Based on research finding to date, it seems that monensin decreases intake of low quality forages as well as rumen turnover rate. One explanation for reduced forage intake is decreased rate, but not necessarily extent of ruminal digestion. Decreasing the rate of digestion of particulate matter in the rumen would prolong rumen retention and slow rumen turnover. Reduced rumen turnover would decrease feed intake if bulk fill limits intake. The decreased energy intake of monensin fed cattle may not reduce performance however, due to compensating factors. These may include: 1) increased propionate production, 2) decreased methane production, 3) decreased heat loss, 4) decreased energy expenditure for grazing and 5) decreased metabolic fecal energy loss.

Slow Ammonia Release for Steers

K. L. Mizwicki, F. N. Owens, K. Poling and G. Burnett

Story in Brief

Slow and rapid ruminal ammonia release rates were simulated by feeding urea intermittently. Steers were fed half a pound of prairie hay hourly with the following daily dietary supplements: Urea continuously (C) as 0.007 lb/hr; moderate (M) as 0.031 lb/hr for 6 hr; rapidly (R) as 0.19 lb of urea in 1 hr, or no supplemental urea (0). Ruminal ammonia remained stable with treatments C and O. Treatments R and M peaked at 1.5 and 6.5 hr after feeding began showing that slow release of ammonia was effectively achieved. Digestibility of dry matter was increased by 5 percent and retention of nitrogen was increased with the addition of urea regardless of the rate of urea administration. Simulated slow ammonia release rates enhanced neither dry matter digestibility nor nitrogen retention. Use of ammonia in the rumen was not improved by slowing its release rate.

Introduction

Cattle grazing low quality forage utilize supplemental urea poorly. This has been attributed to rapid breakdown of urea to ammonia with low availability of energy for bacteria to use the ammonia. Slowing the ammonia release rate might help balance ammonia and energy availability. The objective of this study was to determine if slow release of ammonia would prove beneficial for digestion and nitrogen retention of steers fed winter range grass.

Experimental Procedure

Four 790 lb crossbred steers were held in metabolism stalls and fed hourly with timed automatic feeders. Winter harvested native prairie hay was fed at a rate of ½ lb/hr. Daily nitrogen supplements provided urea continuously (C) as .007 lb urea/hr for 24 hr each day; moderated (M) .031 lb urea/hr for 6 hr each day; rapidly (R) .19 lb urea in the first hour, or no supplemental urea (0). In addition, 1.33 lb of an energy supplement (Table 1) was provided the first hour of each 24 hr feeding cycle similar to commercial supplementation practices for cattle grazing winter range. Steers were rotated among treatments so that each steer received each treatment for 2 weeks. Total urine and feces were collected the last 5 days of each period.

Results and Discussion

Ruminal ammonia concentrations over time with each treatment are shown in Figure 1. These patterns generally reflect infusion times and should simulate rapid, slow or very slow release compounds or no supplemental urea.

Table 1. Diet composition

Ingredients	Energy supplement	Urea supplement
	%	%
Corn, dent, yellow grain, ground	74.7	----
Urea	----	62.1
Alfalfa, aerial part, dehy. meal	18.4	----
Sodium sulfate	2.88	----
Monosodium phosphate	3.31	----
Sugarcane, molasses, dehy.	----	37.9
Salt, trace mineralized	.61	----
Vitamin Premix[a]	.062	----

[a]To provide 2200 IU Vitamin A/kg and 275 IU D_3/kg feed.

Digestibilities (DMD) for the ration and for cellulose were increased by urea feeding (Table 2). Timing of urea feeding, however, did not influence digestibility. The increase in DMD is attributable completely to an 8 percent increase in cellulose digestibility with urea addition.

Nitrogen digestibilities were increased from 13 to 60 percent with the addition of urea. Protein digestibilities, recalculated assuming that urea was completely digestible, show a decrease in digestibility of non-urea nitrogen from 13 percent with no additional urea to 4 percent with additional urea (Table 2). This decrease in protein digestibility may be attributed to use of urea nitrogen for bacterial protein synthesis. Such bacterial protein would

