Monensin for Wheat Pasture Stockers: Ruminal Fermentation, Forage Intake and Performance

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Story in Brief

Steers grazed on wheat pasture and fed 200 mg. of monensin per day had higher ruminal pH values, lower total ruminal VFA concentrations, and lower ruminal ammonia concentrations. The acetic:propionic acid ratio of steers fed monensin was decreased by about 40 percent. Calculated amounts of ruminal methane produced were decreased about 15 percent in steers fed monensin. Forage intakes of steers fed monensin and grazed on wheat pasture were slightly (12 percent) greater ($P>.05$) than that of steers fed no monensin.

Introduction

Rumensin[1] (monensin sodium) is a feed additive marketed to improve feed efficiency of feedlot cattle. Feeding rumensin to *feedlot* cattle, at a level of 30 grams per ton of feed, does not alter weight gains. Although monensin is not presently cleared by the FDA to be fed to *stocker* cattle grazed on forages, rumensin has been reported to increase weight gain by 10 to 15 percent or more.

The objective of this study was to determine the effect of monensin on (1) ruminal fermentation, (2) forage intake, and (3) weight gain of stocker cattle grazed on wheat pasture.

Materials and Methods

Ruminal Fermentation Studies

During April 7 to 22, 1976, four ruminally cannulated Hereford steer calves were fed two supplements (control and monensin) in a switchback design. During each period (7 day preliminary, 1 day sampling) two steers were individually fed 200 mg. of monensin daily mixed in 0.5 pounds of the ration[2], and two steers were fed 0.5 pounds daily of the same ration without any added monensin. On sampling days, rumen fluid samples were taken at

[1]Trade name of Elanco, Division of Eli Lilly and Co., Indianapolis, Indiana.

[2]Ration consisted of the following (as-fed basis): Ground corn, 62.75 percent; cottonseed hulls, 14 percent; soybean meal, 10 percent; dehydrated alfalfa pellets, 6 percent; molasses, 5 percent; and minerals, 2.25 percent.

four and 24 hours after supplement feeding for pH, volatile fatty acid (VFA), and ammonia analyses. All steers grazed wheat pasture between feedings and samplings.

Forage Intake Trials

Eight crossbred calves grazing a single wheat pasture were randomly assigned to two treatments. All steers were dosed with four grams of chromic oxide in gelatin capsules twice daily (8:00 a.m. and 4:00 p.m.) for a ten-day period. During this period, four of the eight steers received 200 mg. of monensin added to the chromic oxide capsules given at the morning dosage. On days eight, nine, and ten, fecal samples were collected at each of the dosage times. Chromic oxide (an indigestible marker) and *in vitro* dry matter digestibilities of handclipped forage samples were used to calculate fecal output and forage intake, respectively.

Performance Trials

Cooperative trials are being conducted in which gains of wheat pasture stockers fed 200 mg. of monensin/head/day in a pelleted feed or monensin-containing blocks free-choice will be compared with weight gains of stockers fed no monensin. These cattle have not been weighed off test and no data are available at this time.

Results and Discussion

Ruminal Fermentation Studies

The pH of rumen fluid samples was increased, and the total VFA (Table 1) concentrations were decreased in steers fed monensin on wheat pasture. The magnitude of these differences due to monensin was less at 24 hours after feeding monensin than at four hours after feeding monensin. The changes in rumen fluid pH and total VFA concentrations due to monensin suggest that either the steers fed monensin had consumed less wheat forage, or that ruminal digestibility of the wheat forage consumed by the steers fed monensin was decreased. Recent studies by Owens[3] have shown a 10.2 percent reduction in ruminal dry matter digestibility of steers fed an 85 percent concentrate ration containing 17 percent crude protein.

The Molar percentages of ruminal acetic and propionic acids were decreased and increased, respectively, in steers fed monensin, and the magnitude of these changes was similar at four and 24 hours after feeding. The rumen acetic:propionic acid ratio of steers fed monensin was decreased by 40.3 and 40.0 percent at four and 24 hours after feeding monensin.

[3]Unpublished results.

Table 1. Effect of monensin on ruminal fermentation of wheat pasture stockers

	Control	Monensin[1]
4 Hr Post-feeding		
pH	6.22	6.75*
NH_3, mg/100 ml	19.38	16.81
Total VFAs, umoles/ml	219.8	166.0*
VFA molar percentages		
Acetic	65.86	59.14*
Propionic	16.40	25.03*
Butyric	13.28	10.78
Valeric	0.96	0.96
Isovaleric	1.98	2.88*
Acetic:propionic ratio	4.04	2.41*
24 Hr Post-feeding		
pH	6.15	6.48
NH_3, mg/100 ml	20.31	14.84
Total VFAs, umoles/ml	214.6	191.5
VFA molar percentages		
Acetic	67.30	60.32*
Propionic	16.32	24.80
Butyric	12.29	9.80
Valeric	0.90	0.94
Isovaleric	1.89	2.74
Acetic:propionic ratio	4.17	2.50

[1]200 mg./head/day
*Significantly different from control ($P<.05$).

The relative amount of gases (CO_2 and CH_4) produced in the rumen was decreased as the acetic:propionic acid ratio decreased. Consequently feeding of monensin to wheat pasture stockers might decrease the incidence of bloat. Gas production calculated (Table 2) from the relative production of acetic, propionic and butyric acids indicate that the amount of total gas (CO_2 plus methane) produced per unit of feed digested in the rumen was reduced by 8 percent by monensin feeding. Methane production was decreased by approximately 15 percent in steers fed monensin. The reduction in methane may be more important than the reduction in carbon dioxide plus methane, from the standpoint of wheat pasture bloat of stockers, in that a greater percentage of the methane than of carbon dioxide would have to be eructated. Further, if monensin reduces the extent of ruminal digestion of wheat forage dry matter and forage intake, reduction in gas would be even greater.

The ruminal ammonia concentrations of steers fed monensin was decreased at both sampling times. The magnitude of the decrease was about two-fold greater at 24 hours (26.9 percent) after feeding monensin than at four hours (13.3 percent) post-feeding. The decreased ruminal ammonia concentrations of steers fed monensin suggest that less forage protein was degraded

Table 2. Effect of monensin on calculated quantities of carbon dioxide and methane produced by ruminal fermentation

Hr. post-feeding of monensin:	4		24	
	Control	Monensin	Control	Monensin
CO_2 + CH_4, ml/g				
glucose digested	164.7	151.4	164.7	151.4
% reduction over control	- - -	8.07	- - -	8.07
CH_4, ml/g				
glucose digested	63.2	53.8	64.0	54.6
% reduction over control	- - -	14.87	- - -	14.68

Table 3. Effect of monensin on forage intake of wheat pasture stockers

	Control	Monensin
Steer body wt., lb.	492 ± 5.5	496 ± 4.6
Wheat forage intake		
lb. dry matter/steer/day	16.0 ± 1.0	18.1 ± 1.4
lb. dry matter/100 lb. body wt.	3.26 ± 0.17	3.64 ± 0.25

in the rumen. This would likely be beneficial to wheat pasture stockers in that ruminal ammonia concentrations often exceed those believed to be required by bacteria for maximum ruminal dry matter digestion.

Forage Intake Trials

Steers grazing wheat pasture and fed 200 mg. of monensin per day consumed 13.1 percent more wheat forage dry matter/head/day and 11.7 percent more forage dry matter per 100 pounds body weight per day than steers fed monensin ($P>.05$). Additional trials are presently underway to further evaluate the effect of monensin on forage intake of wheat pasture stockers.