Effects Of Prepartum Nutrition And Body Condition Score At Calving On Calf Birth Weight And Average Daily Gain

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Story in Brief

Angus x Hereford multiparous cows (n=55) were fed different diets during mid-gestation to calve between a BCS 4 and 6 to evaluate the effects of prepartum nutrition and body condition score (BCS) at calving on birth weight and ADG of calves. Nutritional treatments (109 d) commenced when cows were between 65 and 160 d of gestation. Cows were randomly blocked by BCS and allotted to receive either free access to a high energy supplement (high supplement; 12 % CP and prairie hay), or maintained on pasture and supplemented with 1.6 kg (moderate supplement), 1.1 kg (low supplement), or 0.45 kg (very low supplement) of range cubes (40 % CP). Cows were categorized into high (> 5), moderate (5), or low (< 5) BCS at calving. Body weights of calves were recorded at birth and at 30 to 90 d in April or May. Feeding a high nutritional supplement significantly increased BCS at calving; however, cows fed moderate, low, or very low amounts of supplemental protein did not differ in BCS at calving. Prepartum nutrition and BCS at calving did not influence birth weights or calf gain during the first 3 mo of age. Since prepartum nutrition influenced weight and BCS changes during mid to late gestation without altering calf birth weight or average daily gain, we conclude that fetal growth rate is protected from dietary changes of the dam when multiparous cows calve with BCS between 4 and 6.

Key Words: Birth Weight, Body Condition Score, Prepartum Nutrition

Introduction

Body condition score (BCS) and prepartum nutrition affect postpartum reproduction of beef cows, and BCS at calving is the single best predictor if a cow will be become pregnant during the breeding season (Richards et al., 1986; Selk et al., 1988). To ensure proper reproductive performance, multiparous cows should calve in a BCS 5. Changes in BCS during the last trimester of gestation did not influence the postpartum interval to conception, pregnancy rates, or birth weights of calves, if cows calved in moderate BCS (Morrison et al., 1999). While the importance of fat reserves on reproductive performance is established, the effect of BCS on the birth weight and average daily gain of calves is unclear (reviewed by Holland and Odde, 1992). BCS at calving of primiparous cows influenced birth weight of calves (Spitzer et al., 1995), and feeding mature cows to loose 28 kg of body weight during the second and third trimesters of pregnancy decreased birth weight of calves (Freely et al., 2000). The effects of nutrient intake of mature cows calving with a BCS between 4 and 6 on calf birth weight remains unclear. The objective of this study was to evaluate the effects of BCS of 4 to 6 at calving and nutrient intake during mid to late gestation on calf birth weight and early postnatal average daily gain.

Materials and Methods

Multiparous Angus x Hereford spring calving cows were fed to calve between BCS 4 and 6 to evaluate the effects of BCS at calving and prepartum nutrient intake on birth weight and ADG of calves. In late September (4 to 7 mo before calving), Angus x Hereford cows (n = 55) were blocked by BCS and randomly allotted to receive either free access to a high energy diet (12 % CP) and prairie hay (high diet), or maintained on pasture and supplemented with 1.6 kg/d (moderate diet), 1.1 kg/d (low diet), or 0.45 kg/d (very low diet) of range cubes (40 % CP). Cows received their diets until mid January (0.5 to 3.5 mo before calving), then all cows were fed 1.4 kg/d of range cubes and dormant native pasture until calving. When snow or ice covered pasture or daily maximum temperature was less than 4° C, cows had access to hay. Body weight and BCS were determined after 17 h without feed or water prior to dietary treatment and monthly until after calving. The average calving date was March 15, and cows were categorized into high (> 5), moderate (5), or low (< 5) BCS at calving. Calf weights were recorded at birth and in April or May (at 30 to 90 d of age) to evaluate gain. Calves were sired by one Angus bull by artificial insemination (AI), and cows were exposed to two Angus bulls after AI.

Heifer birth weights were adjusted to bull equivalents by multiplying by 1.07. The effects of BCS and nutritional treatment on calf birth weight and average daily gain were determined by analysis of variance (Proc GLM; SAS, 1990) with a completely randomized design. The models included nutritional treatment or BCS, sire of calf and the interaction for birth weight, and sex of calf and interactions were added to the model for daily gain. Julian date of birth was used as a covariable.

Results and Discussion

Prepartum nutrition influenced ($P < 0.01$; Figure 1) BCS and body weight of cows at calving. Cows fed the high diet had significantly greater BCS and body weight ($P < 0.01$) at calving than cows fed the other diets. Cows fed a moderate, low, or very low amount of supplement did not differ ($P > 0.1$) in BCS or body weight at calving. Cows fed the moderate, low, and very low supplements were maintained on pasture, and nutritional treatments differed only in the quantity of supplement that cows received. BCS at calving may have been similar for low and very low cows because cows were able to maintain body fat reserves on pasture with minimal supplementation, or nutritional treatments ceased an average of 2 months before calving.