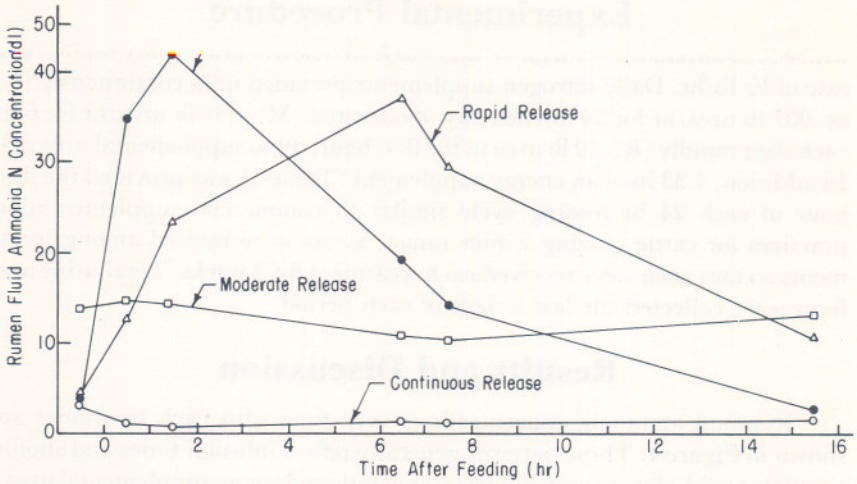

Figure 1. Ruminal ammonia concentrations with interval urea supplementation. Treatments are no urea (●), Rapid release (△), Moderate release (□) and Continuous release (○).

Table 2. Digestibility of nutrients by steers receiving urea at various intervals

Item	Urea administration interval				
	No Urea	Rapid	Moderated	Continuous	SE[a]
	%				
Dry matter[b]	46.8	48.8	50.0	48.9	.88
Cellulose[b]	50.8	54.3	55.4	55.4	1.39
Nitrogen[c]	13.4	60.2	60.3	60.3	1.44
Nitrogen adjusted[c,d]	13.4	3.4	3.0	5.6	1.46

[a]Standard error of the mean.
[b]Mean of urea treatments differs statistically from no urea (P<.05).
[c]Mean of urea treatments differs statistically from no urea (P<.01).
[d]Calculated assuming complete digestion of urea.

have a digestibility of about 66 percent, lower than the 100 percent assumed in the above calculation. Steers fed urea had greater nitrogen retention than those fed no urea independent of the rate of release of ammonia (Table 3).

Slow release of ammonia did not improve digestibility, nitrogen balance or ruminal protein synthesis in this experiment with steers fed a limited amount of low quality forage. Perhaps under free choice feeding conditions feed intake could favor slow ammonia release. But the benefit of slow release compounds with low quality forages remains to be proven. Enhanced feed intake and decreased "ammonia intoxication" may be responsible for im-

Table 3. Nitrogen retention by steers receiving urea at various intervals

Item	Urea administration interval				
	No Urea	Rapid	Moderate	Continuous	SE[a]
Nitrogen intake, g/day[b]	23.2	60.4	60.2	60.4	.80
Nitrogen excretion, g/day					
Fecal[c]	20.7	24.0	23.7	24.2	.86
Urinary[b]	9.8	25.1	24.3	23.9	1.86
Nitrogen retention, g/day[b]	−7.1	11.4	12.2	12.4	1.58

[a]Standard error of the mean.
[b]Mean of urea treatments differs statistically from no urea ($P<.01$).
[c]Mean of urea treatments differs statistically from no urea ($P<.05$).

proved performance of range cows fed the slow release compound discussed elsewhere in this report.

Range Studies With A New Slow Release Urea Compound

O. Forero, F. N. Owens, P. Leme and K. S. Lusby

Story in Brief

A new slow release urea compound (SRU) which had previously been shown to attenuate ruminal ammonia release and reduce the potential for urea toxicity was evaluated in range supplements in two wintering trials. Seventy-eight pregnant Hereford cows were fed 2 lb/head/day of supplements with 15 or 40 percent all natural protein, 40 percent protein supplements with SRU furnishing 62.5 percent of the protein equivalent (one SRU supplement was pelleted, one was fed in meal form) and a 40 percent protein supplement in which urea furnished 62.5 percent of the protein equivalent. Weight changes for the 60-day trial were 9.9, 66.3, 59.0, 57.9 and 13.8 lb for the 15 and 40 percent all natural, 40 percent SRU (pellet and meal) and urea respectively. In a second wintering study, 85 lactating Hereford cows were individually fed five supplements consisting of 2.7 lb/head/day of 15 and 40 percent all natural protein, 40 percent protein (SRU meal form), 40 percent protein (urea) and a