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Effects of Rumensin Level During an Acidosis Challenge

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Feeding Rumensin reduced feed intake. Feed intake reduction was greatest when 45 grams of Rumensin/ton was fed following imposed intake variation.

Summary

Eighteen ruminally cannulated steers were used to determine effects of Rumensin level on incidence and severity of acidosis when an acidosis challenge was imposed. Steers received a high-concentrate finishing diet containing either 0, 30, or 45 grams/ton Rumensin. An acidosis challenge was created by feeding only 50% of diet intake one day followed by 175% of intake the next day, four hours post normal feeding time. Feeding Rumensin decreased feed intake during the prechallenge, challenge and acidosis recovery phase. Compared to 30 grams/ton, feed intake was decreased by increasing Rumensin to 45 grams/ton during the five days following the acidosis challenge. Other feeding behavior and ruminal pH measurements were similar among treatments in all phases of this experiment. The imposed feed intake variation in this experiment did not create a significant acidosis challenge.

Introduction

Clean bunk management programs can increase risk for subacute acidosis (*1997 Nebraska Beef Report*, pp. 41), and may also increase the risk of acidosis challenges. Since cattle on clean bunk programs are without feed some period of time prior to feeding, delays in feed consumption at normal times may result in subsequent over-consumption of the diet. Such an incident may occur when storm conditions markedly reduce intake, equipment malfunctions, or management mistakes occur. Blackford et al. (*2000 Nebraska Beef Report*, pp. 55) showed increased Rumensin concentration (45 grams/ton) in a high-moisture corn finishing diet reduced time and severity of pH below 5.6 compared to 30 grams/ton following a delayed feeding (acidosis challenge). Rumensin levels greater than 30 grams/ton may be beneficial in controlling acidosis in emergency or storm situations.

The objective of this study was to evaluate the effects of increasing dietary Rumensin from 30 to 45 grams/ton during and following an imposed acidosis challenge on ruminal pH, blood parameters, and feeding behavior.

Procedure

Eighteen ruminally fistulated yearling steers (BW = 1000 to 1050 lb) were used in a completely randomized design across two periods (nine steers per period). Steers were randomly allotted to one of three dietary treatments (three steers per treatment in each period) based on Rumensin supplementation strategy: 1) 0 grams/ton for the entire period (CON), 2) 30 grams/ton for the entire period (NOR), 3) 30 grams/ton prior to an acidosis challenge; changed to 45 grams/ton during and five days following the challenge; switched back to 30 grams/ton for seven additional days (EXP).

Steers were adapted to a final finishing ration with four transition diets (roughage level 45, 35, 25, 15) over a 20-day period. The final diet contained 63.4% high moisture corn, 21.1% dry-rolled corn, 7.5% ground alfalfa hay, 3% molasses, and 5% supplement (DM basis). Dry matter concentration of the diet was 76.7 $\pm$ 0.4% across treatments in both periods. Diets were formulated to have a minimum of 7% degradable intake protein (approximately 12% CP), 0.7% Ca, 0.3% P, and 0.6% K. Rumensin was included in the diet at 15 grams/ton (treatments NOR and EXP) during the first two transition diets, and Rumensin was included at 30 grams/ton (treatments NOR and EXP) during the final two transition diets and the final finishing diet. Cattle in the CON treatment never received Rumensin. Tylan was included in all diets at nine grams/ton (90% DM basis).

Steers were managed with a clean bunk management program (access to feed from 8 a.m. to 11 p.m. daily) through the transition period and while receiving the final finishing diet. Steers were individually fed diets and feed intake was monitored continuously with feed bunks suspended from load cells. The amount of feed in each bunk was recorded automatically at one-minute intervals throughout each day and stored on the computer. The program recorded a feed weight every six seconds and averaged those weights for every minute. Feed calls were made every morning at 7:30 a.m. based on the amount of feed in the bunk at 9 p.m., 11 p.m., 1 a.m., and 7:30 a.m. Feed was called to result in the next day's diet to be consumed by approximately 11 p.m.

Steers were adapted to the final finishing diet for approximately 40 days prior to initiation of the experiment. On day 1 of the experiment, a submersible pH electrode was placed in the rumen of

each steer through the cannula (*2000 Nebraska Report*, pp. 55). Rumen pH readings were recorded as previously outlined for feed intake data. Rumen pH was automatically recorded every six seconds and averaged for each minute throughout the day. On days 1 to 8, prechallenge data were collected (intake and ruminal pH). Because the steers were unhooked from the computer system for a period of time on day 7 of each period, pH and intake data collected on that day were not used in the analyses. On day 9, steers were fed only 50% of the day 8 intake in order to make steers eat more aggressively the following day. On day 10 (challenge day), the steers were fed 175% of day 8 intake four hours late (12 p.m.) to impose an acidosis challenge. On day 10, the dietary Rumensin level for EXP was increased from 30 to 45 grams/ton. Days 11 to 15 (recovery phase—45 gram) was a recovery period in which the EXP treatment remained on the 45 grams/ton Rumensin level. To determine if there were negative effects of switching back from 45 to 30 grams/ton Rumensin, feed intake and pH data were recorded on days 16 to 22 (recovery phase—30 gram) while the EXP treatment received the 30 grams/ton Rumensin level.

