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Effects of Rumensin Level and Bunk Management Strategy on Finishing Steers

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Rumensin increased meal frequency and decreased meal size without affecting intake. Clean bunk management decreased meal frequency, increased consumption rate, meal size, and ruminal pH change and pH variance.

Summary

Eight ruminally fistulated, yearling steers (two concurrent 4x4 Latin squares) were used to evaluate dietary Rumensin level (0, 30, 30/40 or 40 g/t), and bunk management strategy (ad libitum or clean bunk: 24- or 14-hour feed access). Rumensin decreased meal size and increased meal frequency without compromising intake. Clean bunk management increased consumption rate, meal size and ruminal pH change and pH variance. Steers with limited feed exposure are at greater risk for subacute acidosis; Rumensin effects consumption favorably for controlling acidosis, especially for cattle with limited feed exposure.

Introduction

Reductions in gain and efficiency, as well as digestive disorders, greatly influence feedlot economics. Some of these reductions are so subtle they may go undetected until an adverse feeding condition poses itself. Changes in intake can cause subacute acidosis; likewise subacute acidosis can cause changes in feed intake. Clean bunk management strategies can reduce input costs, feed wastage and human error; however, an increase in management intensity may be required to prevent over-consumption resulting in acidosis. University of Nebraska research suggests Rumensin reduces the area of ruminal pH below 5.6, ruminal pH change, and variance, without affecting feed intake when cattle are fed ad-libitum (1997 Nebraska Beef Report, pp. 49). This may result in reduced incidence of acidosis in high-grain diets. Effects of Rumensin and different bunk management strategies on cattle fed high-grain diets have not been documented. The objective of this trial was to determine if an interaction exists between feeding management strategy and Rumensin supplementation strategies in feedlot steers.

Procedure

Eight ruminally fistulated steers were used in two concurrent 4 x 4 Latin squares to determine if an interaction exists between Rumensin level and bunk management strategy. Steers were assigned to one of two bunk management strategies and one of four Rumensin levels. Over a 21-day period, steers were stepped up with four diets decreasing in roughage level (45, 35, 25 and 15 percent). Steers were allowed 10 days on the final diet before the start of the trial. The final diet consisted of 42.3 percent dry-rolled corn, 42.3 percent high moisture corn, 7.5 percent chopped alfalfa hay, 3 percent molasses and 5 percent supplement, on a dry matter basis.

Levels of Rumensin fed were 0 g/t (CON), 30 g/t (30), 30 changing to 40 g/t the day of the challenge (30/40) and 40 g/t (40). Bunk management strategies employed were ad-libitum (24-hour feed access) and clean bunk management (approximately 14-hour feed access). Steers were fed at 8 a.m. each morning. Steers on the ad-libitum bunk management strategy (ADLIB) were fed to have .25 to .5 pounds of feed left in the bunk at 7 a.m., while steers on the clean bunk management strategy (CLEAN) were fed to have consumed all their feed between 9 p.m. and 10 p.m. The following day's intake was adjusted accordingly. Steers remained on their original assigned bunk management strategy during the step-up and the final diets.

Individual feed bunks were suspended from load cells. Submersible pH probes, running through the ruminal cannula, were suspended in the rumen. Both load cells and pH probes were directly linked to a computer allowing intake and ruminal pH to be collected at two-minute intervals. Amount of feed offered to the CLEAN steers was determined from feed weights at 8, 9, and 10 p.m. retrieved from the computer.

Each of the four periods were 35 days in length, during which feed intake was monitored each day. Day 1-14 was a diet adaptation period with steers housed in free stalls. On day 15, steers were moved to tie stalls and tethered. Submersible pH probes were placed in the rumen through the ruminal cannula. Ruminal pH was monitored from day 15-35. On day 31, steers were challenged by feeding 125 percent of the previous day's intake, four hours late (12 p.m.). During days 32-35, an intake recovery phase was allowed. On day 32, steers were fed the same amount of feed as day 30. During days 33-35, steers were fed to appetite as previously described. On the fourth day of every period, steers moved from the 40 g/t diet to the 0 g/t diet were reinoculated with rumen fluid

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Table 1. Effects of Rumensin level and bunk management strategy on intake behavior and ruminal pH on steers fed a high-grain diet during the pre-challenge phase.

