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Summary

A metabolism trial was conducted to evaluate transitioning cattle from RAMP® directly to a finishing diet without an adaptation period. Adaptation programs included either a 4-step system that decreased RAMP (100 to 0%) while increasing inclusion of the finishing ration (0 to 100%) gradually over 4 steps or a 1-step system where cattle were fed RAMP for 10 days and switched directly to a 47.5% Sweet Bran® finishing ration on day 11. Abruptly transitioning cattle in 1 step to a finishing ration containing 47.5% Sweet Bran decreased average pH while increasing time below pH 5.3 and pH variation compared to the 4-STEP system. Eating time increased as a result of 1-step when cattle were on the final finishing ration.

Introduction

Grain adaptation programs using RAMP have been shown to increase ADG and improve feed efficiency over the entire finishing period compared to traditional grain adaptation with alfalfa hay (*2012 Nebraska Beef Cattle Report*, p.85). Improved performance during the finishing period may be due to a reduction in subclinical acidosis or a change in eating behavior. A feedlot study found that cattle fed RAMP for 10 days can be transitioned rapidly to a 47.5% Sweet Bran finishing ration in as little as three days using 3 steps, or in four days using 1 step without negatively affecting performance (*2013 Nebraska Beef Report,* pp. 78-79). The objective of the current metabolism study was to evaluate the effects of transitioning cattle from RAMP directly to a finishing ration without an adaptation period on DMI, eating behavior, and ruminal pH of ruminally fistulated steers.

Procedure

A 35-day metabolism trial was conducted using seven ruminally fistulated steers (BW = 1,065 ± 110 lb). Treatments were imposed during the grain adaptation period (Table 1). Control steers (n = 4) were gradually adapted to a finishing diet using a 4-step system (4-STEP) which decreased RAMP inclusion (100 to 0%) while increasing inclusion of finishing ration (0 to 100%) equally over 4 periods (4, 6, 6, and 6 days), RAMP was mixed with finishing ration 1 (47.5% Sweet Bran, 40% high-moisture corn (HMC), 7.5% alfalfa hay (AH) and 5% supplement, DM basis; F1) and fed as a single diet. The 1 step adaptation system (1-STEP; n = 3) involved feeding RAMP for 10 days and switching directly to F1 on d 11. F1 was fed for 14 days for 1-STEP and 6 days for 4-STEP. Following F1, a second finisher (F2), which contained (DM basis) 25% Sweet Bran, 22.5% modified distillers grains with solubles, 40% HMC, 7.5% AH and 5% supplement, was fed for 7 and 11 days for 4-STEP and 1-STEP, respectively. All diets contained 25 g/ton Rumensin® and 12 mg/lb thiamine. Steers were individually housed in box stalls and were offered *ad libitum* access to feed and water and fed once daily at 0800 hour. Feed intake was continuously monitored using feed bunks suspended on load cells to determine intake rate and meals per day. Feed refusals were collected daily, weighed, and a 10% representative sample was retained and dried in a forced-air oven at 60°C for 48 hours to obtain DMI.

Wireless pH probes were placed into the rumen of each steer for the trial duration. Each probe was attached to a weighted enclosure designed to maintain the electrode in the ventral sac of the rumen. Ruminal pH was recorded at 1 minute intervals. On days 9 and 22 of the trial each probe was briefly removed from the rumen, before feeding, to download pH data and recalibrate the probe.

Data from the first days of F1 and F2 were analyzed to compare the two systems using the GLIMMIX procedure of SAS (SAS Inst. Inc., Cary, N.C.) Steer was the experimental unit

Table 1. Dietary composition (%) and days for 4-STEP or 1-STEP RAMP adaptation (DM).

Adaptation:	1	2	3	4	Finisher 1	Finisher 2
4-STEP (day)	(1-4)	(5-10)	(11-16)	(17-22)	(23-28)	(29-35)
RAMP	100	75	50	25	—	—
Alfalfa	—	1.9	3.8	5.6	7.5	7.5
HMC[1]	—	10	20	30	40	40
Sweet Bran	—	11.9	23.7	35.6	47.5	25
MDGS[2]	—	—	—	—	—	22.5
Supplement[3]	—	1.2	2.5	3.8	5	5
1-STEP (day)	(1-10)				(11-24)	(25-35)
RAMP	100				—	—
Alfalfa	—				7.5	7.5
HMC[1]	—				40	40
Sweet Bran	—				25	25
MDGS[2]	—				—	22.5
Supplement[3]					5	5

[1]High moisture corn.
[2]Modified distillers grain with solubles.
[3]Supplement formulated to provide 25 g/ton Rumensin and 12 mg/lb thiamine (DM).

and was treated as a random effect, and day was treated as a repeated measure.

