The Effects of Levamisole, Receiving Diets, and Pre and PostTransit Potassium on Gain and Health of Stressed Calves[1]

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Summary

We purchased 264 calves (125 bulls and 139 steers) in Tennessee and transported them to Kansas to evaluate the effects of levamisole injections and potassium supplementation, before and after transit, and feedlot receiving rations on performance and health of stressed calves. The calves were held for 48 to 96 hours in the order-buyer barn, fed either a 1.1% or 1.5% potassium (K) ration, transported for 24 hours, and fed either a 40% concentrate or hay-plus protein-supplement receiving diet fortified with either 1.1 or 1.7% K for 28 days. They were met in Kansas with 16 hr of cold driving rain, followed by severe cold temperatures, so stress was extreme. Subsequently, the calves grazed native pasture for 60 days.

Levamisole reduced (P<.10) feedlot mortality. Bulls were castrated upon arrival and levamisole reduced mortality in castrated bull calves more than in steer calves (P<.05). Levamisole tended to increase IBR antibody titers and enhance change in BVD titers. Mortality was 12.3% in calves fed the 40% concentrate diet and 8.5% in those fed hay and protein supplement. More (P<.10) medical treatments per calf were required in the concentrate-fed calves than in the hay-fed calves. Due to the extreme-stress conditions during the first week in the feedlot, the calves required most of the 28-day receiving period to recover purchase weight and gains were similar (P>.05) in all groups.

Fewer of the calves fed the 1.5% K pretransit diet died during the first 3 days in the feedlot than of those fed the control diet, but the posttransit K (1.7% K) diet resulted in a trend toward higher mortality during the receiving period.

Introduction

Feeder calves undergo numerous stresses while they are marketed, transported, and adapted to feedlot environments. These stressors, in combination with viral and bacterial pathogens, can increase incidence of bovine respiratory disease (BRD) and make adaptation to the feedlot environment difficult. Lack of appetite may add to the stress and increase the incidence of BRD.

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Experimental Procedures

In March 1983, three loads of calves were purchased at auction markets in Eastern Tennessee and North Carolina. The mixed-breed calves (125 bulls and 139 steers) were randomized to treatment groups within sex status at an order- buyer barn (OBB) in Newport, Tennessee. The calves were processed at the OBB and one third were injected with 10 ml of levamisole phosphate (13.65% active ingredient).

The calves were held at the OBB for 48 to 96 hours, depending on when they were purchased. The calves received 2 pounds of cracked corn per head daily with either 1.1 or 1.5% potassium supplementation, plus ad libitum intake of mixed grass hay. The calves were mainly medium-frame, number one-muscled calves that were black and red in color. Each load was penned separately at the OBB. The three loads of calves traveled together and were in transit for 24 hours. After arrival in Kansas, the calves were processed immediately and another third of the calves were injected with levamisole phosphate. All calves were vaccinated for infectious bovine rhinotracheitis (IBR), bovine virus diarrhea (BVD), parainfluenza$_3$ (PI_3), and blackleg (4-way). The bull calves were castrated with a knife, and the cords were stapled with steel staples. The calves consumed the receiving diets for 28 days, consisting of either a 40% concentrate diet or a grass hay ration plus 2 lb of 32% crude protein supplement. Each ration contained 1.1 or 1.7% potassium. This was followed by a holding period of 17 days, during which the calves were fed silage, then 60 days on native grass pasture (May 15 to July 14).

Calves were examined daily for visual signs of morbidity and treated when they were subjectively determined to be sick. Rectal temperatures of all calves were taken at the OBB, on arrival at the feedlot, and on days 7 and 14. If an animal's temperature exceeded 104° F, it was treated. The calves were mass medicated on days 3 and 4 when a high percentage were visually sick after 16 hours of exposure to cold driving rain, followed by severe low temperatures. This exposure resulted in an inordinate percentage of morbidity and a subsequent high death loss. A wide range of antibiotics, prescribed by a practicing veterinarian, was used.

Results and Discussion

Injection with levamisole either at the OBB or upon arrival at the feedlot decreased ($P<.10$) mortality (Table 12.1). Mortality was 14.8% in control calves, 9.6% in calves injected with levamisole at the OBB, and 6.8% in calves injected with levamisole upon arrival at the feedlot. There was a trend for levamisole to reduce mortality most in calves shipped as bulls and castrated upon arrival. Death loss was 19.0% for the control calves, 12.2% for those injected with levamisole at OBB, and 4.8% for those injected on arrival. Levamisole has been shown to increase antibody titers when administered with a vaccine. Our calves were vaccinated against BVD and IBR, and levamisole treatment tended to enhance the change in BVD antibody titers and increase IBR antibody titers at feedlot day 28.

The receiving diets (hay vs. concentrate) did not influence gain during the 28-day receiving period, but the high stress level may have nullified any ration effect. In fact, the castrated bull calves still had not recovered purchase weight after 28 days in the feedlot. These super-stressed calves required most of the 28 days to recover purchase weight. Of the concentrate-fed calves, 12.3% died vs

8.5% of the hay-fed calves. In the castrated bulls, morbidity was 14.3% of those fed the concentrate receiving diet vs. 9.7% of those fed the hay diet, with little difference in mortality. Calves fed the 40% concentrate diet required more (P<.10) medical treatments per calf from feedlot day 7 to day 28 than did those fed hay and protein supplement.

The concentrate-fed calves had higher (P<.05) body temperatures at feedlot day 14 than those fed the hay diet. They also tended to have less change in lymphocyte blastogenesis and BVD antibody titers than hay-fed calves. All the health parameters favored the hay diet in these super-stressed calves, especially with bull calves castrated on arrival. In calves subjected to less stress, a higher energy receiving ration may be desirable because of increased gains.

There was no clear-cut effect of supplemental potassium on mortality or morbidity. However, most of the forage that the calves consumed in Tennessee prior to transit contained at least 2.5% potassium. This may explain, in part, the failure of the calves to respond to higher dietary potassium at the feedlot. Earlier research showed a poorer response of fall-shipped calves when the potassium level reached 3.1%. The potassium level of the diet before calves enter the marketing channels may effect the level of potassium required in a receiving ration for maximum benefit in terms of reduced health problems.

Table 12.1. Effects of Levamisole and Receiving Diets on Calf Gains and Health

Item	Least Squares Means[a]		
	Control	Levamisole Injected at Tennessee	Injected at Manhattan
Total Gain, lb (purchase to end pasture period, 105 days)	141.0[b]	148.9[c]	152.5[c]
% Mortality: All calves	14.8[b]	9.6[c]	6.8[c]
Castrated Bulls	19.0[b]	12.2[c]	4.8[d]

	Feedlot Diet	
	Hay plus 2 lb Protein Suppl.	40% Concentrate
Receiving Period Gain, lb (28 days)	54.6	60.1
Silage and Pasture Gain, lb (77 days)	135.7	138.2
% Mortality: All calves	8.5[b]	12.3[c]
Castrated Bulls	9.7[b]	14.3[c]
No. Treatments/Animal (day 7 to 28)	.84[b]	1.12[c]

	Control	Feedlot K	OBB K	Feedlot and OBB. K
Purchase to Feedlot Day 28 Gain, lb	2.6[b]	6.4[c]	8.0[b]	7.8[b]
% Mortality	7.3[b]	16.6[c]	7.9[b]	9.9[b]

[a]The least squares model included levamisole, sex status, potassium, feedlot diet, feedlot diet by potassium interaction.

[bcd]Means within a row with a different superscript differ significantly (P<.10).