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THE INFLUENCE OF DIFFERENT SUPPLEMENTAL STRATEGIES AFTER CALVING FOR COWS MANAGED TO DIFFERENT BODY CONDITIONS SCORES DURING GESTATION

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SUMMARY

Advances in reproductive efficiency from that which is now commonly obtained by beef cattle producers in North Dakota, may be difficult or economically infeasible. In contrast, feed costs associated with yearly maintenance of mature cows encompasses a large portion of cow-calf expenditures. Reducing these feed costs would have a greater impact on increasing the efficiency and add to greater profitability to beef production in North Dakota, as long as reproductive performance is maintained. The objective of this study is to evaluate the influence of nutrient supplementation after calving for beef cows managed differently during gestation on cow reproduction and calf performance. Sixty British crossbred cows, of similar age and breeding, will be assigned to two body condition score nutritional treatments in the fall after weaning. Cows will be fed to achieve a body condition score of either 4 or 6 at calving. After calving, cows will be assigned to one of three treatments for approximately 60 days: 1) control (CON) will receive a basal hay diet (8% CP), 2) energy (ENG) will receive the CON diet plus a barley supplement fed daily at 4.4 lbs./hd/d, 3) protein (PRO) will receive the CON diet plus a 40% natural protein supplement fed daily at 1.5 lbs./hd/d. Measurements that will be collected include: cow body condition score and body weight changes, calf birth and weaning weights, dystocia scores and calf morbidity, days to first estrus, percent of cows bred early and overall pregnancy rates. Economic analysis of production costs and cow longevity will also be measured over a four year period. Results of this study should indicate critical periods of cow nutritional requirements and what feeding

management alternatives producers can use before and(or) after calving to maximize returns to North Dakota cow-calf enterprises.

PROJECT OBJECTIVES

Evaluate pre-calving body condition and post-calving supplementation effects on beef cow reproduction and calf performance.

INTRODUCTION

Two areas that can increase profitability for commercial cow-calf producers are: 1) a reduction in feed costs for cow maintenance and 2) an increase in reproductive efficiency. In fact, reproductive efficiency is five to ten times more important, economically, than growth. Because nutrition plays an important role in determining reproductive success, reducing feed costs by altering intake and nutrient densities in the diet, timing of nutrient supplementation, or type of feed resources offered must be carefully planned. Furthermore, management strategies that target a reduction in feed costs should be based on results from properly designed research where reproduction and calf health and performance have been fully evaluated.

Although nutritional effects on postpartum reproduction have been clearly established, direct biological mechanism(s) have not been elucidated. This has resulted in nutritional management guidelines based on correlations with body condition (reflective of previous nutrition). It has also prevented advances in research directed at reducing feed inputs and fostered the perception that body condition status of the female dictates reproductive outcomes.

Because maternal feed inputs are a large percentage of the expenses in cow-calf enterprises, we should consider the impact of altering cow nutrition during periods of high nutrient requirements (last stage of gestation and lactation) or when feed resources are most expensive to provide. Inadequate energy or protein nutrition before and(or) after calving lowers pregnancy rates and first-service conception, as well as increases the postpartum interval in suckled beef females (Randel, 1990). Conversely, as the plane of nutrition is increased, reproduction is improved. However, underlying mechanisms by which nutrition regulates reproduction are presently unclear.

Beef cow nutrient requirements increase from the mid-stage of gestation to the first three to four months of lactation (NRC, 1984). If producers have limited feed or economic resources, the importance in providing adequate nutrition during these physiological stages becomes apparent. Earlier research has shown that prepartum nutrition, primarily energy intake, is more critical to the length of postpartum anestrus than nutrition after calving (Dziuk and Bellows, 1983; Richards et al., 1986). The provision of nutrients at this physiological stage is intended to increase nutrient stores, and is subjectively measured in terms of body condition score. These researchers suggest that a minimum body condition score of 5 (1 = emaciated, 9 = obese) is optimal for satisfactory reproductive performance.

The classical work of Wiltbank et al. (1962) confirmed a decrease in days to first estrus for cows maintained on a high plane of nutrition prior to calving. However, the number of services per conception was not different for cows maintained on low nutrition (50% of NRC energy requirements) before calving and then fed on a high plane of nutrition (133% of NRC energy requirements) after calving. More recent research has confirmed this positive effect on reproduction when intake of postpartum energy (Houghton et al., 1990; Laflamme and Connor, 1992) or protein (Hunter and Magner, 1988; Wiley et al., 1991) is above requirements. These responses were especially notable when prepartum nutrition was inadequate to meet cow requirements based on NRC (1984). Although increased nutrition before calving may provide adequate nutrient stores for acceptable postpartum reproduction, this practice may conceal specific nutrient(s) that are metabolically active in the stimulation of reproductive processes.

