INFLUENCE OF COBALT-DEXTROSE-LACTONE ON GLUCOSE, VOLATILE FATTY ACIDS AND REPRODUCTIVE PERFORMANCE OF BEEF COWS

D.K. Bishop[1], R.P. Wettemann[2] and K.S. Lusby[3]

Story in Brief

Spring calving Hereford and Hereford x Angus cows (n=91) grazing native range pastures were used in this study. Cows were fed protein/energy supplements to achieve a body condition score of 5.5 at parturition. Cobalt-dextrose-lactone (CDL) was added to the diet of half of the cows on each supplemental treatment. Glucose was quantified in plasma on four consecutive days during gestation and weekly during lactation. Progesterone was quantified in weekly samples to determine the onset of luteal activity and cows were exposed to fertile bulls for a 70 day breeding season. Volatile fatty acids (VFA) were quantified in rumen samples collected during lactation. Treatment with CDL increased concentrations of glucose in plasma during gestation but not during lactation. Addition of CDL to diets increased total VFA in the rumen. The percentage acetate in the rumen was increased and the percentage buterate was decreased. CDL did non influence days from calving to the onset of luteal activity and conception, or the percentage of cows that became pregnant during the breeding season.

(Key Words: Beef Cow, Cobalt, Glucose, Reproduction, VFA.)

Introduction

Nutrient intake and body energy reserves influence reproduction in beef cows. Concentrations of glucose in plasma of cows may be used to evaluate nutritional status and are related to rebreeding performance in nutritionally stressed cows (Selk et al., 1985). Propionate is a precursor for gluconeogenesis and increased concentrations of this volatile fatty acid are associated with increased concentrations of glucose in plasma. In a preliminary trial, CDL increased glucose concentrations but did not influence concentrations of insulin or nonesterfied fatty acids in plasma of cows fed chopped prairie hay during early gestation. The objective of this study was to

[1]Graduate Student [2]Regents Professor [3]Professor

evaluate the influence of CDL on concentrations of glucose in plasma and reproductive performance of beef cows on range pastures.

Materials and Methods

Ninty-one spring calving Hereford and Hereford x Angus cows were fed supplements to evaluate the efficacy of replacing soybean meal as a protein source with wheat middlings (Ovenell et al., 1990). Supplements were fed to provide 1.2 lb of crude protein/day from soybean meal (diet 1) or wheat middlings (diet 4) or .8 (diet 2) or 1.0 (diet 3) lb of crude protein/day from wheat middlings. Cobalt-dextrose-lactone (CDL; .60% cobalt; Agro-K, Minneapolis, MN) was fed to half of the cows on each supplemental treatment at a rate of 7.04 g/day. CDL was fed from approximately 100 days before calving until 85 days post partum. All cows calved between February 4 and April 5 and had an average body condition score (BCS; 1=emaciated, 9=obese) of 5.5 at calving. Weights and BCS of cows were determined after 16 h without feed and water every 28 days during treatment. Calf weights were recorded at birth and at weaning. Fertile bulls were introduced on May 5 and remained for a 70 day breeding season.

Blood samples were collected on four consecutive days during the last trimester of gestation and weekly between 25 and 85 days post partum. Glucose concentrations in plasma were quantified in all samples. Progesterone was quantified in plasma samples collected weekly to determine the onset of luteal activity. Volatile fatty acid concentrations were quantified in rumen samples collected (during lactation) on May 18 from 42 cows.

Results and Discussion

Concentrations of glucose in plasma of beef cows during late gestation are depicted in Figure 1. Glucose concentrations were greater ($P < .05$) on all four days in cows treated with CDL compared with control cows. Average concentrations of glucose were $67.3 \pm .9$ and $68.8 \pm .9$ mg % for control and CDL cows, respectively. Body weights and body condition scores were not influenced by the addition of CDL to diets. Control cows lost 92 pounds from late pregnancy until the middle of the breeding season (June 6) and CDL treated cows lost 104 pounds ($P > .20$). CDL did not influence concentrations of glucose in blood samples collected each week during lactation (Figure 2).

Concentrations of volatile fatty acids in rumen samples are summarized in Table 1. CDL increased the molar % acetate and decreased the molar % butyrate in the rumen of lactating cows. Total concentrations of volatile fatty acids were increased ($P < .05$) when CDL was added to the diet. Apparently

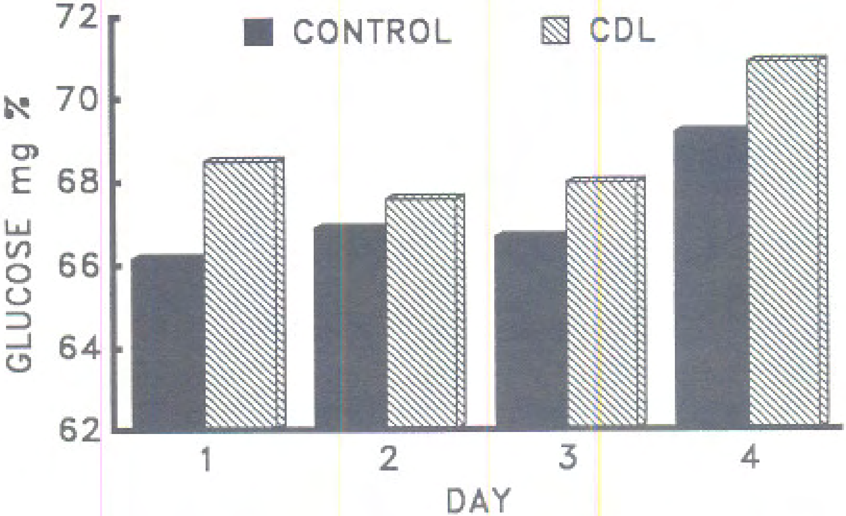

Figure 1. Concentrations of glucose in plasma during late gestation in control cows and cows fed cobalt-dextrose-lactose (CDL).