Results

Intakes of F1 and F2 were similar statistically for 4-STEP and 1-STEP ($P > 0.4$; Table 2). One steer on 1-STEP had reduced DMI (50%) for two days along with low ruminal pH and high pH variation within d on F1, suggesting acidosis. After the period of reduced intake, DMI increased to a level consistent with other animals on the 1-STEP treatment for the remainder of the trial. Although 1-STEP likely caused acidosis in this steer, the 1-STEP treatment has been evaluated in a feedlot study and no adverse effects on performance were observed when compared to 4-STEP (*2013 Nebraska Beef Report* pp. 80-81). Eating time was greater for 1-STEP compared to 4-STEP when fed F1 ($P = 0.02$) or F2 ($P = 0.07$), but meals/day were similar ($P > 0.65$) across treatments for F1 and F2. A change in eating time suggests the abrupt step changed eating behavior.

Average ruminal pH was lower while fed F1 ($P = 0.03$) or F2 ($P = 0.02$) for 1-STEP cattle compared to 4-step (Table 2; Figure 1). Cattle adapted with 1-STEP had greater time below pH 5.3 and pH 5.6 while fed F1 ($P = 0.03$) or F2 ($P = 0.01$) compared to 4-STEP. While on F2, 1-STEP cattle had a lower minimum pH ($P = 0.01$) compared to 4-STEP. Magnitude of pH change and pH variance were not different ($P > 0.44$) while cattle were fed F1. However, magnitude of pH change and ruminal pH variance were greater ($P < 0.04$) for 1-STEP compared to 4-STEP for F2. Abruptly transitioning cattle from RAMP to high-grain finishing diets containing 47.5% Sweet Bran decreased average pH while increasing time below pH 5.3 and pH variation compared to the 4-STEP system. Eating behavior was affected by 1-STEP with cattle eating longer each day when compared to 4-STEP. This change in behavior was likely due to lower ruminal pH but could reduce acidotic insults if this behavior continues throughout feeding period.

Table 2. Effects of 4-STEP or 1-STEP adaptation methods on intake, intake behavior, and ruminal pH the first six days cattle were fed finisher 1 (F1) and finisher 2 (F2).

	First 6 days of F1			First 6 days of F2		
Item	4-STEP	1-STEP	*P*-value	4-STEP	1-STEP	*P*-value
DMI, lb/day	27.2	25.2	0.53	23.8	27.4	0.40
Intake Rate, %/hour	16.9	20.6	0.12	17.4	18.7	0.47
Eating time, min	310	368	0.02	304	397	0.07
Meals/day, n	9.5	8.9	0.77	8.7	9.1	0.65
Average pH	5.84	5.60	0.03	5.83	5.64	0.02
Maximum pH	6.63	6.37	<0.01	6.49	6.58	0.23
Minimum pH	5.26	5.07	0.06	5.29	5.04	0.01
pH change	1.38	1.29	0.47	1.20	1.55	0.03
pH variance	0.127	0.099	0.44	0.084	0.158	0.04
Time < 5.6, min	471	807	0.03	403	762	0.01
Area < 5.6[1]	96	217	0.02	71	210	0.02

[1]Area under curve (magnitude of pH < 5.6 by minute).

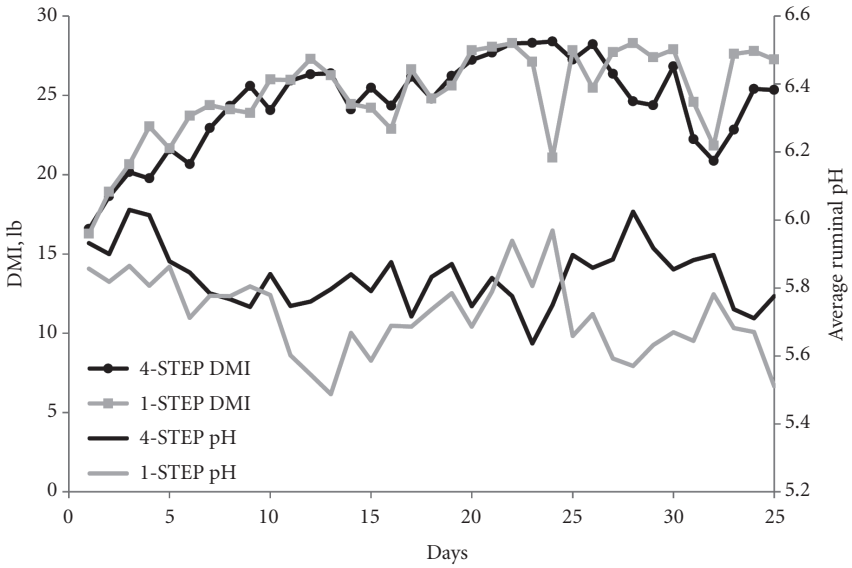

Figure 1. DMI and average ruminal pH of cattle transitioned to a finishing in 1-STEP or 4-STEPs.

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