ENERGY OR PROTEIN SUPPLEMENTS BEFORE OR AFTER CALVING FOR BEEF COWS

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Story in Brief

In three consecutive years, spring-calving cows (n=348) were used to determine effects of level and source of supplemental energy or protein, before and after calving on cowherd performance. Cows were wintered on native range and either 3 lb/day of 40% protein (PROTEIN) or 6 lb/day of a 20% protein supplement (ENERGY) until calving. After calving, cows either remained on the same supplement, were switched to the other supplement or in years two and three were fed 5.7 lb/day of 40% supplement (HI PROT). Cows fed ENERGY during gestation had greater weight (20 lb) and increased body condition scores (BCS; .2 units) at calving than PROTEIN fed cows. Calf birth weight was less for prepartum PROTEIN vs ENERGY fed cows, but calf weaning weight was not affected. Cows fed ENERGY prior to calving had an 11% greater pregnancy rate than the cows fed PROTEIN. After calving, cows fed PROTEIN or ENERGY had similar weight and body condition changes. Cows fed HI PROT postpartum lost less weight during supplementation but had lower summer gains than ENERGY fed cows. Milk production tended to be greater for cows fed ENERGY postpartum than for PROTEIN fed cows, but was similar to HI PROT fed cows. During postcalving supplementation, calves of HI PROT fed dams had similar weight gains than ENERGY fed dams but after supplementation ended, calves of cows fed HI PROT had lower weight gains than ENERGY or PROTEIN. Pregnancy rates were similar for all postcalving treatments. Conception rates of spring calving cows were significantly improved by feeding greater levels of supplemental energy prepartum.

(Key Words: Beef Cattle, Protein, Energy, Supplements, Reproduction.)

Introduction

The major goal of a cow herd nutritional program is to achieve high reproductive rates with the least feed. Recent studies in which the same energy and protein supplements were fed during the winter to lactating fall-calving cows and to nonlactating spring-calving cows in late gestation, strongly suggest that stage of lactation can affect weight change responses of grazing cows. It is possible that increasing the levels of protein or energy supplemented during the

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winter might improve reproduction even though weight or body condition changes might be minimal. The objective of this study was to determine the effects of supplementation with protein and energy before and after calving on cow weight and condition, reproductive performance and calf weight gains.

Materials and Methods

For three successive years, pregnant, 2- to 5-year old Hereford and Hereford x Angus cows (1990, n=96; 1991, n=126; 1992, n=126) were blocked by age, breed, and weight and randomly allotted to treatments. Cows were supplemented from November 8 until calving with a 20% CP soybean hull and soybean meal-based supplement (ENERGY) or a 40% CP soybean meal-based supplement (PROTEIN) fed to provide 1.12 lb/day of protein. After calving, equal numbers of cows from each precalving treatment were fed the same supplement until the end of supplementation in mid-April or were switched to the other precalving supplement. In years 2 and 3 a third of the cows were switched to the PROTEIN supplement to provide 2.4 lb/day protein (HI PROT).

Supplement amounts were prorated for 6 days/week individual feeding in covered stalls. All cows grazed together on native tallgrass pastures and had free access to a salt-mineral mixture (Salt, 63.47; dicalcium phosphate, 33.33; copper sulfate, .40; zinc oxide, .43; mineral oil, 2.85%) and water at all times. Cows were fed native grass hay (4.3% protein) from March 23 until April 20 in years 1 and 2 while in year 3, hay was fed during nine days of inclement weather.

Cow weights (16-hour shrink) were taken at 28-day intervals until the beginning of the calving season. From the start of the calving season until the end of supplementation (April 20), cows were weighed at 14-day intervals and the closest weight to calving was used as the final pregnant weight. A 65-day natural breeding season commenced the day following the end of supplementation. Milk production was estimated by the weigh-suckle-weigh technique with three consecutive 8-hour measurements. In the fall, cows were examined for pregnancy via rectal palpation. Data were subjected to least-squares analysis of variance using a model that included the effects of supplement type, cow age and breed and all possible two- and three-way interactions.

Results and Discussion

Supplementation during gestation. ENERGY fed cows gained more weight during gestation (P<.01) than PROTEIN fed cows (Table 1) although the difference was only 20 lb, ranging from 15 lb in year 3 to 44 lb in year 1. Most of the gain took place during November and December. Variation in weather between years obviously affected the magnitude of precalving weight changes.

Along with greater weight gain, ENERGY fed cows lost less BCS before calving than PROTEIN fed cows (.2 units, P<.011). This advantage in BCS for

Table 1. Effect of supplements fed to spring-calving cows during gestation on body weight, body condition score, reproduction and calf birth weight.

	PROTEIN	ENERGY	*P* value	SE[b]
No. of cows	172	170		
Calving date, Julian	60	62		
Initial wt, lb	975	972		
Wt gain, lb				
November 8 to calving	33	53	.001	2.4
Calving	-130	-134	.28	3.5
Calving to April 20	-33	-33	.91	3.5
April 20 to July 5	108	117	.10	3.3
July 5 to weaning	18	13	.20	3.1
Initial body condition score	5.8	5.8		
Body condition score change				
November 8 to February 1	-.5	-.3	.001	.03
February 1 to April 20	-.4	-.4	.41	.05
April 20 to weaning	.5	.5	.98	.04
Pregnancy rate, %	79.7	90.5	.004	3.2
Calving interval, days	364	363	.45	1.7
Milk yield, lb/day	13.2	13.2	.72	.4
Calf birth wt, lb	38	84	.03	.9
Calf weaning wt, lb	390	423	.16	2.0

[a] See Table 1 for description of supplements fed before calving.
[b] SE is the average of the least squares means SE in a row.

cows fed ENERGY prepartum continued throughout the breeding season and was measurable at weaning. Weight losses from the birthing process (difference between pre- and postcalving weights) were not different for ENERGY and PROTEIN fed prior to calving.