Prepartum nutrition did not influence calf birth weights or average daily gain (Table 1; $P > 0.1$). Calves on all diets gained an average of 0.92 kg per day during the first 30 to 90 d of age. Feeding cows to loose body condition during the second and third trimester reduced calf birth weight (Freetly et al., 2000). Differences between the previous study and ours may be due to differences in dietary treatments. In the study by Freetly et al. (2000), cows were individually fed a complete diet and cows lost 28 kg of body weight during the third trimester of gestation. In our study, the low and very low diets consisted of different quantities of supplement fed to cows grazing pasture, and these diets did not influence BCS or body weight of cows or calf birth weights. Also, cows were fed the same diets during the last 0.5 to 3.5 months of pregnancy. A more severe nutritional restriction during late pregnancy may have resulted in decreased birth weight.

Figure 1. Influence of prepartum nutrition on BCS of cows during mid to late gestation

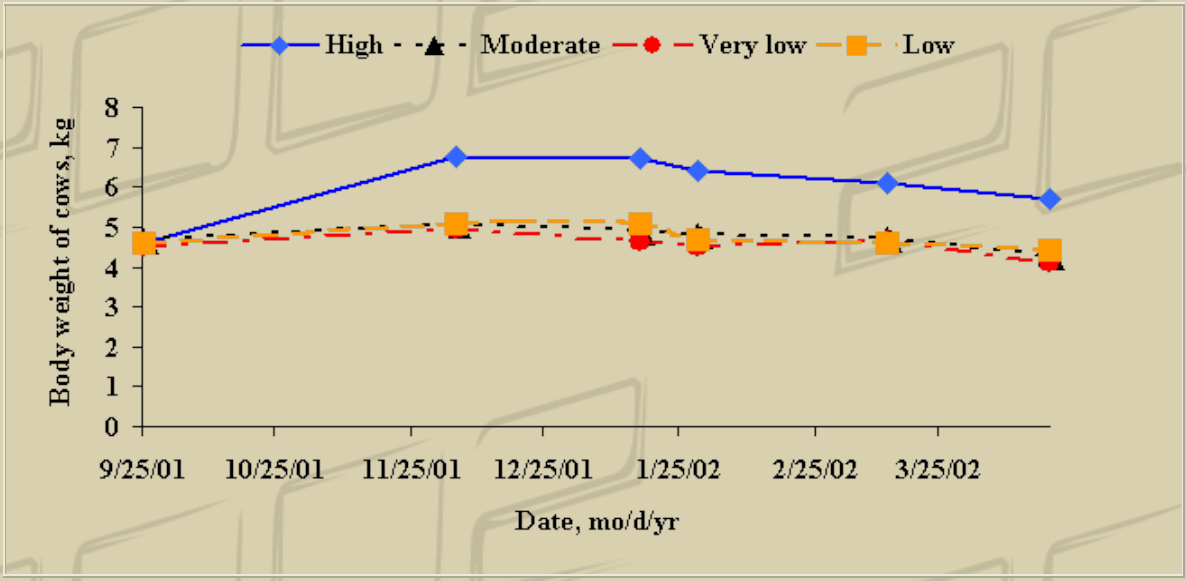

Table 1. Effects of prepartum nutrition on birth weight and early postnatal growth of calves				
	Prepartum nutrition			
	High	Moderate	Low	Very low
Cows, no.	12	16	17	10
BCS at calving	6.1 [a]	4.8 [b]	4.7 [b]	4.5 [b]
Birth weight, kg [c]	40.8 ± 1.1	41.8 ± 1.0	41.6 ± 1.0	41.4 ± 1.2
ADG of calves, kg/d [d]	1.0 ± 0.05	.9 ± .05	.9 ± .05	.9 ± .05

[a,b] Means in a row without a common superscript letter differ ($P<.01$)

[c] Birth weights were adjusted for sex; means did not differ ($P>.1$)

[d] Means did not differ ($P>.1$)

Body condition score at calving did not influence birth weight or average daily gains of calves (Table 2; $P > 0.1$). Prepartum nutrition and subsequently body condition score may (Corah et. al., 1975; Bellows and Short, 1978) or may not (Anthony et. al., 1986; Hough et al., 1990) influence birth weight of calves depending on factors such as nutrient intake, environment, and age of cow. The difference between primiparous and multiparous cows may be due to increased nutrient requirements of primiparous cows for growth, resulting in less energy for the fetus when nutrients are limited. In conclusion, alterations in nutrition in mid to late gestation that resulted in BCS between 4 and 6 at calving did not influence calf birth weight or daily gain during the first 3 mo of age. The fetus has a high priority for nutrients and is protected from changes in nutrient intake of the dam.

Table 2. Effects of BCS at calving on birth weight and ADG of calves			
	BCS at calving		
	< 5	5	> 5

Cows, no.	25	11	14
BCS at calving	4.3	5.0	6.1
Birth weight, kg [a]	41.3 ± 1.7	41.8 ± 1.2	41.5 ± 1.0
ADG of calves, kg/d [b]	.9 ± .05	1.0 ± .05	.9 ± .05

[a] Birth weights were adjusted for sex; means did not differ ($P>.1$)

[b] Means did not differ ($P>.1$)

Implications

Nutrient intake during mid to late gestation that resulted in BCS between 4 and 6 at calving do not influence birth weight or early postnatal gain of calves. If spring calving cows loose BCS during gestation because of reduced nutrient availability, but calve in thin to good BCS, calf performance should not be compromised. However, cows must calve in moderate to good condition (BCS 5 or greater) to have acceptable reproductive performance.

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