Feed intake measurements included DM intake, rate of intake, number of meals per day, average meal size, total time spent eating, and average meal length. Ruminal pH measurements included average pH, area of pH below 5.6, (time below x magnitude below), maximum pH, minimum pH, and pH variance.

Intake and ruminal pH data were analyzed using the mixed procedure of SAS. Results were divided into four phases: prechallenge (days 1 to 8, excluding day 7), challenge day (day 10), recovery—45 gram (days 11 to 15), and recovery—30 gram (days 16 to 22). Prechallenge data were analyzed separately since data were collected before Rumensin treatments were imposed. Steer was the experimental unit. Observations were recorded for period x phase x steer for intake and pH data. Contrasts were used to compare CON versus NOR and EXP, and NOR versus EXP. Treatment means were separated within each phase using the LS MEANS procedure with protected F-test ($P \leq 0.10$).

Table 1. Effects of increasing Rumensin level on feed intake and ruminal pH of steers fed a corn-based finishing diet during the prechallenge period.

	Rumensin Level[a]			
Item	CON	NOR	EXP	SEM
Feed Intake[b], lb/day (DM)	24.9	20.6	19.4	.8
Rate, %/hour	26	30	28	1
Meals				
Number/day	7.0	6.1	7.8	.7
Average size, lb DM	3.9	3.9	2.9	.5
Time spent eating				
Total, min/day	492	447	497	35
Average, min/meal	74	82	67	8
Ruminal pH				
Average	5.57	5.57	5.65	.13
Variance	.124	.188	.181	.04
Area < 5.6	356	329	259	91

[a]CON= 0 grams/ton Rumensin, NOR= 30 grams/ton Rumensin fed continuously, EXP= 30 grams/ton Rumensin prechallenge, 45 grams/ton Rumensin fed challenge day and for 5 days following, 30 grams/ton Rumensin fed for the remainder of the period.
[b]Control versus the average of 30 grams/ton and 45 grams/ton ($P < .05$).

Table 2. Effects of increasing Rumensin level on feed intake and ruminal pH of steers fed a corn-based finishing diet during the challenge period.

	Rumensin Level[a]			
Item	CON	NOR	EXP	SEM
Feed Intake				
lb/day, DM[b]	34.3	30.5	29.4	1.1
Rate, %/hour	42	44	68	9
Meals				
Number/day	3.2	2.7	2.2	.8
Average size, lb DM	15.9	13.6	18.3	2.9
Time spent eating				
Total, min/day	221	194	182	51
Average, min/meal	90	81	103	14
Ruminal pH				
Average	5.68	5.71	5.77	.10
Maximum	7.02	7.11	7.12	.09
Variance	.530	.618	.640	.06
Area < 5.6	365	389	370	104

[a]CON= 0 grams/ton Rumensin, NOR= 30 grams/ton Rumensin fed continuously, EXP= 30 grams/ton Rumensin prechallenge, 45 grams/ton Rumensin fed challenge day and for 5 days following, 30 grams/ton Rumensin fed for the remainder of the period.
[b]Control versus the average of 30 grams/ton and 45 grams/ton ($P < .05$).

Results

Prechallenge Phase

Results from the prechallenge phase are summarized in Table 1. Steers fed Rumensin consumed 20% less feed (20.0 vs 24.9 lb of DM) compared with steers fed the control diet containing no Rumensin ($P < 0.05$). Intake rate, total number of meals, average meal size, time spent eating, and average meal length were similar among treatments. Ruminal pH, pH variance and area below pH 5.6 were similar among treatments during the prechallenge phase.

Challenge Day Phase

Results from the challenge day are presented in Table 2. Averaged across treatments, steers consumed 146% more feed (31 versus 21 lb DM) on the challenge day compared with their average feed intake during the prechallenge phase. During the chal-

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lenge day, steers fed Rumensin consumed 15% less feed compared with their counterparts not being fed Rumensin ($P < 0.05$). Intake rate, total number of meals, average meal size, time spent eating, and average meal length were similar among treatments. Ruminal pH, pH variance and area below ruminal pH 5.6 were similar among treatments.

Acidosis Recovery Phase

Results from the recovery—45 gram phase are presented in Table 3. Steers fed 45 grams/ton Rumensin consumed 18% less feed than those fed the control diet during the five days following the challenge day ($P < 0.05$). Feed intake of steers fed NOR was intermediate to that of the steers fed CON and EXP treatments. Intake rate, number of meals, average meal size, time spent eating, and average meal length were similar among treatments. Ruminal pH, pH variance and area below 5.6 were similar among treatments. Results from the recovery—30 gram phase showed no deleterious effects of switching the EXP treatment back to a 30 grams/ton Rumensin after five days on the 45 gram/ton level.