Cows fed ENERGY during gestation had greater pregnancy rates than cows fed PROTEIN (91 vs 79%, P<.002), suggesting that prepartum nutritional levels can affect reproduction without major changes in BCS or cow weight. The BCS at calving for cows in our study was 5.3 for PROTEIN and 5.4 for ENERGY, probably low enough for cows to respond to additional energy.

Calves of cows fed ENERGY during gestation weighed 2 lb more at birth than calves from PROTEIN fed cows (P<.01) and gained more (13 lb) from birth to the end of supplementation (P<.06). This increase in weight gain was apparently not a reflection of greater milk production, because 24-hour milk production was similar for cows fed PROTEIN or ENERGY to calving. Precalving supplementation of the cow had no effect on calf weaning weight.

Supplementation after calving. Differences in supplemental energy amounts compared the ENERGY and PROTEIN supplements fed all three years, while differences in supplemental protein amounts compared ENERGY and HI PROT supplements in years 2 and 3. Cow weight loss from calving to the end of supplementation was similar for ENERGY and PROTEIN (Table 2) and significantly less for cows fed HI PROT than cow fed ENERGY (Table 3). Weight gains during the breeding season tended to be greater for ENERGY compared to PROTEIN fed cows but ENERGY-fed cows gained 22 lb more than HI PROT. Differences in BCS generally followed the trend of body weight (BW) changes.

Milk production during early lactation was greater (1lb/day) for ENERGY (P<.09) than for PROTEIN. Feeding HI PROT did not increase milk production compared to ENERGY.

Five percent more (P<.27) cows fed ENERGY from calving to the start of the breeding season were pregnant compared to PROTEIN fed cows but no difference was seen between ENERGY and HI PROT fed cows. Neither level

Table 2. Effects of feeding PROTEIN and ENERGY supplements to spring-calving cows during early lactation on weight, body condition score, reproduction and calf performance.

	PROTEIN	ENERGY	P value	SE[b]
No. of cows	123	122		
Calving date, Julian	61	62		
Postcalving wt, lb	891	889		
Wt change, lb				
Calving to April 20	-42	-40	.88	4.2
April 20 to July 5	117	123	.15	3.7
July 5 to weaning	18	11	.10	2.9
Body condition score (scale 1 - 9)				
February 1	5.4	5.4		
Body condition score change				
February 1 to April 20	-.4	-.4	.91	.04
April 20 to weaning	.3	.4	.31	.04
Pregnancy rate, %	83.3	88.1	.27	3.1
Calving interval	362	361	.82	1.5
Milk yield (April 20), lb/day	12.3	13.4	.07	.4
Calf weaning wt, lb	436	440	.44	5.7

[a] See Table 1 for description of supplements fed after calving.
[b] SE is the average of the least squares means SE in a row.

Table 3. Effects of feeding ENERGY and HI PROT supplements to spring-calving cows during early lactation on weight, body condition score, reproduction and calf performance.

	ENERGY	HI PROT	P value	SE[b]
No. of cows	72	75		
Calving date, Julian	61	60		
Postcalving wt, lb	895	900		
Wt change, lb				
Calving to April 20	-31	-11	.002	4.8
April 20 to July 5	103	81	.001	3.3
July 5 to weaning	13	18	.36	3.3
Body condition score (scale 1 - 9)				
February 1	5.4	5.4		
Body condition score change				
February 1 to April 20	-.6	-.5	.08	.06
April 20 to July 5	.6	.4	.10	.06
July 5 to weaning	-.2	-.1	.23	.05
Pregnancy rate, %	86.0	87.3	.81	3.7
Calving interval	363	362	.64	3.2
Milk yield (April 20), lb/day	12.3	12.8	.65	.55

[a] See Table 1 for description of supplements fed after calving.
[b] SE is the average of the least squares means SE in a row.

of supplemental energy or protein affected subsequent calving interval. The relatively short postpartum supplementation period in our trial may not have been sufficient in terms of both length and nutrient intake to significantly increase reproduction.

Calf weight gain was not different at any period of lactation for cows fed ENERGY or PROTEIN after calving, in agreement with milk production estimates taken on April 20. Calves of cows fed HI PROT had similar weight gains to calves of cows fed ENERGY while cows were fed supplements postcalving, but gained significantly less during the breeding season and tended to gain less in late summer than calves of ENERGY fed cows. Calf weaning weights were similar for ENERGY and PROTEIN but offspring of HI PROT fed cows tended ($P<.11$) to weigh less at weaning than those of cows fed ENERGY.

In conclusion, feeding greater levels of supplemental energy before calving increased cow gains, condition score and pregnancy rates, but feeding greater levels of energy after calving did not affect cow weight or condition or calf growth. Changing supplements at calving had no effect on cowherd

production, indicating cattlemen have the flexibility to make supplemental adjustments at this time. Feeding increased levels of supplemental protein will reduce BW loss during early lactation, but can have a detrimental effect on post supplementation calf growth. Prepartum supplementation had more influence on pregnancy rate than postpartum-supplementation.