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Abstract

Two trials were conducted to determine the effects of Rumensin in cold-stressed cattle. Steers fed diets with and without Rumensin were exposed to cold stress (0 C) and thermoneutrality (20 C). Rumen volatile fatty acids and rumen vault gases were sampled to monitor rumen fermentation. Although not statistically significant, Rumensin decreased rumen acetate to propionate ratios and increased CO_2/CH_4 ratios in both thermal environments. Such a methane decease should improve feed efficiency because less energy is wasted. Thus, Rumensin appears to support a more efficient rumen fermentation in cold stress as well as thermoneutrality.

Keywords

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Ruminal Effects of Rumensin During Cold Stress

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Summary

Two trials were conducted to determine the effects of Rumensin in cold-stressed cattle. Steers fed diets with and without Rumensin were exposed to cold stress (0 C) and thermoneutrality (20 C). Rumen volatile fatty acids and rumen vault gases were sampled to monitor rumen fermentation. Although not statistically significant, Rumensin decreased rumen acetate to propionate ratios and increased CO_2/CH_4 ratios in both thermal environments. Such a methane decrease should improve feed efficiency because less energy is wasted. Thus, Rumensin appears to support a more efficient rumen fermentation in cold stress as well as thermoneutrality.

Introduction

Rumensin improves ruminant feed efficiency and/or average daily gain. It shifts the rumen fermentation by decreasing the acetic-to-propionic acid ratio, thus cutting energy loss. Rumen function can change during thermal stress. We attempted to determine if the fermentation shift due to Rumensin still occurred during cold stress.

Procedure

In two 56-day trials involving 16 steers (average initial weight 310 kg), we compared the effect of Rumensin on rumen fermentation during cold stress (0 C) and in the thermoneutral zone (TNZ) (20C). The steers were housed in chambers capable of controlling both temperature (± 2 C) and humidity (± 5%). The steers were on concrete slats and had approximately 2.33 m^2 per head.

Two steers per trial were allotted by weight to each of the following treatments: cold-Rumensin, cold-control, TNZ-Rumensin, and TNZ-control. The diets(Table 13.1)were fed with or without 30 g Rumensin/ton of air-dry feed. The diet was changed because of bloat problems in Trial I. Cattle were individually fed, twice daily *ad libitum*, by using electronic headgates. Rumen fluid and vault gases were sampled at 14-day intervals beginning approximately 3 hours after feeding.

Results and Discussion

Rumensin-fed cattle characteristically have increased propionate and reduced levels of acetate and CH_4, and thus have improved feed efficiency. Our VFA concentrations are shown in Table 13.2. Although not statistically different, Rumensin decreased the acetic/propionic acid ratio and increased the CO_2/CH_4 ratio for thermoneutrality and cold stress. Although our numbers were limited, Rumensin appeared to have the same impact on VFA and rumen vault gases during cold stress as during thermoneutrality.

Table 13.1. Effect of Rumensin and Temperature on Rumen Volatile Fatty Acid Concentrations and Rumen Vault Gas Composition

Temperature	0 C		20 C	
	Rumensin	No Rumensin	Rumensin	No Rumensin
Volatile fatty acid, molar concentrations				
Acetic acid (molar %)	55.27	55.57	55.27	56.06
Propionic acid (molar %)	31.12	28.99	29.92	27.61
Isobutyric acid (molar %)	1.34	1.40	1.81	1.56
Butyric acid (molar %)	9.62	10.34	9.81	10.67
Isovaleric acid (molar %)	1.06	1.19	1.09	1.38
Valeric acid (molar %)	0.98	1.35	0.98	1.29
Total VFA (μmoles/ml)	77.48	82.06	78.37	79.65
Acetic/propionic acid ratio	1.89	2.20	1.93	2.17
Rumen vault gas, percent of H_2+CH_4+CO_2				
H_2	1.02	0.84	0.65	0.91
CH_4	27.87	28.54	28.95	29.93
CO_2	71.11	70.62	70.40	69.16
CO_2/CH_4	2.55	2.48	2.43	2.31

No significant differences ($P<.05$).

Table 13.2. Composition of Diet (dry matter basis) for Steers

Ingredient	%
Trial 1	
Alfalfa hay, S-C, mid-bloom, grnd	33.3
Corn, dent yellow, grain, cracked	62.0
Soybean meal, solv-extd	3.0
Fat, animal	0.7
Dicalcium phosphate	0.5
Salt	0.5
Trial 2	
Prairie hay, mid bloom	4.5
Alfalfa pellets, dehy, meal	12.0
Corn, dent yellow, grain, cracked	70.0
Soybean meal, solv-extd	10.1
Fat, animal	1.0
Dicalcium phosphate	1.2
Limestone	.6
T. M. Salt	.6