	Rumensin level[a]						Bunk management[b]			
Item	CON	30	30/40	40	SEM	P-Value	CLEAN	ADLIB	SEM	P-Value
Intake										
DM/day, lb	27.9	27.3	28.1	26.2	1.6	.47	27.1	27.7	2.1	.85
Rate, %/hr	26.7	23.3	25.4	26.3	2.1	.69	32.3	18.5	1.5	<.01
Meals										
Number/day	5.9	6.8	6.5	6.3	.5	.50	4.5	8.2	.57	<.01
Avg[c], lb	7.4	5.0	4.9	5.0	1.1	.13	7.6	3.5	1.2	.05
Eating time										
Total, min/day	502	519	505	530	28.5	.90	475	553	20.1	.04
Avg. meal[c], min	124	91	87	99	14.3	.10	130	70	15.7	.03
Ruminal pH										
Average	5.69	5.64	5.81	5.73	.11	.37	5.75	5.69	.14	.77
Change	1.47	1.39	1.36	1.34	.09	.61	1.46	1.31	.08	.23
Variance[c]	.161	.120	.125	.127	.02	.15	.186	.080	.018	<.01
Area < 5.6[d]	104	115	106	98	33	.87	95	116	43.7	.75

[a]CON = 0 g/t Rumensin, 30 = 30 g/t Rumensin, 30/40 = 30 changing to 40 g/t Rumensin the day of the challenge, 40 = 40 g/t Rumensin.
[b]CLEAN = Clean bunk management strategy, ADLIB = Ad-libitum bunk management strategy.
[c]Rumensin versus Control (P < .05).
[d]Area = magnitude of ruminal pH below 5.6 by min.

from a donor steer being fed a similar diet without Rumensin.

Statistical analysis of the data was conducted by the use of the Mixed model procedure in SAS. Results were divided into three phases: pre-challenge (days 24-30, seven days previous to the challenge), challenge (day 31, the day of the challenge), and post-challenge (days 32-35, four days post challenge). Contrasts used in the pre-challenge phase were CON compared with the average of diets containing Rumensin and 30 compared with 40 g/t Rumensin. Contrasts used in the challenge phase were CON compared with the average of diets containing Rumensin, 30 compared with 30/40 g/t Rumensin and 40 compared with 30/40 g/t Rumensin. Contrasts used in the post-challenge phase were CON compared with the average of diets containing Rumensin, 30 compared with 40 g/t Rumensin and 30 compared with 30/40 g/ton Rumensin.

Results

Dry matter intakes (lb/day) were similar among Rumensin levels (CON = 21.4, 30 = 21.7, 30/40 = 21 and 40 = 21.5) and bunk management strategies

Table 2. Effects of Rumensin level and bunk management strategy on intake behavior and ruminal pH in steers fed a high-grain diet during the challenge phase.

	Rumensin level[a]						Bunk management[b]			
Item	CON	30	30/40	40	SEM	P-Value	CLEAN	ADLIB	SEM	P-Value
Intake										
DM/day[c,d],lb	33.4	31.5	33.9	31.3	2.2	.20	33.9	31.1	2.9	.52
Rate, %/hr	22.6	22.4	20.2	24.6	2.4	.66	27.1	17.9	1.7	<.01
Meals										
Number/day	7.13	6.88	7.00	6.33	.66	.81	6.19	7.48	.62	.20
Avg, lb	5.25	5.31	5.20	5.19	.89	.99	6.08	4.39	1.05	.30
Eating time										
Total, min/day	502	510	537	523	28.6	.80	521	515	20.2	.86
Avg. meal, min	76	82	81	88	10.4	.81	90	73	10.7	.29
Ruminal pH										
Average	5.69	5.62	5.68	5.70	.13	.93	5.67	5.67	.15	.98
Change[e]	1.53	1.51	1.47	1.64	.07	.24	1.65	1.42	.08	.10
Variance	.210	.181	.181	.220	.025	.48	.269	.127	.025	<.01
Area < 5.6[f]	131	139	151	119	42.5	.89	135	134	48.9	.99

[a]CON = 0 g/t Rumensin, 30 = 30 g/t Rumensin, 30/40 = 30 changing to 40 g/t Rumensin the day of the challenge, 40 = 40 g/t Rumensin.
[b]CLEAN = Clean bunk management strategy, ADLIB = Ad-libitum bunk management strategy.
[c]30 versus 30/40 g/t Rumensin (P = .10).
[d]40 versus 30/40 g/t Rumensin (P = .09).
[e]40 versus 30/40 g/t Rumensin (P = .05).
[f]Area = magnitude of ruminal pH below 5.6 by min.

