).</td>
<td>Not as dangerous as bull; more active than average cow.</td>
<td>Generally not as active as bull; feeding extra animal without milk income.</td>
</tr>
<tr>
<td>6) Pressure-sensitive rump patches, colored paint, or grease.</td>
<td>24-hour detection; no extra animals to maintain.</td>
<td>Frequent false positives from general cow activity and rubbing.</td>
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<tr>
<td>7) Pattern of progesterone (in blood or milk).</td>
<td>Indicates ovarian activity with or without observed estrus.</td>
<td>Requires training and attention to detail.</td>
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<tr>
<td>8) Pedometers (mechanical or electronic).</td>
<td>Accurately reflects cow's activity and predicts oncoming estrus.</td>
<td>Breakage and loss of costly units; must calculate change from base values.</td>
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<tr>
<td>9) Vaginal electrical impedance or changes in body temperature.</td>
<td>Accurately reflects cow's physiology and oncoming of estrus.</td>
<td>Technology still being tested; requires some costly equipment; final cost unknown.</td>
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Table 2. Methods To Induce Estrus At A Predetermined Time.

<table>
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</tr>
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<tbody>
<tr>
<td>1) Enucleation of the corpus luteum (rubbing off the yellow body).</td>
<td>Simple manipulative procedure for trained professional.</td>
<td>Can cause internal bleeding, adhesions, and sterility (not usually recommended).</td>
</tr>
<tr>
<td>2) Progestin compounds (in feed or subcutaneous implant).</td>
<td>Easy to give; can time insemination without checking for heat.</td>
<td>Requires head restraint to implant; not cleared for lactating cows.</td>
</tr>
<tr>
<td>3) Prostaglandin compounds.</td>
<td>Similar to 2 above.</td>
<td>Requires I.M. injection.</td>
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</table>
**Recommendations**

To improve estrus detection in dairy cows, follow these recommendations:
- Emphasize the importance of estrus detection among your family members and help train the person or persons responsible.
- Using a 21-day calendar, begin observing cows early postpartum to help anticipate future estruses.
- Set aside at least two times each day to observe cows for estrus (not while doing other chores or milking).
- Make each of your observations a minimum of 20 to 30 minutes long.
- Make your observations during the cool, late evenings and early mornings (the later and earlier, respectively, the better).
- Make your observations while cows are resting and loafing (not while they are being distracted with feeding or while they are coming in to be milked).
- If possible, move the cows to a firm-packed dirt lot with good footing just prior to being observed.
- Investigate different commercial estrus detection aids to determine which can help in your particular management situation (each has its own advantages and disadvantages).
- Write down everything; always keep a pocket note pad and pen with you, and transfer your notes to a permanent wall chart or book at least once a day.

Good estrus detection continues to be a mixture of art and science. With more than $20,000 of potential profit to be gained per herd each year, it pays to invest more time and money into this important practice.

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**Typical Lactation Curve For A 15,000-Pound Production Record.**

*Based on average production per month.*