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RELATIONSHIP BETWEEN COW FEEDING TIME AND TIME OF PARTURITION

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ABSTRACT

In this study mature gravid beef cows were randomly allotted to one of four confinement pens in each of three years. Cows in two of the pens were fed once daily at 0830 h while cows in the other 2 pens were fed once daily at 1600 h during year one and at 2100 h during years 2 and 3. All cows were fed a corn silage, shelled corn, soybean meal diet according to NRC estimates during the third trimester. All cows, regardless of feeding time, were observed to have consumed their allotted portion of feed within a three hour time period. During years 1 and 2, the timed feeding regimen began 30 d prior to birth of the first calf. During year 3, the timed feeding regimen began 60 d prior to birth of the first calf. A total of 170 parturitions occurred during this study. No significant differences or trends in parturition times were observed between cow feeding times in any of the years. Even when data from all three years are combined, no difference ($P > .10$) in the relationship between cow feeding time and the time of calving was observed. During this study more cows ($P < .05$) were observed to have calved between 0600 h and 1800 h regardless of feeding time. Similarly more cows were observed to have calved between 0600 h and 2200 h regardless of treatment. The length of time from feeding to calving was not different ($P > .05$) between treatments for year 1 or year 3, but was shorter ($P < .01$) for cows fed at 0830 h than for cows fed at 2100 h during year two. When the data from all three years are combined, cows fed at the morning feeding had a shorter ($P < .05$) interval between feeding and calving than cows fed at the evening feeding, comparing 11.1 h and 13.4 h, respectively. The time of feeding did not alter the time of calving.

INTRODUCTION

It is well recognized that close observation of cows due to calve is essential if calving problems and calf mortality are to be kept to a minimum. Constant watch

of a herd for prolonged periods during the calving season is fatiguing and requires additional labor. Glucocorticoids and prostaglandins have been tried extensively to control parturition to more predictable periods but their use results in a high incidence of placental retention. Therefore, it appears that the discovery of a method of controlling calving which is devoid of such complications would prove an asset to the beef industry.

The observation of a Canadian cattleman, Gus Konefal, that the time of feeding could cause cows to calve during the daylight hours has been met with great interest and skepticism. In an experiment designed to test the Konefal theory, Yarney, et al. (1979) observed cows to have significantly more calves during 0700 and 1900 hours if fed long stem hay twice a day at 1100 hours and again at 2100 hours beginning one month prior to calving as opposed to being fed at 0800 hours and again at 1500 hours, comparing 79.6% vs. 38.4%, respectively. Lowman, et al. (1981) tested several once a day feeding regimes which began one week prior to the calving season and found that feeding cows at 2200 hours stimulated 22% more of the cows to calve between 0600 and 2200 hours than feeding cows once daily at 0900 hours. They concluded, however, that their observations may only apply to spring calving cows which have a large proportion of their daily feed intake controlled. In addition, they suggested the diet should consist predominately of roughage which is slowly consumed, such as grass silage or long stem hay. Bellows (1981) observed 17% more daytime births in heifers fed once daily at 2000 h compared to heifers fed at 0800 h.

Relationships between feeding times and time of parturition has also been studied in sheep. Cobb and Gonyou (1982) compared lambing times when ewes were fed once daily at 0800, 1200, 1600 and 2400 h and found an increased number of lambings to occur between 0600 and 1800 h for ewes fed at 1200 h.

Rumen motility studies by Dirksen and Kaufman (1979) indicate the frequency of rumen contraction falls a few hours before parturition and that intrarumenial pressure begins to fall in the last two weeks of gestation, with a more rapid decline during calving. Therefore, it may be hypothesized that evening feeding causes intrarumenial pressure to rise at night and decline in the day, thus stimulating the cow to calve during the day time hours.

Since a paucity of knowledge seems to exist regarding the relationship between time of feeding and time of parturition a study was designed to examine the effects of feeding regimen on the time of day calving occurred for beef cows (1) maintained in total confinement, (2) limit fed corn silage, and (3) bedded with corn stalks.