The results of this experiment are in contrast to previous experiments conducted with similar treatments. Blackford (*2000 Nebraska Beef Report,* pp. 55) reported feeding Rumensin decreased ruminal pH variance and area below 5.6 and 5.0 during the challenge day. Furthermore, Blackford reported increasing the dietary concentration of Rumensin from 30 to 45 grams/ton increased average ruminal pH during the five-day period following an acidosis challenge. In the present experiment, increased feed consumption on the challenge day did not appear to create a significant acidosis challenge. Figure 1 summarizes the change in ruminal pH area below 5.6 during the prechallenge, challenge, and acidosis recovery phase. The average ruminal pH during the challenge day was 5.72, which was greater than the average pH during the prechallenge phase.

Reasons why an acidosis challenge did not occur in the present experiment are difficult to explain. Over the course of conducting several of these experiments, we have observed large animal-to-animal variation in how cattle respond to an imposed acidosis challenge despite using similar animals in experiments. Some animals have demonstrated the ability to handle large changes in feed intake without creating an acidosis challenge. Because the steers in this experiment were exposed to only one of the three treatments, animal-to-animal variation would influence our results. Additionally, ruminal pH of steers reached 7.0 or higher (Table 2) on the day of the challenge, which was a result of being fed only 50% of their normal feed intake the day prior to the challenge and four hours late on the challenge day. The high ruminal pH when the animals were exposed to feed on the challenge day may have provided a significant buffering effect to the large meals consumed. In contrast to previous studies (*2000 Nebraska Beef Report,* pp. 55)

Table 3. Effects of increasing Rumensin level on feed intake and ruminal pH of steers fed a corn-based finishing diet during the recovery period.

	Rumensin Level[a]			
Item	CON	NOR	EXP	SEM
Feed Intake				
lb/day, DM[b]	21.6	19.1	18.2	1.1
Rate, %/hour	18	22	26	9
Meals				
Number/day	7.1	7.0	6.5	.8
Average size, lb DM	7.2	4.3	5.0	2.8
Time spent eating				
Total, min/day	418	499	443	51
Average, min/meal	54	68	57	13.7
Ruminal pH				
Average	5.41	5.50	5.45	.10
Variance	.108	.121	.094	.063
Area < 5.6	433	386	399	104

[a]CON= 0 grams/ton Rumensin, NOR= 30 grams/ton Rumensin fed continuously, EXP= 30 grams/ton Rumensin prechallenge, 45 grams/ton Rumensin fed challenge day and for 5 days following, 30 grams/ton Rumensin fed for the remainder of the period.
[b]Control versus the average of 30 grams/ton and 45 grams/ton (P < .05).

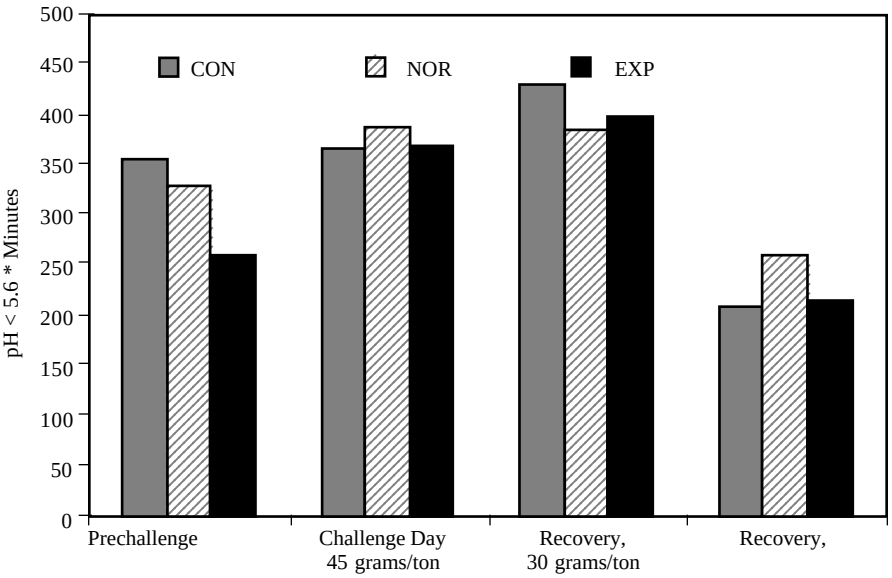

Figure 1. Ruminal pH area below 5.6 for prechallenge, challenge, and recovery phases.

where the acidosis challenge was imposed after a 14 day adaptation to respective diets, cattle in the present study were on the finishing diets 40 days prior to imposed acidosis challenge. It is not clear what effects time on feed (Rumensin) has on the incidence and severity of acidosis when a challenge is imposed.

Rumensin, fed at either 30 or 45 grams/ton, decreased feed intake during the prechallenge, challenge, and acidosis recovery periods. When fed at 45 grams/ton for five days following the imposed intake variation, the decrease in feed intake was greater than that observed with feeding 30 grams/ton. The reduction in feed intake with increased dietary Rumensin would be a positive aspect of controlling acidosis when feedlot cattle exhibit aggressive consumption patterns following an event that may disrupt normal feeding behavior.

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