INFLUENCE OF PREPARTUM NUTRITION OF PRIMIPAROUS BEEF COWS ON CALF GROWTH, MASTITIS, AND REPRODUCTIVE PERFORMANCE AFTER EARLY WEANING

T.D. Hamilton[1], R.P. Wettemann[2] and L.J. Spicer[3]

Story in Brief

The influence of prepartum nutrition on calf growth, mastitis, and reproductive performance after early weaning was evaluated using 27 Hereford and Angus x Hereford primiparous cows calving in February and March, 1994. Approximately 75 days prior to calving, heifers were assigned to one of two diets, either to maintain weight (M, n=13) or to gain weight (G, n=14). After calving, all cows were fed in the same pasture to maintain weight. Calves were weaned at 2 to 3 months of age. Incidence of mastitis was evaluated by analyzing the effect of treatment on the number of somatic cells present in milk samples obtained from each cow on the day of weaning. Average daily gain of calves was influenced by the diet fed prepartum. Days to onset of luteal activity was influenced by the diet fed prepartum, BCS at weaning, and calving date. Percentage of fat in milk samples was influenced by treatment, however, BW and BCS of cows, number of somatic cells, and other milk components were not influenced by treatment.

(Key Words: Heifers, Average Daily Gain, Mastitis, Luteal Activity.)

Introduction

Reproductive performance of a cow herd is largely influenced by body condition of cows and nutrient intake. Body condition score (BCS) can be used to estimate body energy reserves in cows and to assess potential reproductive performance. Calf birth weight is influenced by body energy reserves of first calf heifers when they have a BCS between 4 and 6 (1=emaciated, 9=obese) at parturition (Spitzer et al., 1995), and BCS of mature cows at weaning influences the interval from weaning to the onset of luteal activity (Bishop et al., 1994). BCS at calving is a major factor that determines if a mature cow will become pregnant during the subsequent breeding season (Selk et al., 1988).

Mastitis is an inflammation of the mammary gland which interferes with normal milk secretion and/or quality. The number of somatic cells (SC), in milk is an indication of mastitis. Because of the effect mastitis has on the quantity and quality of milk, it could have an effect on calf growth.

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[1]Graduate Assistant [2]Regents Professor [3]Associate Professor

Therefore, the objectives of this study were to determine 1) the influence of BCS and days post partum at early weaning on reproductive performance of primiparous cows, 2) the influence of prepartum nutrition on calf growth, and 3) the incidence of increased SC in milk of primiparous cows and the effects of increased SC on calf growth.

Materials and Methods

Twenty-seven Hereford and Angus x Hereford heifers calving at two years of age were blocked by BW and BCS and fed one of two diets prepartum. Assignments were made approximately 75 days prior to parturition. One diet, designated as maintenance (M), was designed so heifers would maintain body weight. The other diet, gain (G), was designed so heifers would gain weight. Heifers on the M diet were fed .9 kg. of a 40% protein supplement from December 16 to January 5, and 1.8 kg. of a 20% protein supplement from January 6 until calving. These heifers also received limited amounts of hay from January 20 until calving. Heifers on G received 1.4 kg. of a 40% protein supplement from December 16 to January 5, 2.8 kg. of a 20% protein supplement and hay from January 6 to January 19, and 3.6 kg. of a 20% protein supplement and hay from January 20 until calving. After calving all cows were group fed supplemental protein in the same pasture in order to maintain body weight.

Heifers were weighed monthly beginning November 15, 1993, and BCS were recorded. All calves were weaned May 20, 1994, at ages ranging from 53 to 97 days. On the day of weaning, at 2 h after calf removal, milk samples were taken from each quarter of each cow for analysis of percentages of fat, protein, lactose, and solids non-fat (SNF), and number of somatic cells.

Beginning at weaning, and once weekly for 6 weeks, blood plasma samples were obtained and concentrations of progesterone were analyzed to determine days from weaning until the onset of luteal activity. The first of two consecutive weekly samples with progesterone $\geq$ 1 ng/ml was designated as the onset of luteal activity.

Results and Discussion

Heifers calved between February 12 and March 28. Body condition scores on February 16, 1994, were 4.73 and 4.96 for cows on the M and G diets, respectively ($P<.07$). On April 18, when calves were between 21 and 65 d of age, prepartum nutrition did not influence the weights of cows. Average weights were 313 and 327 kg for cows on M and G, respectively. Body condition scores of cows on April 18, 1994, were not influenced by prepartum

nutritional treatments (4.23 and 4.29 for heifers on M and G, respectively). The average calving date was similar for heifers on the two diets.

Average daily gain (kg) of calves was influenced by prepartum diet ($P<.09$) and averaged $.60\pm.03$ and $.69\pm.04$ for treatments M and G, respectively (Table 1). Average daily gain of calves was not influenced by the BCS of cows at weaning ($P>.10$), when calving date was used as a covariate (Table 2).