MATERIALS AND METHODS

In this study mature Angus-Hereford cross cows in their last trimester were randomly allotted to one of four confinement pens in each of three years (table 1). In year 1 of this study 53 cows bred to Charolais bulls were assigned to pens 30 days prior to the birth of the first calf. During year 1 all cows calved during a 60 day time period. In year 2, 60 cows bred to either Angus or Chianina bulls were assigned to pens 30 days prior to the birth of the first calf. During year 2 all cows calved withint a 54 day time period. In year 3, 57 cows bred to Chianina bulls were assigned to pens 60 days prior to the birth of the first calf. All cows calved during a 60 day

period during year 3. During year 1 two pens of cows were fed at 0830 h while the other two pens of cows were fed at 1600 h. During years 2 and 3, cows in two of the pens were fed at 0830 h while cows in the other two pens were fed at 2100 h.

Each confinement pen consisted of 392 m^2 allowing each cow 7.4 m^2 during year 1, 6.5 m^2 during year 2 and 6.9 m^2 during year 3. Each pen was totally paved with 95 m^2 under roof. That portion of the lot under roof was cleaned and bedded weekly with one large round bale of corn stalks weighing approximately 364 kg. Water was provided ad libitum, as was a commercial mineral mixture containing 19% calcium, 18% phosphorus, and 18% salt. All cows were fed corn silage, corn and soybean meal in a mixed ration daily at automated feed bunks (table 2). During years 2 and 3, those cows which were fed at 2100 h were locked inside the barn at 1600 h so feed could be deposited in the feed bunks and then they were turned out to eat at 2100 h.

During the calving season cows were monitored constantly 24 h a day. Consequently, the exact time of parturition was observed and recorded. Data were analyzed by Chi-square procedure to test the null hypothesis that there were no significant differences in the number of cows calving during the day between morning and evening fed cows. The mean times parturition occurred following feeding were analyzed by analysis of variance for a completely randomized design using pens as the unit of analysis (Steel and Torrie, 1960).

RESULTS AND DISCUSSION

During each of the years all cows in each pen were observed to have consumed their allotted ration within 3 h time. In addition, each time the corn stalks were deposited in the pens for bedding the cows were observed to consume an unknown portion of each bale and no attempt was made to estimate the amount of consumption. What effect the corn stalk consumption had on the time of calving is not known.

No differences ($P > .10$) between feeding time in the number of cows calving between 0600 h and 1800 h were observed in any of the years (table 3). Similarly, no differences ($P > .10$) between feeding times in the number of cows calving between 0600 h and 2200 h were observed in any of the years (table 5). Combining the number of parturitions in years 1, 2, and 3, 62% of the cows fed at the morning feeding were observed to have calved between 0600 and 1800 h compared to 55% of the cows fed at the evening feeding. Similarly, 77% of the cows fed at the morning feeding were observed to have calved between 0600 and 2200 h compared to 74% of the cows fed at the evening feeding. Whether the evening feeding occurred at 1600 h or at 2100 h did not alter the number of cows calving during the day.

In this herd more ($P < .05$) cows were observed to calve between 0600 and 1800 h and between 0600 and 2200 h than expected, regardless of the time of feeding. Combining the calving data of the morning fed cattle and the evening fed cattle of all three years, the null hypothesis that the calvings occurred at a uniform rate throughout the 24 h was tested, i.e., that 50% of the calvings occurred between 0600 and 1800 h and that two-thirds of the calvings occurred between 0600 and 2200 h. The values of X^2 were 2.15 and 2.38 respectively. Accordingly, 58% of the cows calved between 0600 and 1800 h (table 4) while 75% of the cows calved between 0600 and 2200 h (table 6).

On the assumption that time of feeding was the major influence on time of calv-

ing, the pattern of calving relative to the time of feeding was calculated. Table 7 shows the calving frequency for morning fed and evening fed cows relative to time of day. Frequency of calving was calculated for six 4 h periods and related to the time of day and time of feeding. There was no evidence that the pattern of calving relative to time of feeding was different for the morning and evening fed cows in any of the years.

The mean hours post feeding that calving occurred (table 8) were calculated for morning and evening fed cows in each of years 1, 2, 3, and combined years 1, 2, and 3. Significant differences were observed for year 2 and when years 1, 2, and 3 were combined. When the data from years 1, 2, and 3 were combined, the interval from feeding to calving was shorter ($P < .05$) for morning fed cows than for evening fed cows, comparing 11.12 h vs. 13.38 h respectively. A shorter time interval between feeding and calving of morning fed cows would be expected since no signficant difference between morning fed or evening fed cows was observed in the number of cows calving during the day whether the day was considered to be 0600-1800 h or 0600-2200 h.