During the winter feeding period in the Northern Great Plains region, beef cows may be in a negative energy balance during periods of extreme cold temperatures. In order to maintain adequate adipose tissue stores, the plane of nutrition must be increased. This adds to the expense of maintaining sound reproductive females. As suggested by prior research, it may be possible for beef cows to loose body condition or BW and still maintain reproductive efficiency, provided excess nutrients are fed after calving. It has not been determined if a specific nutrient (protein vs. energy) is more effective or directly involved in mechanisms stimulating these responses. This is especially true for cows consuming basal forage diets, typically found in North Dakota (cool season grass hays containing 8 to 12% CP). Furthermore, nutrient manipulation (prior to calving and after calving) may be successful within the confines of an experimental period, but data are lacking for treatment effects extended over continuous parities.

MATERIALS AND METHODS

British crossbred beef cows (n = 66) of similar age and breeding at the Dickinson Research and Extension Center will be required for the experiment. In the fall of 1994, cows will be assigned to two dietary winter treatments. Cows will be fed to achieve a body condition score of 5.5 to 6 (HBC), or a body condition score of 4 to 4.5 at calving (LBC). Wintering diets will be fed from December 1, 1994, to March 15, 1995, to achieve different body condition score status at calving. After calving (March 15 to April 30), cows will be assigned to one of three treatments postpartum for approximately 60 days. One group of cows will receive a basal hay diet (8% CP) fed ad libitum (CON). Another group will receive the CON diet plus a barley energy supplement fed daily at 4.4 lbs./hd/d (ENG). A final postpartum treatment group will receive the CON diet plus a 40% natural protein supplement fed daily at 1.5 lbs./hd/d (PRO). Supplements will be formulated to contain equal quantities of protein.

On May 31, 1995, cows will be turned out on pasture until the start of breeding (June 6) and managed as a group until weaning. Cows will remain on their respective treatments in subsequent years (total years = 4) unless culled from the herd.

Cow weights and condition scores will be measured at the beginning of the experiment, January 1, 1995, one week prior to calving, prior to breeding and at weaning each year. Milk production will be estimated with a portable milk machine (Dhuyvetter, et al. 1993) 30-40 d postpartum (approximate mean postpartum date). Cow forage intake will be estimated on a pen basis as the amount offered. This variable will not be statistically tested but used to describe basal diet conditions and approximate intake. Calf birth weights will be recorded and calf weights will be measured prior to breeding and at weaning. Calf health (morbidity and incidence of scours) and dystocia (calving difficulty scores, Wiley et al., 1991) will be measured after calving.

Days to first estrus will be determined analyzing blood progesterone concentrations beginning 20 d after calving and continuing to the start of breeding. Cow pregnancy rates will be determined by ultrasound on d 42 of the breeding season (determination of cows bred early) and at weaning (overall pregnancy rate).

This experiment is designed to be repeated over a four year period. Cows will remain on their respective treatments each year unless culled from the herd for typical management reasons (ie. nonpregnant, late bred, soundness, temperament, etc.). Culling rates for respective treatment groups will be analyzed as well as mean cow age for determination of treatment effects on cow longevity.

RESULTS

From this study, nutritional effects on reproduction before and after calving can be evaluated. Potential comparative measures are given in Table 1. Specific nutrient supplementation (energy vs. protein) may provide insight into their importance for reproductive success. By altering nutrient supply prior to calving, producers may be able to determine, when cow nutrient requirements are less critical. Or, if providing key supplementation after calving, can cows compensate for pre-calving shortages. This can be important for cows that go into the winter in marginal body condition, as well as cows that have ample fat reserves. Will cows that have excess condition at calving rebreed without supplementation expenses after calving? Can we manage cattle in this manner in successive years or will cows leave the herd earlier as a result of any one of these nutritional regimens? Calf growth and health could also be affected by nutritional manipulations of the cow herd.

How cows respond to treatments after calving may depend on how they were managed prior to calving. This would result in different nutritional recommendations for producers whose resources best match a successful treatment combination. Evaluation of these pre- and post-calving treatments may lead to a better understanding of nutritional effects on cow reproduction and optimization of cow reproduction, calf growth and enterprise profitability in North Dakota.

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Table 1. Potential comparisons of cows managed to different body condition scores before calving (4.0 - 4.5 vs. 5.5 to 6.0) and then supplemented with protein (PRO), energy (ENG) or no supplement (CON).

Measurement	Body Condition Score at Calving 4.0 - 4.5			Body Condition Score at Calving 5.5 - 6.0		
	CON	ENG	PRO	CON	ENG	PRO
Cow weight and Body condition score						
December						

March	
June	
October	
Cow milk production	
Days to first estrus	
% bred early (21 days)	
0Final pregnancy rate	
Calf dystocia score	
Calf scour incidence	
Calf morbidity	
Calf weight	
Birth	
June	
Weaning	
Feed Costs	
Number of cows culled	

DATA CURRENTLY
BEING COLLECTED

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