Prepartum nutrition influenced ($P<.05$) the interval from weaning until the onset of luteal activity (Figure 1). This interval was also influenced ($P<.05$) by calving date, when body condition score at weaning was used as a covariate (Table 3). Cows that calved early (between February 12 and March 6) had a shorter interval to onset of ovarian luteal activity than cows calving late (between March 7 and March 28). Body condition score at weaning had a significant effect ($P<.08$) on the interval to the onset of luteal activity. Luteal activity commenced at 25.8 days after weaning in maintenance heifers and 20.0 days ($P<.05$) after weaning in gain heifers.

Reduced energy intake of mature cows during the prepartum period tends to increase the postpartum interval to the onset of luteal activity. This study revealed similar results with heifers even though the diets used were for maintenance and gain whereas the diets with mature cows consisted of less energy intake and cows actually lost weight. Therefore, reduced energy intake of first calf heifers to prevent weight gain during late gestation alters the factors controlling initiation of luteal activity after parturition.

Reduced nutrient intake reduced ($P<.03$) the percentage of fat in milk samples. However, the prepartum diet did not alter the percentages of protein, lactose, and SNF, or number of somatic cells in milk samples. The somatic cell counts in this study were all relatively low. Only 7.7% of the quarters had greater than 100,000 somatic cells and 19.2% of the cows had at least one quarter with greater than 100,000 somatic cells. Reason for the minimal somatic cell counts could be attributed to the low incidence of mammary infections in these primiparous cows and to the fact that milk samples were taken between 7.5 and 14 weeks after calving. According to a study conducted by Miller et al. (1991) with dairy cows, somatic cell counts were greatest in milk samples taken during the first two weeks after calving. The number of somatic cells present in the milk samples was not ($P>.10$) related to growth rate of calves.

We conclude that prepartum nutrition at early weaning of first calf cows has an effect on the preweaning growth rate of calves. Luteal activity is initiated sooner after weaning in cows fed a diet to gain weight prepartum and in cows that have a longer post partum interval at early weaning. We suggest that adequate nutrient intake of cows during late gestation is important for maximal growth rate of calves, as well as for optimal reproductive performance.

Literature Cited

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Table 1. Influence of prepartum nutrition on characteristics of first calf heifers.

Measurement	Treatment	
	Maintenance	Gain
No of Cows	13	14
Onset of luteal activity, days	25.8 ± 2.2[a]	20.0 ± 1.8[b]
ADG of calves, kg/d	.60 ± .03[c]	.69 ± .04[d]
Heifer weight, kg[e]	313 ± 6	327 ± 8
Heifer BCS[e]	4.23 ± .07	4.29 ± .09
Somatic Cells (SCC) x 10^3	31 ± 6	156 ± 143
Fat %	2.17 ± .11[a]	2.94 ± .15[b]
Protein %	3.20 ± .03	3.24 ± .03
Lactose %	5.02 ± .02	5.05 ± .02
Solids-non-Fat %	8.95 ± .03	9.02 ± .05
Cows with SCC > 100,000, %	8	31
Quarters with SCC > 100,000, %	2	14

[a,b]Values in the same row not sharing a common superscript differ (P<.05).
[c,d]Values in the same row not sharing a common superscript differ (P<.09).
[e]April 18, 1994.

Table 2. Effect of body condition score (BCS) at weaning, adjusted for calving date, on ADG (kg) and LA (days).

	BCS < 5	BCS ≥ 5	Observ. sig. level
ADG	.65 ± .04	.64 ± .03	NS
LA	25.8 ± 1.0	18.4± 2.2	.08

Table 3. Effect of early or late calving, adjusted for body condition score at weaning, on ADG (kg) and LA (days).

	Early	Late	Observ. sig. level
ADG	.65 ± .02	.64 ± .05	NS
LA	18.8 ± 1.8	26.5 ± 1.8	.05

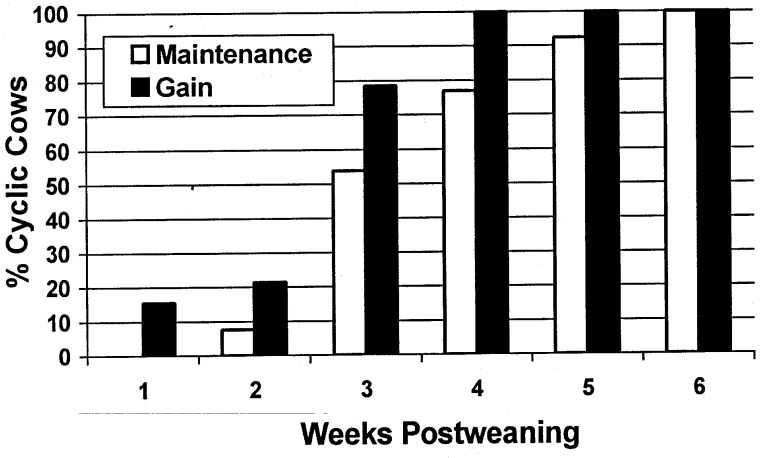

Figure 1. Percentage of cows expressing luteal activity postweaning, by week.