

Estrous Behavior as Affected by Number of Cows in Estrus and Pen Size

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Story in Brief

The effect of number of cows in estrus and size of pen on estrous behavior were determined with the HeatWatch® system. Cyclic, non-suckled Angus and Angus x Hereford cows were monitored in winter and summer. During each season, 16 cows were maintained either in a drylot (180 x 300 ft) or a pasture (30 acre). Estrous cycles were synchronized with two injections of prostaglandin F_{2α} at the beginning of treatment and thereafter prostaglandin F_{2α} was administered so that 1, 2-3, 4-6 or 7 or more cows were estrus at the same time. Progesterone was measured to determine that estrous behavior was associated with normal luteal response to treatment and subsequent ovulation. Estrous behavior was quantified by duration of estrus and the number of mounts during the estrus. Cows maintained in the pen or pasture had a similar number of mounts and duration of estrus. Estrous cows were mounted more times and had a longer duration of estrus in winter than in summer. Cows exhibited more mounts per estrus as the number of cows in estrus increased from one to seven or more. Duration of estrus was shortest when one cow was in estrus alone and was similar when two to seven cows were in estrus. Increasing the number of cows in estrus at the same time may increase the number of cows detected in estrus with visual observation.

Key Words: Beef Cows, Estrous Behavior, Estrus, Pen Size

Introduction

The use of artificial insemination (AI) for beef cattle is essential to accelerate genetic improvement. The widespread implementation of AI in the beef industry has been hindered by the laborious and inefficient methods used for accurate estrous detection, a prerequisite for proper timing of AI. Methods to eliminate the need for estrous detection, such as timed AI, have resulted in limited success in the dairy and beef industries. Our goal is to enhance estrous detection by determining factors that influence the expression of estrous behavior.

Factors affecting estrous behavior in beef cows have not been well documented. Synchronized beef heifers may be mounted as many as 50.1 ± 6.4 mounts per estrus (Stevenson et al., 1996) and postpartum beef heifers may be mounted only 7.5 ± 2.0 times (Ciccioli and Wettemann, 2000). Increasing the number of dairy cows in estrus from one to four or more cows increased the number of mounts received from 11.2 to 49.8 (Hurnik et al., 1975). Factors such as day postpartum, pen size, season of the year, body condition score and the number of other cows in estrus could affect the manifestation of estrous behavior in beef cows. Our objective was to determine the effect of size of pen and number of beef cows in estrus on estrous behavior.

Materials and Methods

Cyclic, non-suckled Angus and Angus x Hereford cows ($4.06 \pm .26$ yr) were monitored in winter (January and February) and summer (July and August). Cows were maintained in either a 180 x

300 ft drylot pen or a 30 acre pasture (n=16/pen or pasture/season). Free choice prairie hay was offered to maintain initial body condition score (5.5; BCS 1=emaciated, 9=obese). Cows in drylot were provided access to artificial shade while cows on pasture had natural shade. Estrous cycles of both pen and pastures groups were synchronized at the beginning of treatment with two injections of prostaglandin F_{2α} (PGF_{2α}, 25 mg i.m., Lutalyse[®], Pharmacia and Upjohn Co., Kalamazoo, MI) 10 d apart. After synchronization, cows were strategically treated with PGF_{2α} between d 6 and d 17 of the cycle (d 0=estrus), two to three times over a 40-d period. This treatment was applied to create periods when different numbers of cows (one, two to three, four to six, or seven or more) were expressing estrus at the same time. PGF_{2α} injections were planned so that each cow exhibited estrus with a different number of cows in estrus at the same time with each PGF_{2α} treatment. Blood samples were taken on d 0, 4, and 10 relative to PGF_{2α} treatment and concentrations of progesterone were quantified by radioimmunoassay. Progesterone concentrations were used to determine normal ovarian response to PGF_{2α} and were used in analysis.

The HeatWatch[®] (Ddx, Inc., Denver, CO) system was used to continuously monitor estrous behavior. A patch containing an electronic sensor was affixed to the tail head of each cow at the beginning of treatment. When a cow was mounted, the sensor transmitted a radio signal to a computer, which recorded the time and duration of each mount. These data were used to determine the number of mounts per estrus and duration of estrus. The beginning of estrous behavior was defined as the first mount of two mounts within 4 h, and the end of estrus was defined as the last mount with at least one mount in the preceding 4 h and no mounts in the following 12 h. Cows were considered to be in estrus together if duration of estrus overlapped as determined by these criteria. Data were analyzed as a 2 x 2 x 4 factorial in a completely randomized design. Least squares analyses of variance were used to determine the effects of treatment on estrous behavior. The model included pen or pasture, season, the number of cows in estrus and the interaction of pen or pasture and number of cows in estrus. All other interactions were tested and were nonsignificant, therefore they were removed from the model.

