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SEASONAL EFFECTS ON ESTROUS BEHAVIOUR AND TIME OF OVULATION IN BEEF COWS

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Story in Brief

Estrous behavior and time of ovulation were determined for four seasons in Angus x Hereford cows. The HeatWatch® system was used to observe estrous behavior for two consecutive estrous cycles in summer-1, winter, spring, and summer-2 seasons. Estrous behavior was characterized by number of mounts, duration of estrus, and the longest interval between mounts. Transrectal ultrasonography was used to determine time of ovulation. Season did not influence time of day when estrous behavior began, time of day when ovulation occurred and the interval from the onset of estrus until ovulation. Season affected duration of estrus, number of mounts, and interval between mounts. Cows had longer estrus, fewer mounts, and longer intervals between mounts in summer than in winter. We conclude that season of the year alters estrous behavior of beef cows; however, time of ovulation relative to the onset of estrus is not influenced by season.

Key Words: Beef Cow, Estrus, Ovulation, Artificial Insemination

Introduction

Artificial insemination (AI) allows the use of superior genetics and reduces time needed for genetic change. Less than 6% of the beef cows in the United States are inseminated artificially. This minimal use of AI is probably caused by labor requirements and the necessity to detect estrus. Traditional methods to determine when to inseminate cows depend on accurate detection of estrus. A common practice used to inseminate cows is the a.m.□p.m. rule. With this method, cows detected in estrus in the morning are inseminated in the evening, and cows first exhibiting estrus in the evening are inseminated the following morning. Twice daily visual observation of cows and tail marking do not allow precise detection of the onset of estrus. This may result in less than optimal timing of insemination, which could result in reduced pregnancy rates.

Continuous observation of cows is necessary to accurately detect the onset of estrus. The HeatWatch® system allows this to be done. It is composed of a sensor that attaches to the tail-head of a cow and sends a radio signal to a computer when a cow is mounted. In a study by Stevenson et al. (1996), the HeatWatch® system detected 37% more beef heifers in estrus than did visual observation. This system permits precise identification of estrous behavior.

Transrectal ultrasonography allows the time of ovulation to be determined within hours. Using the HeatWatch® system and transrectal ultrasonography, measurement of time of ovulation in relation to the onset of estrous behavior can be precisely determined. A better understanding of the relationship between the times of estrus and ovulation will improve pregnancy rates with AI. The objectives of this study were to determine seasonal influences on estrous behavior and time of ovulation in beef cows.

Materials and Methods

Seasonal influences on estrous behavior and time of ovulation were evaluated in Angus x Hereford cows. Cows were managed each season in a 30 acre pasture with both natural and

artificial shade. There were not any ponds in the pasture, and cows received water from a metal tank. Free choice hay and 20% crude protein range cubes were fed to maintain body condition. Cows were synchronized with prostaglandin $F_{2\alpha}$ to ensure that only five or less cows were in estrus at one time. The HeatWatch® system was used to determine estrous behavior during two consecutive estrous cycles in summer-1 (August, September, n=17), winter (December, January, n=20), spring (April, May, n=17), and summer-2 (August, September, n=21). Estrous behavior was characterized by number of mounts, duration of estrus, and the longest interval between mounts. Onset of estrous behavior was defined as the first of three mounts within a 4-h time period, and end of estrus was identified as the last mount without a subsequent mount during the next 12 h. The first estrous cycle each season was used to quantify behavior, and the second cycle was used to determine time of ovulation. Commencing 16 h after the onset of the second estrus, transrectal ultrasonography was performed every 4 h until ovulation, which was determined as the time when the dominant follicle was no longer present on the ovary.

Results and Discussion

Mean, maximum, and minimum ambient temperatures during the seasons are in Table 1. Season altered estrous behavior of cows (Table 2). Duration of estrus was longer in both summer seasons than in winter ($P<.1$), and duration of estrus during spring was not different from summer and winter. Cows were in estrus for 18.0 ± 1.0 h the first summer and 17.3 ± 1.3 h the second summer. Estrus lasted 14.4 ± .8 h in the winter (Table 2).

Cows were mounted more times ($P<.05$) in winter (69.8 ± 9.5 mounts) than in either summer season (43.7 ± 6.9 mounts). The number of mounts per estrus was variable with a maximum of 182 and a minimum of 12 mounts in the winter, and a maximum of 154 and a minimum of 12 mounts in the summer seasons. Stevenson et al. (1996) observed an average of 50 mounts for beef heifers. Duration of the longest interval between mounts was shorter ($P<.05$) in winter (2.1 ± .3 h) than in summer (4.1 ± .7).

Dairy cattle may have a shorter duration of estrus and less mounts than beef cows. Duration of estrus in dairy cattle averaged 9.5 h with 10.1 mounts, and season of the year did not influence behavior (Walker et al., 1996). Dransfield et al. (1998) found an average duration of estrus of 7.1 h with 8.5 mounts in dairy cows. Less mounts and a shorter duration of estrus in dairy cows than in beef cows may be influenced by environmental factors that differ between production practices for the breeds. Confinement, milking, contact with humans, stress, and other factors may influence estrous behavior of cattle.

