EFFECT OF MONENSIN AND LASALOCID ON WATER INTAKE, RUMEN VOLUME, LIQUID PASSAGE RATE AND RUMINAL DRY MATTER IN FEEDLOT HEIFERS

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Story in Brief

Nine Angus x Hereford heifers (1,200 lb) were used to compare the effect of two commercial ionophores on drinking water kinetics and on the amount of dry matter found in the rumen. Heifers were fed an 80% concentrate diet with or without monensin (300 mg/day) or lasalocid (220 mg/day) twice daily at 1.6% of body weight. Ionophores were hand-mixed with the diet and offered daily in the morning feeding. Water was offered free choice. Water intake was recorded daily. Water intake was similar (6.5 gallons/day) for the three diets. Ruminal evasion of drinking water was higher (5.9 gallons/day) for the monensin-fed animals as compared to control (5.2 gallons/day). Rumen volume and rate of fluid passage were not altered by either monensin or lasalocid when compared to the control diet. Dry matter in the rumen was 22% higher for heifers fed monensin. Increased residence time of dry matter in the rumen with monensin may partially explain why it often reduces feed intake.

(Key Words: Monensin, Lasalocid, Water Intake, Ruminal Contents.)

Introduction

Numerous studies with ionophores have stressed their value in diets for ruminants. Mode of action of these compounds still is debatable; however, one primary response to ionophores is an increase in feed efficiency achieved through regulating ruminal fermentation and site of digestion. Although very little research has focused on the effect of ionophores on water intake, liquid kinetics and rumen volume, Lemenager et al. (1978) and Owens et al. (1979) indicated that monensin reduced ruminal passage rates of liquid and solid fractions. These effects are highly correlated associated with feed intake and digestibility. By reducing turnover rate, extent of ruminal digestion should be

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enhanced. The objective of this trial was to study the effect of monensin and lasalocid on ruminal liquid passage rate, daily water intake, and ruminal volume of both solid and liquid in beef heifers limit-fed a high concentrate diet.

Materials and Methods

Nine Hereford x Angus heifers (1,200 lb) with large rumen cannulas housed in individual pens were used in three 3 x 3 Latin squares. Water was available at all times and daily water consumption was recorded during the 42-day study. Periods lasted 14 days. The first 11 days were for adaptation to the test diets (Table 1). Diets were fed twice daily (8:30 a.m. and 3:30 p.m.) at 1.6% of body weight (DM basis).

Previous to the experiment, each ionophore was mixed separately with 6.6 lb of ground corn. Each day, 20 g of this mixture was hand-mixed with the diet, and included in the morning's feed. On days 12 through 14 of each period, polyethylene glycol (PEG; M.W. 3350) was included in the drinking water (11.36 g/gallon of water offered) to study ruminal evasion. To estimate ruminal liquid dilution rate, 245 ml of cobalt ethylenediaminetetracetate (Co-EDTA; 880 mg Co) were dosed intraruminally 21 h prior to total ruminal evacuation. Ruminal digesta was

Table 1. Composition of concentrate (dry matter basis[a]).

Ingredient	Percent
Corn, dry rolled	63.10
Cottonseed hulls	14.10
Soybean meal, 44% CP as fed	10.05
Alfalfa, dehydrated pellets	6.00
Cane molasses	5.00
Salt	.50
Ground limestone	.50
Dicalcium phosphate	.50
Aurofac-10	.15
Urea, 42% N	.10
Ionophore[bc]	

[a] Control diet.
[b] Control + 300 mg Monensin/hd/day.
[c] Control + 220 mg Lasalocid/hd/day.

obtained by evacuation, weighed, separated by passing through a sieve with .25 x .25 inch pores, subsampled, and promptly returned to the rumen. Immediately after ruminal sampling, 2.2 lb of solid digesta and 1 quart of liquid were weighed separately and dried at 60°C for approximately 48 h. Concentrations of PEG and Co were estimated in ruminal liquid samples. Liquid dilution rate for Co was calculated as the slope of the natural logarithm of marker concentration vs time (Teeter, 1981). Total PEG intake (g/day), PEG outflow, ruminal volume, and the calculations for water evasion were similar to those described by Garza and Owens (1989). Data generated were analyzed for a triplicated 3 x 3 Latin square design using a general linear models procedure. Classes included squares, pen within squares, period within squares and treatments. When significant treatment effects were detected, means were separated using least significant difference.

Results and Discussion

Water intake and ruminal liquid volume estimated by direct evacuation were not affected by added ionophores (Table 2). Likewise, distribution of liquid associated with the solid fraction, expressed as bound liquid per lb DM, showed no appreciable difference between these three diets. Rumen liquid outflow remained constant (4.7 %/h) in all treatments. This is in contrast to data presented by Owens et al. (1979) in which liquid dilution rate decreased when monensin was added to a high concentrate diet. Although daily dry matter intake was held constant between treatments, total dry matter in the rumen and percent DM of ruminal contents were greater ($P<.02$) when heifers were fed monensin (Table 2). Similar trends were evident for lasalocid. This indicates that residence time for dry matter in the rumen was increased.

Whether increased ruminal dry matter fill in the monensin-fed animals, without altering ruminal liquid volume, was due to an increased water adsorption to the solids and altered chewing or by enhanced evasion of fluids to the lower tract is not clear. An increased rumen solids content would be expected to decrease rate of passage of ruminal solids as suggested by Owens and Goetsch (1986) and could explain reduced intake of cattle fed monensin (Potter and Wagner, 1987).

Effects of ionophores on ruminal water evasion are presented in Table 2. Evasion of drinking water, estimated by PEG inflow and outflow, was extremely high (90%) in the heifers fed monensin but similar for the control and heifers fed lasalocid. Evasion values generally agree with observations by Garza and Owens (1989).

Table 2. Effect of monensin and lasalocid on water intake, ruminal liquid distribution, volume and passage rate (n=9).

Item	Diets		
	Control	Lasalocid	Monensin
Intake:			
Feed, lb/d	23.4	23.4	23.4
Water, gal/d	6.4	6.5	6.5
Evasion,			
gal/d	5.2[e]	5.3[ef]	5.9[f]
% of intake	84.1[c]	81.2[c]	90.2[d]
Rumen contents:			
Liquid,			
Total, gal	12.5	13.0	13.0
Free, gal	10.5	10.6	10.4
Bound to feed, gal	2.0[a]	2.4[ab]	2.6[b]
pH	6.0	6.1	6.1
Solids, lb	15.7[a]	17.2[a]	19.7[b]
Liquid, lb	101.4	103.0	107.3
Dry matter, %	13.4[c]	14.3[cd]	15.4[d]
Ratio of bound liquid:DM	1.0	1.1	1.1
Rumen liquid outflow, %/h	4.7	4.7	4.6

[a,b] Means in the same row with different superscripts differ (P<.01).
[c,d] Means in the same row with different superscripts differ (P<.05).
[e,f] Means in the same row with different superscripts differ (P<.10).

Results suggest that monensin and lasalocid may affect ruminal fill but do not alter water intake, distribution of the liquid in the rumen, or rumen liquid volume. The increased evasion of drinking water from the rumen of animals fed monensin deserves further study. Delivering specific nutrients to the hindgut via drinking water may enhance animal performance.

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