Effects of RAMP™ on Feed Intake and Ruminal pH During Adaptation to Finishing Diets

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Summary

A metabolism trial was conducted using an adaption strategy where RAMP inclusion was decreased (100 to 0%) while increasing inclusion of the finishing ration (0 to 100%) was compared to a traditional adaption (Control) where alfalfa hay inclusion was decreased (45 to 7.5%) while increasing corn. Adapting cattle with RAMP increased DMI, had no effect on average pH, pH variance, or magnitude of change compared to Control. Grain adaption with RAMP is a viable alternative to traditional grain adaptation.

Introduction

RAMP is a complete-feed starter ration developed by Cargill, which contains a high level of *Sweet Bran*® **and a minimal amount of forage**. RAMP is intended to serve as an alternative to a mixture of grain and forage for receiving cattle or adapting cattle to grain, therefore eliminating a large portion of the forage needed in feedlots. Previous research has shown adapting cattle to grain using RAMP tended to increase ADG and improved feed efficiency over the entire feeding period (*2012 Nebraska Beef Cattle Report,* pp. ??). The objective of the current study was to evaluate the effects of grain adaption with RAMP on ruminal pH and DMI.

Procedure

A metabolism trial was conducted using six ruminally fistulated steer calves (BW = 561 ± 66 lb). Steers were gradually adapted to a finishing diet using four adaption diets over five periods consisting of seven days each, followed by seven days on a common finishing diet. Treatments were imposed during grain adaption using two grain adaptation programs (Table 1). With RAMP adaption, RAMP inclusion was decreased (100 to 0%) while increasing inclusion of the finishing ration (0 to 100%) by mixing RAMP with the various ingredients of the finishing ration as a single ration. The control adaptation treatment contained 25% Sweet Bran, 5% dry supplement, with alfalfa hay inclusion decreasing from 45 to 7.5% while increasing the corn blend (60% high-moisture corn and 40% dry-rolled corn) from 25 to 62.5% (DM). The final step diet served as the common finisher for all treatments the last seven days. RAMP, all step diets and the finishing diet 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 hours. 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 every minute continuously for seven days. Each probe was briefly removed from the rumen on day seven prior to feeding each period to download pH data and recalibrate the probe.

Data were analyzed as a 2 × 5 factorial design using the GLIMMIX procedure of SAS (SAS Inst., Inc., Cary, N.C.). Steer was the experimental unit and was treated as a random effect, and the residual was used to test for treatment affects. The model included period, treatment, period × treatment and day. Day was treated as a repeated measure.

Results

One steer from the control treatment was removed from the study for reasons unrelated to treatment. No period × treatment interactions occurred; therefore, main effects of adaptation treatment (Table 2)

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Table 1. Dietary composition (%) and days on feed of control and RAMP adaptation treatments (DM).

Days fed	1-7	8-14	15-21	22-28	29-35
Adaptation	1	2	3	4	Finisher
Control					
Alfalfa	45	35	25	15	7.5
HMC	15	21	27	33	37.5
DRC	10	14	18	22	25
Sweet Bran	25	25	25	25	25
Supplement[1]	5	5	5	5	5
RAMP					
RAMP	100	75	50	25	—
Alfalfa	—	1.88	3.75	5.62	7.5
HMC	—	9.37	18.75	28.13	37.5
DRC	—	6.25	12.5	18.75	25
Sweet Bran	—	6.25	12.5	18.75	25
Supplement[1]	—	1.25	2.5	3.75	5

[1]Supplement formulated to provide 25 g/ton Rumensin and 12 mg/lb thiamine (DM).

and period (adaption diet; Table 3) are presented. Cattle adapted using RAMP had greater DMI ($P = 0.07$) than those adapted with the control treatment. Similar increases in DMI were observed when cattle were adapted to grain using Sweet Bran (*2009 Nebraska Beef Cattle Report,* pp. 56-58). Average ruminal pH, minimum pH, and maximum pH were not affected by adaption method. Adapting cattle with RAMP had no effect on magnitude of pH change or ruminal pH variance. These findings are contrary to previous research where adapting cattle with Sweet Bran increased pH variance and decreased average, minimum, and maximum pH values (*2009 Nebraska Beef Cattle Report,* pp. 56-58). Time below pH 5.6 or 5.3 were not affected by adaption treatment. Area below 5.6 was not different, but area below 5.3 increased ($P < 0.01$) for cattle adapted with RAMP.

Intake increased (Table 3) with each period as steers were adapted to the finishing ration ($P < 0.01$) and then decreased ($P < 0.01$) from adaption period 4 to the finishing diet. Average ruminal pH was not different during the adaption periods but decreased ($P < 0.05$) once on the finishing diet. Minimum pH decreased ($P < 0.05$) from adaption period 2 to adaption period 3 and from adaption period 4 to the finishing diet ($P < 0.01$). Maximum pH was not affected by adaption period. Time below pH 5.6 was not affected by adaption period, but area below pH 5.6 increased ($P = 0.02$) once cattle were fed the finishing diet compared to the first two periods. Time and area below pH 5.3 increased ($P < 0.01$) when the cattle were on the finishing diet compared to all other adaption periods. In summary, adapting cattle to grain using RAMP increased DMI and decreased area below pH 5.3, which is an indicator of subclinical acidosis, and thus is a viable alternative to traditional grain adaption programs.

Table 2. Effects of grain adaption with RAMP or control adaptation methods on intake and ruminal pH.

	Treatment		
Item	Control	RAMP	*P*-value
DMI, lb/day	11.02	16.17	0.07
Average pH	5.86	5.77	0.58
Maximum pH	6.51	6.38	0.33
Minimum pH	5.29	5.31	0.87
pH change	1.13	1.12	0.86
pH variance	0.07	0.06	0.49
Time < 5.6, min	351.8	363.3	0.93
Area < 5.6[1]	69.2	72.4	0.71
Time < 5.3, min	92.2	76.8	0.70
Area < 5.3[1]	15.6	8.1	< 0.01

[1]Area under curve (magnitude of pH < 5.6 or 5.3 by minute).

Table 3. Effect of adaption period[1] on intake and ruminal pH.

Adaptation:	1	2	3	4	Finisher	*P*-value
DMI, lb/day	10.68^{a}	12.71^{b}	14.63^{c}	16.22^{d}	13.75^{bc}	< 0.01
Average pH	5.93^{a}	5.87^{a}	5.83^{a}	5.81^{a}	5.63^{b}	0.01
Maximum pH	6.36	6.49	6.52	6.46	6.38	0.10
Minimum pH	5.57^{a}	5.44^{a}	5.26^{b}	5.22^{b}	5.00^{c}	< 0.01
pH change	0.63^{a}	1.08^{b}	1.28^{bc}	1.22^{bc}	1.46^{c}	< 0.01
pH variance	0.04^{a}	0.06^{b}	0.08^{b}	0.07^{b}	0.10^{c}	< 0.01
Time < 5.6, min	334.3	301.1	318.8	363.6	470.2	0.12
Area < 5.62	72.9^{a}	72.9^{a}	63.2^{ab}	45.7^{ab}	99.1^{b}	0.02
Time < 5.3, min	53.2^{a}	63.3^{a}	69.3^{a}	72.6^{a}	163.9^{b}	< 0.01
Area < 5.32	7.1^{a}	14.8^{b}	8.2^{a}	9.2^{a}	20.1^{c}	< 0.01

[1]Each adaption period consisted of an adaption diet fed for seven days.
[2]Area under curve (magnitude of pH < 5.6 or 5.3 by minute).
[a-c]Within a row, means without a common superscript are different $P < 0.05$.

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