2016

Rumen Protected Amino Acids in Finishing Cattle Diets

Colton Oney
University of Nebraska-Lincoln

Curtis J. Bittner
University of Nebraska-Lincoln, curtis.bittner@unl.edu

F. Henry Hilscher Hilscher
University of Nebraska-Lincoln, henry.hilscher@unl.edu

Andrea K. Watson
University of Nebraska-Lincoln, awatson3@unl.edu

Terry J. Klopfenstein
University of Nebraska-Lincoln, tklopfenstein1@unl.edu

See next page for additional authors

Rumen Protected Amino Acids in Finishing Cattle Diets

Colton Oney, Curtis J. Bittner, F. Henry Hilscher, Andrea K. Watson,
Terry J. Klopfenstein, Galen E. Erickson and Whitney Rounds

Summary

A 190-d calf fed finishing study, utilizing 240 steers, was conducted to determine the effects of supplementing finishing cattle with bypass amino acids (methionine and lysine) on growth performance. Three treatments (control, methionine, methionine and lysine) were evaluated with 8 pens/trt. All cattle were fed a 40% Sweet Bran, 50% high moisture corn basal diet. Supplementing with bypass amino acids did not affect live cattle performance, and only small differences in 12th rib fat and USDA marbling score were observed. Lack of any dramatic changes in performance suggests these calves were not deficient in methionine or lysine.

Introduction

Supplementing cattle with bypass protein has been shown to improve gains and feed efficiency, especially for young, rapidly growing calves. Methionine and then lysine are the first limiting amino acids in microbial protein. If specific amino acids are limiting, then increasing the amount of those amino acids available to the animal postruminally presents opportunities for increased animal growth and efficiency.

Two products coming from the corn milling industry and commonly fed to cattle are wet corn gluten feed (WCGF) and distillers grains plus solubles (DGS). These products come from the wet and dry corn milling industries, respectively, and have very different nutrient profiles. Sweet Bran®, a branded WCGF developed by Cargill, is 22% CP, of which approximately 25% is ruminal undegradable protein (RUP). Distillers grains average 30% CP, with 63% RUP (as % of CP). Finishing diets containing 20% or more DGS (DM basis) meet cattle requirements for metabolizable protein. Diets containing WCGF that are formulated to meet CP requirements may be deficient in RUP. More specifically, these diets may be deficient in lysine, the first limiting amino acid in corn protein, or methionine, the first limiting amino acid of microbial crude protein. The objective of this trial was to evaluate the effects of bypass methionine and lysine on calf performance in a finishing trial.

Procedure

The current trial evaluated growth implications of the bypass amino acid products, MetiPEARL™ and USA Lysine® of Kemin Industries, Inc. (Des Moines, Iowa) in a calf-fed finishing trial. Two hundred and forty crossbred steers with an average BW of 619 lb (SD = 20 lb) were utilized in a completely randomized treatment design to study the effects of bypass methionine and lysine on growth performance. Steers were received for a 24-d period at the University of Nebraska's Agricultural Research and Development Center (ARDC) near Mead, NE, in October, 2014. After receiving, steers were limit fed at an estimated 2% of BW a diet consisting of 50% alfalfa and 50% Sweet Bran® (DM basis) for 5 d prior to weighing. Cattle were weighed on 2 consecutive days (d 0 and 1) to establish initial BW. Steers were stratified by d 0 BW and assigned randomly to pens. Pens were assigned randomly to treatment. There were 3 treatments and 8 pens/treatment for a total of 24 pens.

Cattle were adapted to a common finishing diet consisting of 40% Sweet Bran®, 50% high moisture corn (HMC), 5% wheat straw, and 5% supplement (DM basis; Table 1). The step up period consisted of 4 diets fed over 21 d. During the adaptation, HMC was increased from 20 to 50% of diet DM while alfalfa was decreased from 30 to 0% of diet DM; all other ingredients were held constant. Supplement was formulated to provide 330 mg/steer daily of Rumensin, 90 mg/steer daily of Tylan, and 3 mg/steer daily of chromium (KemTRACE Chromium). All cattle were fed Optaflexx the last 28 d of the trial at 300 mg/steer daily. Treatments consisted of a control (CON); 8 g methionine/steer daily (26 g MetiPEARL™/steer daily; MET); and 8 g methionine and

Table 1. Composition of diets fed to cattle

Ingredient, % of diet DM	CON[a]	MET	MetLys
High moisture corn	50	50	50
Wet corn gluten feed[b]	40	40	40
Wheat straw	5	5	5
Supplement	5	5	5
Methionine[c]	—	98.1	98.1
Lysine[d]	—	—	113.9
Chromium[e]	3.0	3.0	3.0
Monensin[f]	6.2	6.2	6.2
Tylosin[g]	3.8	3.8	3.8

[a]Treatments were due to cattle diet; CON = control, MET = control diet with added bypass methionine, and MetLys = control diet with added bypass methionine and lysine.
[b]Cargill's Sweet Bran product.
[c]MetiPEARL™ (Kemin Industries, Inc., Des Moines, IA) expressed as lb/ton of supplement. Formulated to provide 26 g/steer daily of MetiPEARL™ or 8 g metabolizable methionine/steer daily.
[d]USA Lysine® (Kemin Industries, Inc.) expressed as lb/ton of supplement. Formulated to provide 28 g/steer daily of USA Lysine® or 12 g metabolizable lysine/steer daily.
[e]KemTRACE Chromium (Kemin Industries, Inc.) expressed as lb/ton of supplement. Formulated to provide 3 mg chromium/steer daily.
[f]Rumensin-90 (Elanco Animal Health, Greenfield, IN), expressed as lb/ton of supplement. Formulated to provide 330 mg/steer daily.
[g]Tylan-40 (Elanco Animal Health), expressed as lb/ton of supplement. Formulated to provide 90 mg/steer daily.

