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Smartamine M Supplementation Reduces Inflammation but Does Not Affect Performance in Receiving Beef Heifers

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Smartamine M Supplementation Reduces Inflammation but Does Not Affect Performance in Receiving Beef Heifers

Abstract

Objective: This study was conducted to evaluate the ability of supplemental methionine to improve health, inflammation status, and performance of receiving cattle.

Study Description: A group of 384 crossbred heifers (initial weight 489 lb) of Tennessee origin were used in a 45-day receiving trial with limit-feeding to evaluate the effects of supplemental methionine (Smartamine M; Adisseo, Alpharetta, GA) on health, inflammation, and performance. Cattle received either 0 (control) or 10 grams/day Smartamine M, a ruminally protected methionine product. Plasma haptoglobin levels measured on days 0, 14, and 45 were used as a biomarker of inflammation.

The Bottom Line: Supplemental methionine supplied by Smartamine M does not improve performance but reduces inflammation and possibly improves immune function in receiving heifers.

Keywords

methionine, receiving cattle, haptoglobin

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Cover Page Footnote

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M.S. Grant, H.F. Speer, W.R. Hollenbeck, R.N. Wahl, N.D. Luchini,¹ D.A. Blasi, and E.C. Titgemeyer

Abstract

Methionine supplementation can improve immune function in transition dairy cattle. To determine if supplemental methionine could improve health and performance in newly received growing cattle, a group of 384 crossbred heifers (489 ± 10.9 lb) of Tennessee origin were received in four truckloads (blocks) over nine days. The day following arrival (day 0), cattle were stratified within block by arrival weight to one of eight pens containing 12 heifers each. Cattle were limit-fed a by-product and corn-based ration at 2.2% of body weight, once daily for 45 days. Within blocks, pens were assigned to one of two treatments: 0 (control) or 10 grams/day Smartamine M as a source of ruminally protected methionine. Pen weights were measured weekly and used to adjust feed offered the following week. Individual heifer body weights and tail vein blood samples were collected on days 0, 14, and 45. Plasma haptoglobin was measured to assess inflammation. Incidences of morbidity and mortality were low. Between days 0 and 45, no differences were observed for average daily gain or gain-to-feed ratio. An interaction between treatment and linear effect of day was detected for plasma haptoglobin ($P = 0.05$); over time, haptoglobin increased more for control than for Smartamine M. Supplemental methionine may alleviate acute phase protein responses in stressed receiving cattle.

Introduction

Methionine supplementation has been shown to improve immune function and reduce inflammation in transition dairy cows. High-risk receiving cattle are also subjected to a wide variety of stressors, such as comingling, transportation, disease exposure, and low feed intake. Because methionine supplementation helps to mitigate stress-induced immune responses in dairy cows, it can likely provide similar benefits to receiving cattle as well. The objective of this trial was to evaluate the ability of supplemental methionine to improve health, inflammation status, and performance of receiving cattle.

¹ Adisseo USA Inc., Alpharetta, GA.

Experimental Procedures

A group of 384 crossbred heifers (initial body weight 489 ± 10.9 lb) were purchased from auction markets in Tennessee and transported to the Kansas State University Beef Stocker Unit, Manhattan, KS, in four truckloads over nine days from October 4 to October 13, 2018. Heifers were blocked by load and stratified by individual arrival body weight within a block to pens containing 12 heifers each. Within block, pens were randomly assigned to one of two treatments creating 16 pens per treatment, for a total of 32 pens. Experimental diets (Table 1) were offered at 2.2% of body weight daily (dry matter basis) and contained either 0 (control) or 10 grams/day Smartamine M (Adisseo, Alpharetta, GA), a ruminally protected methionine product. The 10 grams/day Smartamine M provided 6 grams/day supplemental metabolizable methionine. Smartamine M was delivered in the diet as a mixture with dry-rolled corn.

On day 0, heifers were vaccinated for common viral and clostridial pathogens, treated for internal and external parasites, and received Draxxin (1.1 mg tulathromycin/lb body weight). On day 14, heifers were revaccinated for viral respiratory diseases. Individual body weights were measured at processing (day 0), revaccination (day 14), and the conclusion of the trial (day 45). Pen weights were measured weekly using a pen scale on days 14, 21, 28, 35, and 45. Weekly pen weights were used to calculate feed offered for the following week. Animals were fed once daily at 7:00 a.m. using a Roto-Mix feed wagon.

Heifers were observed twice daily for clinical signs of illness. Animals showing signs of morbidity were treated according to protocol of the K-State Beef Stocker Unit. Prior to feeding on days 0, 14, and 45 a tail vein blood sample was collected from each animal and plasma harvested. Plasma samples were analyzed for haptoglobin concentration as a biomarker of inflammation.

Results and Discussion

Performance data are presented in Table 2. Although there were some statistical differences between treatments for dry matter intake, this was a result of differences in dietary dry matter among treatments as analyzed from weekly feed samples collected on days 0–14, and dry matter intake did not differ practically between groups. No differences in body weight ($P \geq 0.65$), average daily gain ($P \geq 0.52$), or gain-to-feed ratio ($P \geq 0.28$) were observed at any time throughout the trial.

Very low incidences of morbidity and mortality were observed for this trial; data were not analyzed statistically (Table 3). A total of eight heifers were treated once (2.1%) for respiratory illness, five from the Smartamine M treatment (2.6%) and three from the control treatment (1.6%). Two previously treated animals died during the trial, one from each treatment, resulting in total and treatment mortality rates of 0.52%.

