INFLUENCE OF INFUSION DOSE OF SODIUM BICARBONATE ON PERFORMANCE OF LACTATING DAIRY COWS

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Story in Brief

Four ruminally cannulated, lactating Holstein cows were assigned to a 4x4 Latin square to monitor the effects of intraruminal sodium bicarbonate infusion on lactational performance. Cows were infused with 3.8 liters of water or sodium bicarbonate (110, 220, or 330 grams) dissolved in 3.8 liters of water, twice daily; infusion was administered at a constant rate from 2 to 4 hours postfeeding. All cows had access to their diet containing sorghum silage and concentrate in a 35:65 ratio (dry matter basis) for 2 hours, twice daily. Although milk yield tended to increase linearly with increasing sodium bicarbonate infusion dose, other measures of lactational performance generally were not affected by sodium bicarbonate infusion. This suggests that the influence of this buffer may vary, depending upon the route of admininstration.

(Key Words: Sodium Bicarbonate, Dairy Cow, Milk, Intake.)

Introduction

Previous studies have evaluated the influence of intraruminal infusion of sodium bicarbonate on ruminal fluid acid-base status and lactational performance of dairy cows; these studies were designed specifically to examine various infusion intervals (Hogue et al., 1991) and the presence of supplemental dietary sodium bicarbonate (Aslam et al., 1991). The objective of the present study was to evaluate the influence of the infusion dose of sodium bicarbonate on measures of lactational performance.

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Materials and Methods

Four pluriparous ruminally fistulated Holstein cows were arranged in a 4x4 Latin square with experimental periods 2 wk in length. A total mixed diet of sorghum silage and concentrate (35:65 ratio; DM basis) was fed at 0300 and 1500 h; cows were allowed access to the diet for 2 h at each feeding.

Treatments consisted of intraruminal infusion of water from 2 to 4 h postfeeding, or of 110, 220, or 330 g sodium bicarbonate from 2 to 4 h postfeeding. Sodium bicarbonate solution was prepared for infusion at each feeding by dissolving pre-weighed contents of a sodium bicarbonate packet in 3.8 L of water; this solution was allowed to flow by gravity at a controlled rate for 2 h into the rumen.

Results and Discussion

Infusion dose of sodium bicarbonate did not affect dry matter intake (Table 1), whereas milk yield tended to increase ($P=.12$) linearly with increasing infusion dose; this increase was most evident for the 330 g-dose of sodium bicarbonate. Dry matter intake has been reduced by infusion of sodium bicarbonate from 2 to 4 h previously (Hogue et al., 1991). However, dietary sodium bicarbonate has increased dry matter intake and milk yield (Erdman, 1988).

Because milk fat content and milk fat yield were not affected by infusion dose of sodium bicarbonate (Table 1), 4% fat-corrected milk yield also was similar among treatments. Infusion of sodium bicarbonate from 2 to 4 h failed to increase milk fat content or milk fat yield previously (Aslam et al., 1991; Hogue et al., 1991). However, addition of sodium bicarbonate to high concentrate diets typically increases milk fat content, although this response is less marked for diets containing alfalfa or grass (Erdman, 1988).

Milk protein content and milk protein yield were not affected by infusion treatments (Table 1). Milk somatic cell count appeared to be reduced by infusion of sodium bicarbonate, although this comparison was not made in our statistical analysis. The explanation for this response is not clear. In summary, lactational performance of dairy cows was not significantly altered by intraruminal infusion of various doses of sodium bicarbonate, suggesting that the influence of this buffer may vary, depending upon the route of admininstration.

Table 1. Dry matter intake, milk yield and milk composition of cows receiving ruminal infusion of water or 110, 220, or 330 g of $NaHCO_3$ from 2 to 4 h postfeeding.

	Water	110g $NaHCO_3$	220g $NaHCO_3$	330g $NaHCO_3$	SE	Effect	P Value
DM intake, kg	18.2	18.5	18.4	19.6	1.1	NS[a]	
Milk yield, kg	24.5	24.5	25.0	26.1	.7	L[b]	.122
4% FCM, kg	23.0	22.6	24.3	23.7	1.6	NS	
Fat, %	3.57	3.44	3.81	3.38	.3	NS	
Fat yield, kg	.88	.85	.95	.88	.09	NS	
Protein, %	3.16	3.18	3.14	3.11	.04	NS	
Protein yield, kg	.77	.78	.78	.81	.03	NS	
SCC (1,000)	234	101	102	105	56	NS	

[a]Nonsignificant; $P > .15$.
[b]Linear effect of $NaHCO_3$ infusion dose.

Literature Cited

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