Addition of rumen degradable and undegradable protein to corn-based lamb finishing diets.

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Summary

This trial was conducted to evaluate if metabolizable protein (MP) limited lamb performance when fed a corn-based diet. Treatments (Table 1) were arranged in a 2 x 2 factorial design; with or without added DIP and UIP. Lambs fed UIP had heavier final weights (*P* = .009), gained more rapidly (*P* = .007), and were more efficient (*P* = .07) compared with DIP fed lambs. A DIP H UIP interaction occurred (*P* = .08) for REA where addition of UIP alone increased REA compared with diets without UIP addition. Dietary NE_m and NE_g were greater (*P* = .09) for diets containing added UIP.

Introduction

Metabolizable protein (MP) is the combination of ruminal undegradable intake protein (UIP; protein that escapes rumen microbial breakdown) and bacterial crude protein that enters the small intenstine and can be broken down and absorbed by the animal. The metabolizable protein requirements of lambs have not been addressed and need to be established.

Addition of a rumen degradable protein (DIP; protein that is broken down by the ruminal microorganisms) source in high-corn cattle finishing diets shows an increase in performance. However, based on NDSU research replacement of corn with a grain higher in DIP such as field peas demonstrates that lambs may not be limited in ruminal protein when consuming corn-based high-grain diets.

Materials and Methods

Eighty crossbred Hampshire ram lambs (85.8 " .7 lb initial weight) were blocked by weight and allotted randomly to dietary treatment. Lambs were housed at the NDSU Animal Research Center barns. There were 5 pens/treatment. Rumen degradable intake protein sources were SBM and urea; whereas, UIP sources were feathermeal and bloodmeal. Main effects of DIP, UIP, and their interactions were tested. Lambs were fed for 63 days.

Diets were formulated to contain a minimum .7% calcium, .43% phosphorous, 1.22% potassium, 1.51 calcium:phosphorous, and 25 g lasalocid/Ton. Feed offered was adjusted daily prior to feeding. Each pen had access to an indoor and outdoor run and fresh water.

Initial and final weights were an average of two consecutive day weights. Average daily gain (ADG), dry matter intake (DMI), and feed efficiency were measured. Carcass characteristics of all lambs were taken at slaughter, however, hot carcass weight was not gathered due to a mix up at the slaughter facility.

Results

Performance measurements (Table 2) were DMI, ADG, and feed efficiency. Lambs fed UIP had heavier final weights (P = .009), greater rates of gain (P =.007), and were more efficient (P = .07) compared with lambs fed DIP. There was a DIP H UIP interaction (P = .08) for REA (Table 3). Lambs fed UIP had larger REA than lambs fed diets without UIP addition. Other carcass characteristics were not affected (P > .10) by treatment.

Dietary NE_m and NE_g (Table 4) were calculated from lamb performance and were greater (P = .09) for diets containing added UIP.

Conclusions

The lack of response to the addition of DIP, demonstrated that DIP does not limit lamb performance and based on lamb response to added UIP, lambs with the potential to gain .77 lb/day or greater are limited by MP in corn-based finishing diets.

Table 1. Diet Composition (% DM basis)

		Dietary Treatments (% DM basis)			
		-UIP		+UIP	
Item	**Unit**	**-DIP**	**+DIP**	**-DIP**	**+DIP**
DRC	%	75	71	74	70
Alfalfa	%	10	10	10	10

CSB	%	5	5	5	5
SBM	%	6.00	10.51	3.78	8.23
Urea	%	.20	.26	.19	.26
Feather meal	%	.80	.11	3.04	2.34
Blood meal	%	.20	.03	.76	.59
Supplement	%	2.80	3.09	3.23	3.58
Crude Protein	%	14.8	16.9	16.2	18.3
DIP[a]	%	8.9	11.0	8.9	11.0
UIP[b]	%	5.9	5.9	7.3	7.3
MP:ME[c]		22.2	22.2	24.5	23.6

[a] Rumen degradable intake protein

[b] Rumen undegradable intake protein

[c] gram metabolizable protein/Mcal metabolizable energy

Table 2. Effect of treatment on feedlot performance

Dietary Treatments (% DM basis)

		-UIP		+UIP		
Item	**Unit**	**-DIP**	**+DIP**	**-DIP**	**+DIP**	**Error**
Initial wt	lb	85.9	85.3	85.7	86.0	.6
Final wt	lb	134.9	133.8	142.3	138.2	2.0
DMI	lb/day	3.48	3.41	3.70	2.86	.13
ADG	lb/day	.77	.77	.90	.84	.02
Feed/Gain[a]		4.48	4.42	4.07	3.95	-----
REA	in2	2.31	2.34	2.59	2.44	.07

Backfat	in	.88	.74	.85	.96	.07
Bodywall[b]	in	4.74	4.54	4.94	4.86	.53
YG		4.38	3.77	4.38	4.78	.31
NE$_m$[c]	Mcal/cwt	105	106	112	116	5
NE$_g$[c]	Mcal/cwt	74	75	80	83	4

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[a] Feed/Gain was calculated as Gain/Feed. Feed/Gain is a reciprocal of Gain/Feed.

[b] Bodywall is a measurement of total body lean. Lower number corresponds with leaner carcass.

[c] NE$_m$ and NE$_g$ are calculated from lamb performance