Table 3. **Effects of Rumensin level and bunk management strategy on intake behavior and ruminal pH in steers fed a high-grain diet during the post-challenge phase.**

	Rumensin level[a]						Bunk management[b]			
Item	CON	30	30/40	40	SEM	P-Value	CLEAN	ADLIB	SEM	P-Value
Intake										
DM/day, lb	27.7	26.1	27.4	26.3	1.6	.55	26.4	27.3	1.9	.75
Rate[c], %/hr	27.0	24.6	21.0	24.3	1.9	.22	30.2	18.2	1.9	<.01
Meals										
Number/day[d]	6.2	7.3	7.4	6.5	.50	.09	5.5	8.3	.44	<.01
Eating time										
Total, min/day	516	545	538	516	32.0	.84	492	565	28.9	.13
Avg. meal[e], min	114	78	79	89	14.6	.31	107	73	10.3	.07
Ruminal pH										
Average	5.80	5.61	5.75	5.72	.15	.50	5.77	5.67	.18	.71
Area < 5.6[f]	91	130	117	106	46.8	.51	83	140	62.3	.54

[a]CON = 0 g/t Rumensin, 30 = 30 g/t Rumensin, 30/40 = 30 changing to 40 g/t Rumensin the day of the challenge, 40 = 40 g/t Rumensin.
[b]CLEAN = Clean bunk management strategy, ADLIB = Ad-libitum bunk management strategy.
[c]Rumensin versus Control (P = .12).
[d]Rumensin versus Control (P = .06).
[e]Rumensin versus Control (P= .08)
[f]Area = magnitude of ruminal pH below 5.6 by min.

(CLEAN = 21.1, ADLIB = 22.2) for the combined averages of the four, 35-day periods.

Pre-challenge

Results of the pre-challenge phase are presented in Table 1. No interactions were observed during the pre-challenge phase; therefore, main effects of Rumensin level and bunk management strategy are reported. During the pre-challenge phase, Rumensin reduced (P < .05) average meal size and average meal length compared with the CON. Rumensin tended to reduce (P = .11) the largest meal consumed per day compared with CON (10.0 versus 11.9 pounds). Feed intake, intake rate, number of meals and total time spent eating were unaffected by Rumensin level. Rumensin reduced (P < .05) the variance in ruminal pH; however, average ruminal pH, ruminal pH change and the area below pH 5.6 were unaffected by Rumensin level.

Intake was similar between bunk management strategies; however, steers on the CLEAN had a faster (P < .01) rate of intake and consumed fewer (P < .01) meals than steers on the ADLIB (Table 1). Average meal size was more than twice as large (P = .05) for steers on the CLEAN compared with the ADLIB. Average time spent eating a meal was longer (P = .03) for steers on the CLEAN; however, steers on the ADLIB spent a greater (P = .04) portion of their day eating. Ruminal pH variance was greater (P < .01) for the CLEAN compared with ADLIB. Average ruminal pH, ruminal pH change and area below a pH 5.6 were unaffected by bunk management strategy.

Challenge

Results from the day of the challenge are presented in Table 2. No interactions were observed during the challenge phase; therefore, main effects of Rumensin level and bunk management strategy are reported. Steers fed 30/40 had a higher (P ≤ .10) feed intake than steers fed either 30 or 40 g/t Rumensin. Intake rate, number of meals, average meal size and total and average time spent eating were similar among Rumensin levels. Ruminal pH change was reduced (P = .05) by steers fed 30/40 compared with those fed 40 g/t Rumensin. Average ruminal pH, pH variance and the area below a pH of 5.6 were unaffected by Rumensin level.

