Kansas Agricultural Experiment Station Research Reports

Volume 0
Issue 1 *Cattleman's Day (1993-2014)*

Article 969

1987

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Abstract

Feeding the ionophores monensin and lasalocid In a high-concentrate diet resulted in gut tissues utilizing less glucose. Monensin caused less urea to be recycled. The new, experimental ionophore (ICI 139603) resulted in an increased net absorption of acetate. Thus, ionophores may differ in how they execute their effects on feed efficiency.

Keywords

Cattlemen's Day, 1987; Kansas Agricultural Experiment Station contribution; no. 87-309-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 514; Beef; Ionophore; High-concentration; Nutrient; Steers

Influence of Ionophore Addition to a High-Concentrate Diet on Net Nutrient Absorption in Steers

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Summary

Feeding the ionophores monensin and lasalocid in a high-concentrate diet resulted in gut tissues utilizing less glucose. Monensin caused less urea to be recycled. The new, experimental ionophore (ICI 139603) resulted in an increased net absorption of acetate. Thus, ionophores may differ in how they execute their effects on feed efficiency.

Introduction

The ionophore antibiotics, monensin (Rumensin®) or lasalocid (Bovatec®), are common ingredients in most feedlot diets. Their major benefit is an increase in feed efficiency. A new ionophore (ICI 139603)[2] has recently been tested. Preliminary reports indicate that it is effective at about one-third the concentration of monensin and lasalocid. Previously, we have studied how monensin influences nutrient absorption and utilization. The present experiment was conducted to compare the effects of monensin, lasalocid, and ICI 139603 on the rate at which nutrients are absorbed into the portal circulation.

Experimental Procedures

Three Holstein steers (554 lbs avg. wt.) surgically fitted with hepatic portal and mesenteric venous catheters and an elevated carotid artery were used to evaluate changes in absorbed nutrients when ionophores were added to an 85% concentrate diet. The diet included 15% chopped alfalfa plus cracked corn and supplement to supply 11.5% crude protein, .6% calcium, and .4% phosphorus. Treatments were control (no ionophore), monensin (230 mg/head/day), lasalocid (240 mg/head/day), or ICI 139603 (82 mg/head/day). Animals were fed in 12 portions daily (every 2 hours) using an automatic feeding system.

Arterial and portal blood samples were taken at 4 hourly intervals on 3 consecutive days during each sampling period. Blood flow was determined by continuous infusion of p-aminohippuric acid. Nutrient absorption was estimated by measuring the amount of various nutrients in blood supplying the gut, and measuring the same nutrients in blood draining from the gut.

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Results and Discussion

Ionophores did not affect feed intake or portal blood flow (Table 6.1). Ionophore feeding tended to decrease the utilization of glucose by gut tissues (negative values indicate utilization of a nutrient rather than absorption), consistent with previous experiments. No changes were seen in net absorption of L-lactate, ß-hydroxybutyrate, or ammonia-nitrogen. Monensin feeding decreased the recycling of urea-nitrogen, an effect that appears to be consistent. Net absorption of alpha-amino-nitrogen (total amino acids) tended to be less with ICI 139603, but overall net absorption was not significantly affected by ionophores. Acetate absorption was not affected by monensin or lasalocid, but was increased by ICI 139603. No changes were seen in any of the other volatile fatty acids from feeding ionophores. The changes in net glucose absorption are consistent with previous experiments with monensin, as is the decrease in urea recycling. Ionophores generally cause the production of less acetate and more propionate during ruminal fermentation. Since volatile fatty acid absorption is not consistent with the changes in ruminal fermentation, our results suggest that interrelations between gut metabolism and ruminal fermentation may influence absorbed nutrients.

Table 6.1. Influence of Ionophore Addition to a High-Concentrate Diet on Feed Intake, Portal Blood Flow, and Net Nutrient Absorption in Steers

Item	Control	Monensin	Lasalocid	ICI 139603
Intake (lbs. dry matter)	11.5	11.5	12.0	12.1
Portal blood flow, liter/h	705	684	603	688
		Net absorption, mmol/h		
Glucose	-24	-7	-4	-16
L-Lactate	74	68	60	80
B-hydroxybutyrate	44	51	62	60
Ammonia-nitrogen	144	168	162	202
Urea-nitrogen[a]	-87	-36	-72	-92
Alpha-amino-nitrogen	204	179	185	149
Acetate[b]	421	404	442	547
Propionate	441	393	332	411
Isobutyrate	7	8	5	9
Butyrate	47	40	55	40
2-methylbutyrate	9	15	7	15
3-methylbutyrate	2	5	4	2
Valerate	13	10	10	12

[a] Monensin vs Lasalocid, ICI 139603 (P<.10).
[b] ICI 139603 vs Monensin, Lasalocid (P<.10).