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Madeline S. Grant
Kansas State University

Dale A. Blasi
Kansas State University, dblasi@ksu.edu

Evan C. Titgemeyer
Kansas State University, etitgeme@k-state.edu

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CATTLEMEN'S DAY 2024

Supplementation of Methionine or Choline Did Not Improve Health or Growth Performance in High-Risk, Newly Received Beef Heifers

M.S. Grant, D.A. Blasi, and E.C. Titgemeyer

Abstract

Methionine and choline supplementation can improve health and immune function in transition dairy cattle. Our objective was to determine if supplemental methionine or choline improves health or growth performance in high-risk, newly received beef heifers. In a 3-year experiment, 1,440 crossbred beef heifers [480 per year; 493 ± 9.8 lb initial body weight (BW); Tennessee origin] were received in 15 truckloads (blocks; five per year) in October 2020, 2021, and 2022. Heifers were weighed individually upon arrival. On the day following arrival, cattle were stratified within block by arrival weight to one of eight pens containing 12 heifers each. Cattle (40 pens/year; 120 total pens) were limit-fed at 2.2% of BW for 60 days. Pens were assigned to one of five treatments: control; 5 g/day methionine (8.33 g/day Smartamine M; Adisseo USA Inc., Alpharetta, GA; ruminally protected methionine product); 15 g/day methionine (25 g/day Smartamine M); 1.17 g/day choline (26 g/day ReaShure; Balchem Corp., Montvale, NJ; ruminally protected choline product); or 3.5 g/day choline (78 g/day ReaShure). Treatments were top-dressed at feeding daily. In each year, there were eight pens/treatment for a total of 24 pens/treatment across three years. Pen weights were measured weekly to adjust feed offered the following week. Individual BW were measured on days 0, 14, and 60. Dry matter intake was not affected by treatment ($P = 0.48$). We observed minor differences among treatments for final BW, average daily gain, and gain:feed, but none of the treatments were different from control. Overall prevalence of respiratory morbidity and mortality were 28.1% and 0.72%, respectively. No treatment differences were detected for first, second, or third respiratory morbidity or mortality ($P \geq 0.30$). Overall, supplementation with methionine or choline did not affect health or growth performance of high-risk, newly received heifers.

Introduction

Methionine and choline are methyl group sources, and their supplementation improves health and immune function in transition dairy cows. High-risk receiving cattle are also subjected to a wide variety of stressors, such as commingling, transportation, disease exposure, and low feed intake. Because methionine and choline supplementation help to mitigate stress-induced immune responses in dairy cows, we hypothesized it would provide similar benefits to receiving cattle. Recent work suggested that supplemental

methionine may decrease inflammation in newly received beef heifers. The objective of this trial was to evaluate the ability of supplemental methionine or choline to improve health and growth performance of receiving cattle.

Experimental Procedures

In a 3-year experiment, a total of 1,440 crossbred beef heifers [480 per year; average initial body weight (BW) 493 ± 9.8 lb] were purchased from auction markets in Tennessee and transported to the Kansas State University Beef Stocker Unit, Manhattan, KS, in 15 truckloads (five truckloads per year) in October 2020, October 2021, and October 2022. Heifers were blocked by load (15 total blocks; five per year) and stratified by individual arrival BW within a block to pens containing 12 heifers each. Pens were randomly assigned to one of five treatments: control (no added methionine or choline); 5 g/day available methionine (8.33 g/day Smartamine M; Adisseo USA Inc., Alpharetta, GA; ruminally protected methionine product); 15 g/day available methionine (25 g/day Smartamine M); 1.17 g/day available choline (26 g/day ReaShure; Balchem Corp., Montvale, NJ; ruminally protected choline product); or 3.5 g/day available choline (78 g/day ReaShure). A common experimental diet (Table 1) was offered at 2.2% of BW daily (dry matter basis). Treatments were top-dressed at feeding daily.

On arrival, heifers were weighed individually and assigned an individual ear tag. Heifers were placed in pens, offered prairie hay at 1% of BW and *ad libitum* access to water, and were allowed to stand overnight. The next day (day 0), heifers were vaccinated for viral and clostridial pathogens, treated for internal and external parasites, received Draxxin (2.5 mg tulathromycin/kg BW; Zoetis Inc., Parsippany, NJ), and were allocated to pens. On day 14, heifers were revaccinated for viral respiratory diseases. Individual BW were measured at initial processing (day 0), revaccination (day 14), and at trial conclusion (day 60). Pen weights were measured using a pen scale on day 0 and weekly from days 14 to 60. Weekly pen weights were used to calculate feed offered for the following week. Heifers were fed once daily at 7:00 a.m. using a Roto-Mix feed wagon (Model 414-14B; Roto-Mix LLC., Dodge City, KS) for 60 days.