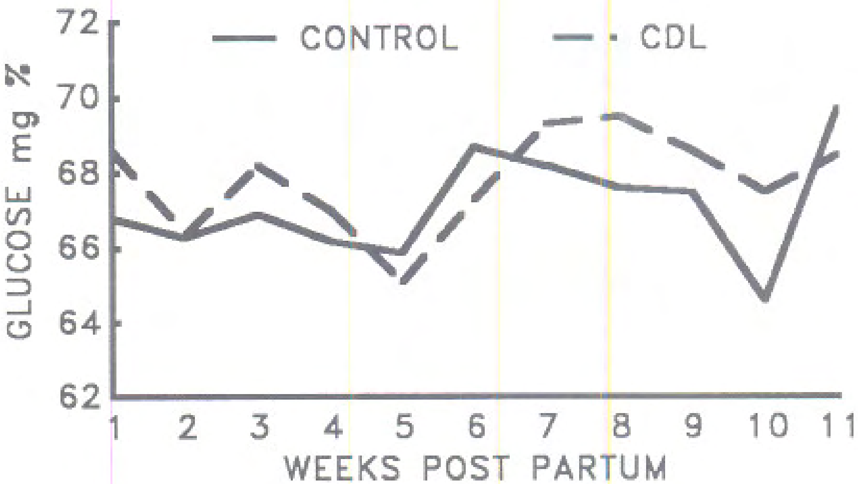

Figure 2. Concentrations of glucose in plasma during lactation in control cows and cows fed cobalt-dextrose-lactose (CDL).

Table 1. Influence of CDL in the diet of lactating beef cows on VFA's in the rumen (May 18).

VFA	Treatment		
	Control	CDL	SE
Acetate, Molar %	71.2[a]	73.0[b]	.5
Propionate, Molar %	13.6	13.2	.3
Butyrate, Molar %	10.3[c]	9.3[d]	.2
Isobutyrate, Molar %	1.9	1.7	.2
Isovalerate, Molar %	2.9	2.7	.1
Total Concentration, Millimolar	33.6[a]	45.5[b]	3.5

[ab] Means with different superscripts differ $P < .05$.
[cd] Means with different superscripts differ $P < .01$.

CDL altered rumen function in cows on forage diets.

Calf weights were adjusted for sex of the calf and age of the dam. There was a trend ($P < .11$) for an interaction between the effects of diet and addition of CDL to the supplement of cows on birth weights of calves (Figure 3). Diets 1 and 2 contained less energy than Diets 3 and 4. Calves from cows on Diets 1 and 2 that were fed CDL had increased birth weights while birth weights of calves from cows on Diets 3 and 4 were not influenced by CDL treatment. Weaning weights of calves was not influenced by addition of CDL to the diet of cows.

Reproductive performance for control and cows treated with CDL is summarized in Table 2. CDL did not influence the percentage of cows with luteal activity at 60 days post partum, the percentage of cows pregnant after a 70 day breeding season, or the average number of days between calving and conception. Increased glucose during gestation may be more beneficial to cows that have decreased body energy stores. Feeding CDL to beef cows on low quality forage increased glucose concentrations in plasma during gestation but did not influence reproductive performance of cows with moderate body condition scores.

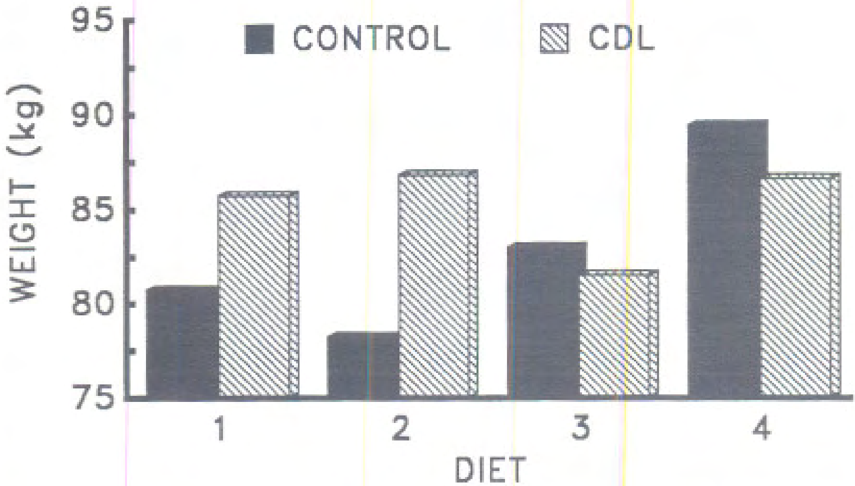

Figure 3. Influence of cobalt-dextrose-lactose (CDL) on birth weight of calves.

Table 2. Reproductive efficiency of control and CDL treated beef cows.

	Treatment	
Criteria	Control	CDL
Luteal Activity at 60 d post partum, %	78	69
Pregnant, %	93	98
Calving to conception, d	96 ± 3	90 ± 3

Literature Cited

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