12 g lysine/steer daily (26 g MetiPEARL™ and 28 g USA Lysine®/steer daily; MetLys). Using the 1996 NRC model the CON diet was predicted to meet cattle metabolizable protein requirements (70 g/d excess), overall CP concentration was 14.7%. However, it is not clear if individual amino acid requirements are being met throughout the feeding period. All cattle were implanted with Revalor-XS on d 0.

Cattle gain was measured throughout the study by collecting pen weights (4% pencil shrink applied) 4 times throughout the trial. Weights were collected after 1 wk on the finisher d 28–29, 72 d after initiation of the trial, at initiation of feeding Optaflexx (d 162), and at termination of the study on the day that cattle were shipped to the packing plant (d 189). All steers were harvested at Greater Omaha Packing Co. (Omaha, NE) on d 190. Six animals were removed before completion of the trial due to respiratory and foot and leg issues (3 on CON; 1 on MET; and 2 on MetLys).

Performance traits measured include DMI, ADG (using limit fed initial and carcass-adjusted final BW), live final BW, and carcass traits. Interim ADG was calculated for 3 periods using limit fed initial and pen weights. On the d of slaughter, HCW was collected. Following a 48-h chill, 12th rib fat thickness, LM area, and USDA marbling score were recorded. Assuming 2.5% kidney, pelvic, and heart (KPH) fat, yield grade was calculated. A common dressing percent of 63% was used to calculate carcass-adjusted performance.

Animal performance and carcass characteristics were analyzed as a completely randomized design using the MIXED procedure of SAS (SAS Institue, Inc., Cary, N.C.). Pen was the experimental unit and animals that were removed during the experiment were not included in the analysis. Treatment was a fixed effect and differences were considered significant at $P \leq 0.05$.

Table 2. Finishing cattle performance and carcass characteristics

	Treatment[a]			SEM	*P*-value
	CON	MET	MetLys		
Performance					
Initial BW, lb	618	620	620	1	0.15
Final BW, lb[d]	1352	1360	1350	11	0.79
DMI, lb/d	22.6	22.7	22.3	0.2	0.46
d 28 ADG, lb[b]	4.36	4.22	4.20	0.09	0.41
d 72 ADG, lb	3.46	3.55	3.51	0.08	0.77
d 162 ADG, lb[c]	3.74	3.82	3.77	0.05	0.50
ADG, lb[e]	3.86	3.90	3.84	0.06	0.77
Feed:Gain	6.00	5.95	6.04	—	0.79
Carcass Characteristics					
HCW, lb	852	857	851	7	0.78
Marbling Score[f]	508[a]	465[b]	498[a]	8.5	0.01
LM area, in^2	13.2	13.5	13.3	0.2	0.33
12th-rib fat, in	0.64a	0.60b	0.60b	0.01	0.02
Calculated YG	3.70	3.50	3.50	0.07	0.08

[a]Treatments were due to cattle diet; CON = control, MET = control diet with added bypass methionine, and MetLys = control diet with added bypass methionine and lysine.
[b]Live ADG measured after 1 week on finisher diet, d 28–29. Measured by pen weighing cattle on 2 consecutive days and applying a 4% pencil shrink.
[c]Live ADG measured by pen weighing cattle on the first day of Optaflexx supplementation and applying a 4% shrink.
[d]Calculated from HCW divided by a common 63% dressing percentage.
[e]Calculated using carcass-adjusted final BW and limit fed initial BW.
[f]300 = slight, 400 = small, 500 = modest, etc.
[ab]Within a row, means without a common superscript after ($P < 0.05$).

Results

There were no differences in DMI ($P \geq 0.46$; Table 2) between the 3 treatments over the entire feeding period. Using carcass-adjusted performance, there was no difference in final BW ($P \geq 0.79$) or ADG ($P \geq 0.77$). Therefore, F:G was also unaffected by the supplementation of bypass amino acids ($P \geq 0.79$). Additionally, when evaluating animal performance using interim pen weights no differences in ADG were observed ($P \geq 0.41$).

While there was no difference in HCW ($P \geq 0.78$) nor LM area ($P \geq 0.33$), there was a notable difference in USDA marbling score ($P \leq 0.01$). When comparing the 3 treatments, CON and MetLys treatments were similar with scores of 508 and 498 respectively ($P \geq 0.05$). The difference appeared in the MET treatment which had a noticeably lower score of 465 ($P \leq 0.05$). There was also a difference found when comparing fat thickness among treatments. The CON treatment had the greatest 12th rib fat ($P = 0.02$). However, all cattle were well finished, with average fat thickness of at least 0.60 in.

In conclusion, bypass amino acid supplementation had no effect on live cattle performance. Each treatment had similar effects both on live performance and carcass characteristics, differing only slightly in 12th rib fat and USDA marbling score. Although WCGF provides less bypass protein than DGS, it appears that a 40% Sweet Bran, 50% HMC diet provides sufficient lysine, methionine and metabolizable protein to meet finishing steer requirements.

Colton Oney, graduate student

Curtis J. Bittner, research technician

F. Henry Hilscher, research technician

Andrea K. Watson, research assistant professor

Terry J. Klopfenstein, professor

Galen E. Erickson, professor, University of Nebraska-Lincoln Department of Animal Science

Whitney Rounds, Kemin Industries, Inc., Des Moines, IA