Throughout the trial, heifers were observed twice daily for clinical signs of respiratory illness. Respiratory illness was treated as follows: first treatment was florfenicol, second treatment was enrofloxacin, and third treatment was oxytetracycline. Heifers requiring a third treatment were declared as chronic and removed from the experiment.

Results and Discussion

Performance data are presented in Table 2. Dry matter intake did not differ among treatments ($P \geq 0.30$), largely because cattle were limit-fed. We observed tendencies for an overall effect of treatment on day 60 final BW, average daily gain (ADG), and gain:feed ($P \leq 0.10$). On day 60, calves supplemented with 15 g/day methionine were heavier than calves supplemented with 5 g/day methionine, 1.17 g/day choline, or 3.5 g/day choline ($P \leq 0.03$). In addition, calves provided 15 g/day methionine had greater ADG and improved feed efficiency compared with calves provided 1.17 g/day choline, or 3.5 g/day choline ($P \leq 0.03$). Despite this, none of the treatments differed from control for final BW, ADG, and gain:feed ($P \geq 0.12$), suggesting overall minimal performance effects.

Health data are presented in Table 2. No differences were detected among treatments for first, second, or third respiratory morbidity or mortality ($P \geq 0.30$). Across the three-year experiment, first treatment morbidity averaged 28.1% and mortality averaged 0.72%. Incidence of first respiratory morbidity differed among the three years ($P < 0.001$) and was 21.5% in year 1, 9.3% in year 2, and 53.5% in year 3. On average, first treatment respiratory morbidity occurred at 18 days on trial.

Implications

Overall, supplemental methionine or choline did not improve growth performance or health of high-risk, newly received beef heifers.

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Table 1. Experimental diet fed to newly received beef heifers

Ingredient	% of Dry matter
Corn, dry rolled	39.5
Wet corn gluten feed[1]	40.0
Prairie hay, chopped	13.0
Supplement[2]	7.5

[1] Sweet Bran, Cargill Corn Milling, Blair, NE.

[2] Supplement pellet formulated to contain (dry matter basis) 8.5% calcium, 0.64% phosphorus, 0.76% potassium, 5.0% salt, and 307 grams/ton monensin (Rumensin; Elanco, Greenfield, IN).

Table 2. Effects of supplemental methionine or choline on growth performance and health of newly received heifers

Item	Control	Methionine, grams/day		Choline, grams/day		SEM[1]	Treatment *P*-value
		5	15	1.17	3.5		
Number of pens	24	24	24	24	24	–	–
Number of heifers[2]	279	278	278	282	280	–	–
Body weight, lb							
Day 0	492	492	494	494	494	2.0	0.26
Day 60	642[ab]	639[b]	646[a]	639[b]	632[b]	4.6	0.09
Average daily gain, lb/day							
Days 0 to 60	2.51[ab]	2.45[ab]	2.56[a]	2.43[b]	2.40[b]	0.075	0.09
Dry matter intake, lb/day							
Days 0 to 60	12.1	12.0	12.1	12.1	12.0	0.07	0.48
Gain:feed, lb/lb							
Days 0 to 60	0.208[ab]	0.204[ab]	0.212[a]	0.201[b]	0.201[b]	0.0058	0.10
Morbidity, %							
Treated once	23.8	24.1	22.6	23.1	27.6	4.15	0.71
Treated twice	4.9	6.7	4.4	4.9	7.2	1.78	0.30
Treated thrice	1.2	1.3	1.4	0.5	0.8	0.65	0.52
Mortality, %	0.6	0.6	0.6	0.9	0.9	0.54	0.97
Days to							
First treatment	19	18	17	21	17	–	–
Second treatment	21	24	18	25	20	–	–
Third treatment	18	33	28	42	26	–	–

[1] Standard error of the mean.
[2] Performance data from dead and chronic heifers were removed from analysis.
[a,b] Within row, means without a common superscript differ, $P \leq 0.05$.