CONCLUSION

Consequently, this study did not find the time of day feeding occurred to alter the time of day calving occurred for cows maintained in confinement lots, limit fed a corn silage diet and bedded with corn stalks. In this study, more cows were observed to have calved during the day than during the night regardless of when feeding occurred, whether day was considered to be 0600-1800 h or 0600-2200 h.

Table 1. Experimental Design

Feeding Time	Morning		Evening	
Pen	1	2	3	4
		Year 1		
No. of cows	14	13	13	13
Hour fed	0830	0830	1600	1600
		Year 2		
No. of cows	15	15	15	15
Hour fed	0830	0830	2100	2100
		Year 3		
No. of cows	15	14	14	14
Hour fed	0830	0830	2100	2100

Table 2. Composition of Diets Used in Years 1, 2 and 3

Item[a]	Year 1	Year 2	Year 3[b]
Corn silage (IFN 3-02-823)	11.4	11.4	13.6
Corn[c] (IFN 4-02-935)	2.7	2.7	1.4
Soybean meal[d] (IFN 5-04-604)	.23	.23	.23

[a]Expressed on an as-fed basis, kg/(cow·day).
[b]In addition, each cow received 200 mg•d^{-1} of a Rumensin premix.
[c]Each cow received an additional 1.4 kg•d^{-1} after 50% had calved.
[d]Each cow received an additional .23 kg•d^{-1} after 50% had calved.

Table 3. Number of Cows Calving During the Day (0600 to 1800 Hours)

Feeding Time	Morning		Evening		Combined	
Calving time	Day	Night	Day	Night	Day	Night
Year 1	18	9	15	11	33†	20†
Year 2	20	10	18	12	38*	22*
Year 3	15	14	13	15	28	29
Total 1,2,3	53	33	46	38	99*	71*

†Numbers within the same row bearing the same superscript differ (P< .10) from the null hypothesis.
*Numbers within the same row bearing the same superscript differ (P< .05) from the null hypothesis.

Table 4. Percent of Cows Calving During the Day (0600 to 1800 Hours)

Feeding Time	Morning		Evening		Combined	
Calving time	Day	Night	Day	Night	Day	Night
Year 1	67	33	58	42	62	38
Year 2	67	33	60	40	63	37
Year 3	52	48	46	54	49	51
Total 1,2,3	62	38	55	45	58	42

Table 5. Number of Cows Calving During the Day (0600 to 2200 Hours)

Feeding Time	Morning		Evening		Combined	
Calving time	Day	Night	Day	Night	Day	Night
Year 1	22	5	19	7	41	12
Year 2	23	7	22	8	45	15
Year 3	21	8	21	7	42	15
Total 1,2,3	66	20	62	22	128*	42*

*Numbers differ (P< .05) from the null hypothesis.

Table 6. Percent of Cows Calving During the Day (0600 to 2200 Hours)

Feeding Time	Morning		Evening		Combined	
Calving time	Day	Night	Day	Night	Day	Night
Year 1	81	19	73	27	77	23
Year 2	77	23	73	27	75	25
Year 3	72	28	75	25	74	26
Total 1,2,3	77	23	74	26	75	25

Table 7. Distribution of Parturition

Feeding Time	0600 0959	1000 0159	0200 0559	0600 0959	1000 0159	0200 0559
			Year 1			
Morning	8	4	6	4	3	2
Evening	4	5	5	4	5	2
			Year 2			
Morning	1	13	6	3	6	1
Evening	3	7	8	4	5	3
			Year 3			
Morning	5	8	2	6	3	5
Evening	4	5	4	8	5	2

Table 8. Number of Hours Following Feeding That Calving Occurred

Year	Morning Feeding	SD	Evening Feeding	SD
1	13.68	7.09	13.45	7.36
2	8.48*	5.90	13.25*	7.48
3	11.46	7.35	13.46	7.60
Total 1,2,3	11.12*	7.04	13.38*	7.39

*Means within a row bearing the same superscript differ (P< .05)

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