For plasma haptoglobin, an interaction between dietary treatment and linear effect of day was observed ($P = 0.05$) (Figure 1). Over the duration of the trial, haptoglobin levels for the Smartamine M treatment group remained relatively stable. Control cattle had numerically lower haptoglobin on day 0, which then linearly increased over the

duration of the trial. It appears that supplemental methionine mitigated the increase in plasma haptoglobin over time in the Smartamine M cattle.

Implications

Our research determined that supplemental methionine mitigated acute phase protein response in supplemented cattle, suggesting a reduction in systemic inflammation.

Acknowledgments

The authors thank Adisseo USA Inc. for their financial support of this project.

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Table 1. Diet composition and Smartamine M inclusion in rations fed to receiving heifers

Item	Treatment	
	Control	Smartamine M
Ingredient, % of dry matter		
Corn, dry rolled	34.5	---
Corn, dry rolled, with Smartamine M ¹	---	34.5
Sweet Bran ²	40.0	40.0
Corn silage	10.0	10.0
Alfalfa hay	4.0	4.0
Prairie hay, chopped	4.0	4.0
Supplement ³	7.5	7.5
Smartamine M, grams/day	0	10

¹Dry-rolled corn and Smartamine M were combined and mixed for 60 seconds in a paddle mixer according to Smartamine M User Guide instructions. The mixture contained 99.5% dry-rolled corn and 0.5% Smartamine M.

²Cargill Animal Nutrition, Blair, NE.

³Supplement peller formulated to contain (dry matter basis) 10.6% crude protein, 8.7% calcium, 0.62% phosphorus, 4.6% salt, 0.70% potassium, 0.20% magnesium, 5.1% fat, and 330 ppm monensin (Rumensin; Elanco, Greenfield, IN).

Table 2. Effect of Smartamine M on performance in receiving beef heifers

Item	Treatment		Standard error of the mean	<i>P</i> -value
	Control	Smartamine M		
Number of pens	16	16		
Number of heifers	191	191		
Body weight, lb				
Day 0	489	489	10.9	0.70
Day 14	534	533	6.4	0.87
Day 21	554	553	5.5	0.88
Day 28	570	571	5.4	0.66
Day 35	589	590	6.3	0.87
Day 45	612	614	6.7	0.65
Average daily gain, lb/day				
Days 0–14	3.17	3.18	0.37	0.95
Days 14–45	2.54	2.61	0.11	0.52
Days 0–45	2.74	2.79	0.14	0.55
Dry matter intake, lb/day				
Days 0–14	9.8	9.6	0.10	0.008
Days 14–45	12.4	12.4	0.11	0.54
Days 0–45	11.6	11.5	0.10	0.001
Gain-to-feed ratio, lb/lb				
Days 0–14	0.326	0.334	0.0412	0.70
Days 14–45	0.204	0.211	0.0075	0.45
Days 0–45	0.236	0.243	0.0141	0.28

Table 3. Effect of Smartamine M on morbidity and mortality

Item	Treatment	
	Control	Smartamine M
Morbidity, %		
Treated once	1.6	2.6
Treated twice	0.5	0.5
Chronic	0.0	0.5
Mortality, %	0.5	0.5

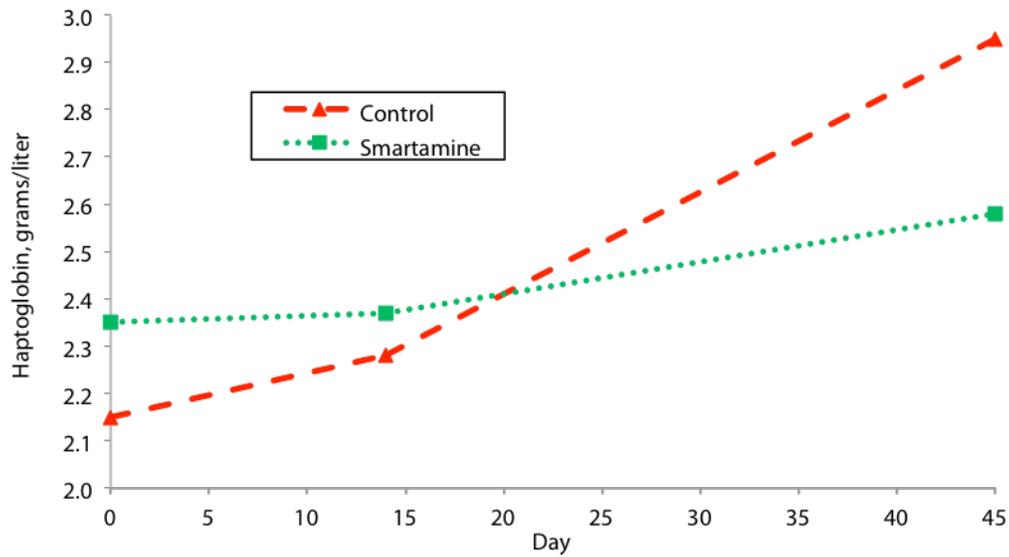


Figure 1. Effect of Smartamine M supplementation on plasma haptoglobin over time. Treatment × linear day interaction, $P = 0.05$, standard error of the mean = 0.22.