Steers on the CLEAN had a faster (P < .01) rate of intake than steers on the ADLIB. Number of meals, meal size and time spent eating were unaffected by bunk management strategy. Ruminal pH variance (P < .01) and change (P = .10) were greater for steers on the CLEAN compared with ADLIB. Average ruminal pH and area below pH 5.6 were unaffected by bunk management strategy.

Post-challenge

Results of the post-challenge phase are reported in Table 3. Steers fed CON tended to have a faster (P = .12) rate of intake than steers fed Rumensin; however, intake was unaffected by Rumensin level. Steers fed Rumensin had a greater (P = .06) number of meals than steers fed CON. An interaction (P = .10) was observed for Rumensin level and bunk management strategy for average meal size. Steers on the CLEAN fed Rumensin consumed smaller (P < .05) meals compared with steers fed CON (Table 4). For steers in the ADLIB, average meal size was similar across Rumensin levels. While total eating time was similar across Rumensin levels, steers fed the CON spent 30 minutes longer (P = .08) eating per meal than steers fed Rumensin (Table 3). Average ruminal pH and the area below pH 5.6 were similar across Rumensin levels. Interactions were observed between Rumensin level and bunk management strategy for ruminal pH change (P= .08) and pH variance (P = .04). Steers on the CLEAN fed CON or 40 g/t Rumensin experienced a larger ruminal pH change (P < .10) and greater ruminal pH vari-

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Table 4. **Interactions of Rumensin level and bunk management strategy on intake behavior and ruminal pH in steers fed a high-grain diet during the post-challenge phase.**

	Rumensin level[a]				
Item	CON	30	30/40	40	SEM
Average meal size[b], lb DM					
CLEAN[c]	8.2[d]	4.4[e]	4.5[e]	5.4[e]	.78
ADLIB[c]	3.5	3.3	3.5	4.0	.78
Ruminal pH change[f]					
CLEAN[c]	1.53[g]	1.21[h]	1.24[h]	1.51[g]	.13
ADLIB[c]	1.08	1.27	1.22	1.28	.13
Ruminal pH variance[i]					
CLEAN[c]	.213[d]	.119[e]	.116[e]	.194[d]	.021
ADLIB[c]	.055	.080	.066	.094	.021

[a]CON = 0 g/t Rumensin, 30 = 30 g/t Rumensin, 30/40 = 30 changing to 40 g/t Rumensin the day of the challenge, 40 = 40 g/t Rumensin.
[b]Rumensin x bunk management interaction (P = .10).
[c]CLEAN = Clean bunk management strategy, ADLIB = Ad-libitum bunk management strategy.
[d,e]Means in a row not bearing a common superscript differ (P < .05).
[f]Rumensin x bunk management interaction (P = .08).
[g,h]Means in a row not bearing a common superscript differ (P < .10).
[i]Rumensin x bunk management interaction (P = .04).

ance (P < .05) than steers fed 30 or 30/40 g/t Rumensin. Ruminal pH change and variance were similar across Rumensin levels for steers on the ADLIB.

Intake was similar across bunk management strategies; however, intake rate was faster (P < .01) for steers on the CLEAN than those on the ADLIB (Table 3). The total number of meals was greater (P < .01) for steers fed on the ADLIB compared with CLEAN. Steers on the CLEAN tended to spend a smaller (P = .13) portion of the day eating, but their average meal length was longer (P = .07) than steers on ADLIB. Average ruminal pH and area below pH 5.6 were unaffected by bunk management strategy.

Rumensin was effective at decreasing meal size and increasing number of meals consumed per day without affecting feed intake. These changes in consumption patterns should be effective in managing acidosis, especially for feedlot cattle with limited exposure to feed. Effects of Rumensin during the post-challenge phase were greater for steers on the CLEAN compared with ADLIB. It is unclear why differences exist between feeding 40 g/t Rumensin continuously compared with 30 g/t or 30/40 g/t for steers having limited access to feed. Steers on the CLEAN had an increased rate of intake and meal size as well as ruminal pH change and variance. Steers with limited exposure to feed are at a greater risk for subacute acidosis.

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