Estrus did not commence at a certain time of the day, and the first mount was evenly distributed across 24 h. This is in agreement with mature dairy cattle (Dransfield et al., 1998), but differs from beef heifers (Stevenson et al., 1996). In our study, the 24-h distribution of mounts per hour during estrus was significantly different ($P<.05$) across 6-h time periods. Cows exhibited increased activity from 6:00 a.m. until noon and less activity from midnight until 6:00 a.m. and from noon until 6:00 p.m. (Figure 1).

Season did not influence the interval from the onset of estrus to ovulation. Cows ovulated 31.5 ± .4 h after the onset of estrous behavior. Walker et al. (1996) found an average of 27.6 ± 5.4 h from onset of estrus to ovulation in dairy cows. Since time from the onset of estrus to ovulation was consistent across seasons, onset of estrus is a good indicator as to when to inseminate.

We conclude that season of the year alters estrous behavior of beef cows. Time of ovulation relative to the onset of estrus is similar during all seasons. The onset of estrous behavior

can be used to estimate when to inseminate beef cows.

Literature Cited

Dransfield, M.B.G. et al. 1998. J. Dairy Sci. 81:1874.

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

Walker, W.L. et al. 1996. J. Dairy Sci. 79:1555.

Table 1. Maximum, minimum, and mean ambient temperatures (° F).

	Season			
Daily temperature	Summer-1	Winter	Spring	Summer-2
Maximum	85.3	50.6	70.3	97.8
Mean	76.5	41.4	58.9	83.6
Minimum	67.4	33.1	47.1	71.3

Table 2. Estrus and ovulation in beef cows.

	Season			
Characteristics	Summer-1	Winter	Spring	Summer-2
Duration of estrus, h				
Average	18.4[a]	14.4[b]	16.0[a,b]	17.3[a]
Max	36.3	20.6	22.8	29.5
Min	8.4	8.8	9	9.7
Total mounts/estrus				
Average	47[c]	70[d]	51[c,d]	41[c]
Max	154	182	98	121

Min	14	12	15	12
Longest interval between mounts, h				
Average	4.0[c]	2.1[d]	3.0[c,d]	4.2[c]
Max	10.2	5.2	6.8	11.4
Min	<0	1	<0	<0
Estrus to Ovulation, h				
Average	32.0[a]	32.7[a]	30.6[a]	30.6[a]
Max	42.8	39.2	38	36
Min	21.8	25.9	22	26

[a,b]Averages with different superscripts differ (*P*<.1).

[c,d]Averages with different superscripts differ (*P*<.05).

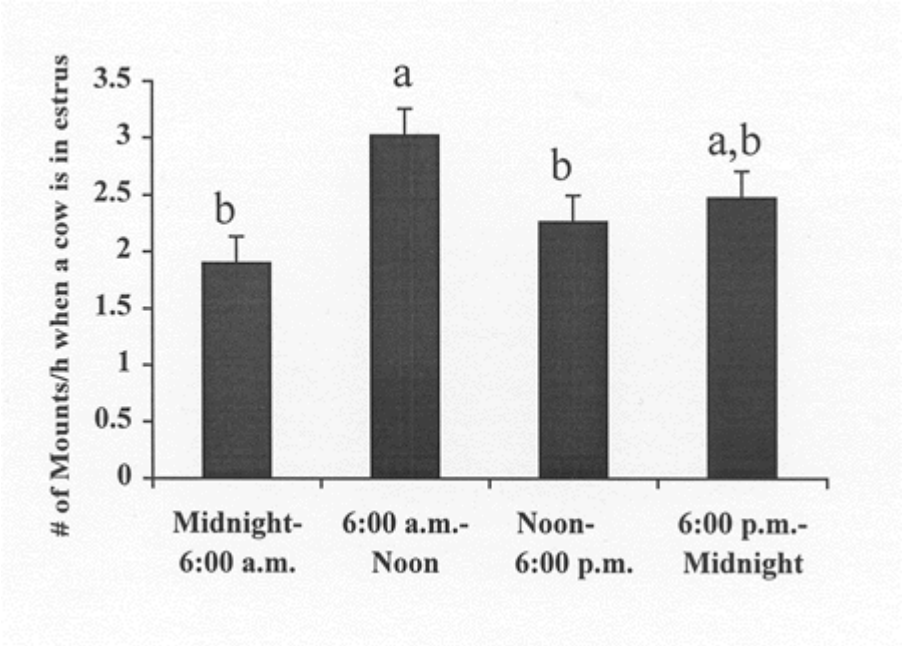

Figure 1. Number of mounts per hour per estrous cow during each 6-h period. [a,b]Means with different letters differ (*P*<.05).

1999 Research Report - Table of Contents