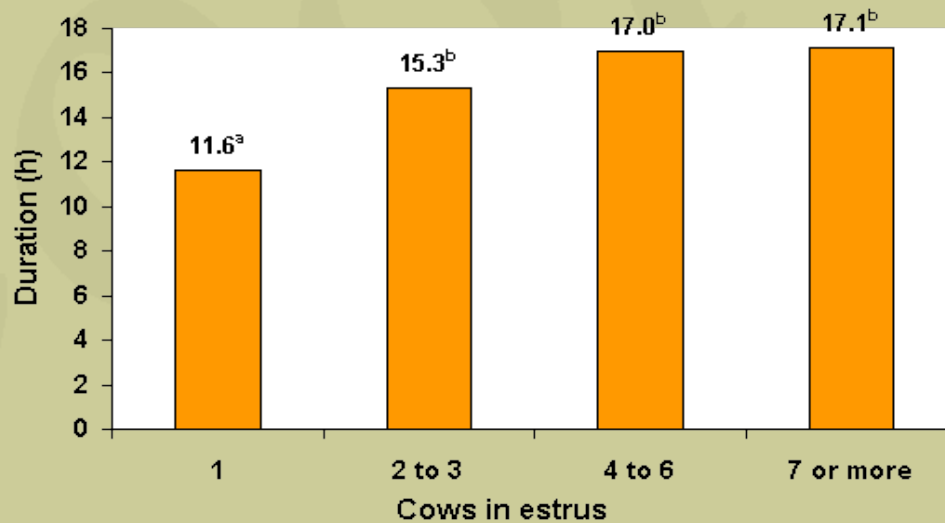
Results and Discussion

Pen size and its interaction with season and number of cows in estrus did not affect estrous behavior. Cows maintained in drylot or pasture received similar numbers of mounts per estrus (P>.10) and expressed a similar duration of estrus (P>.10).

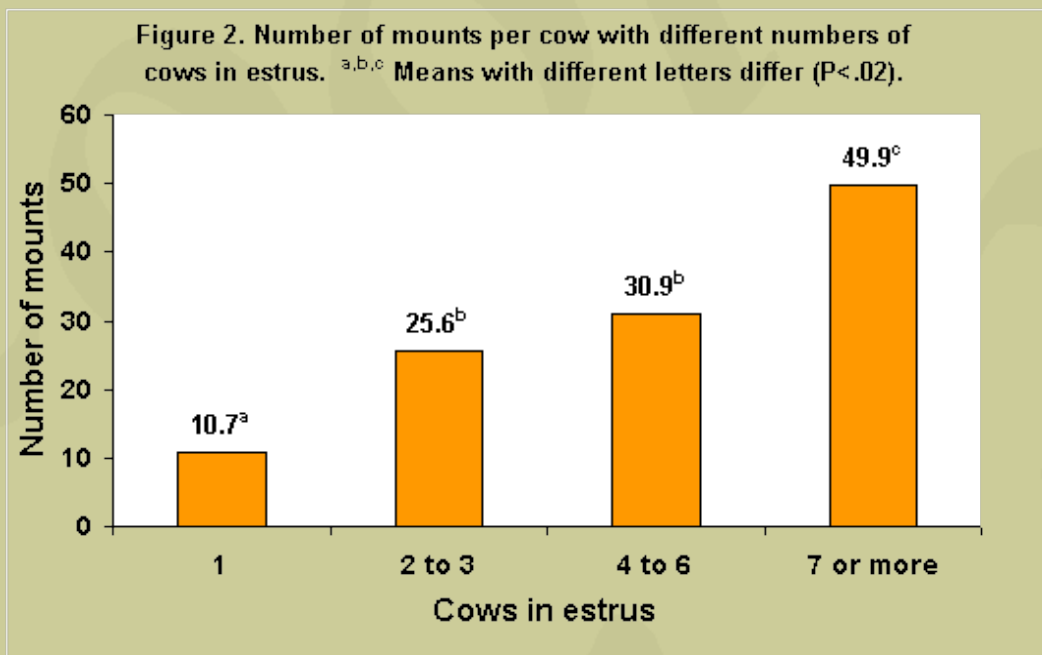
Consistent with our previous observations (White and Wettman, 2000), season influenced estrous behavior. Cows received more mounts (P<.05) in winter than in summer and the duration of behavioral estrus was longer in winter (P<.005). The average duration of estrus in summer was 13.8 ± 0.7 h with 25.2 ± 2.8 mounts per estrus, which increased to 16.7 ± 0.7 h and 33.3 ± 2.6 mounts in the winter.

The number of cows in estrus affected estrous behavior and was not affected by season. The duration of estrus increased from 11.6 ± 1.4 h when one cow was in estrus to 16.5 ± 0.9 when 2 to 16 cows were in estrus together (Figure 1; P<.05).

Figure 1. Duration of estrus with different number of cows in estrus at the same time. ^{a,b} Means with different letter differ ($P < .05$).



The number of mounts received increased as the number of cows in estrus increased (Figure 2; $P < .0001$). When only one cow was in estrus she was mounted 10.7 ± 5.3 times. Cows were mounted 48.9 ± 3.2 when 7 to 16 cows were in estrus together.



Individual cows varied in number of mounts with as few as two mounts per estrus and as many as 105 in the winter and 166 in the summer. When one cow was in estrus she had an average duration of 11.6 h with 10.7 mounts, which is less than one mount per hour. With 7 to 16 cows

in estrus, the average duration of estrus was 17.1 h with 49.9 mounts, which is almost three mounts per hour.

Implications

Our results indicate that detecting a single cow in estrus can be very difficult and she may not be identified with twice daily observations, especially in the summer. Synchronization of estrus reduces the number of days that cows must be observed to detect estrus and increases mounting activity with more estrus cows on a day. More estrus activity will allow a greater percentage of cows to be detected in estrus.

Literature Cited

[Ciccioli, N.H. and R.P. Wettemann.](#) 2000. Okla. Agr. Exp. Sta. Res. Rep. P-980:160.

Hurnik, J.F. et al. 1975. Appl. Anim. Ethology. 2:55.

Stevenson, J.S. et al. 1996. J. Anim. Sci. 74:729.

[White, F.J. and R.P. Wettemann.](#) 2000. Okla. Agr. Exp. Sta. Res. Rep. P-980:176.

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