

Cow-Calf and Stocker

The Effect of Frequency of Feeding on Adaptation of Ruminants to Biuret as an NPN-Source

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Story in Brief

Two trials were conducted to measure the biuretolytic activity of roughage fed ruminants supplemented with biuret at intervals of 1, 2 or 4 days. Rumen contents were collected from each animal at various days before and after supplementation over a 33 day test period for determination of the ability to break down biuret (biuretolytic activity).

Animals receiving the biuret daily or every 2 days were able to develop and maintain high levels of biuretolytic activity throughout both trials. Those animals supplemented every 4 days could neither develop nor maintain biuretolytic activity over the extended feeding intervals. It was concluded that as an NPN supplement for wintering ruminants on range grass, biuret would have to be fed at least every other day.

Introduction

The cost of protein supplementation for winter range cattle in Oklahoma has drawn attention to the possible use of non-protein nitrogen (NPN) sources to meet these needs. Biuret is one form of NPN presently under investigation. Like other NPN sources, biuret must be broken down to ammonia by the rumen microorganism prior to being utilized. Previous research has shown that an adaptation period is required for this ability to break down biuret can develop and this adaptation period is variable depending on the ration.

Furthermore, as soon as biuret is removed from the ration the ability to break down biuret (biuretolytic activity) is quickly lost. Some cattlemen follow the practice of only providing protein supplements once or twice a week during winter range feeding. If biuret is to func-

tion as an NPN supplement, the animals must first develop sufficient biuretolytic activity and, secondly, must maintain this activity during the wintering period. The trials reported here were designed to investigate the effects of frequency of feeding on the development and maintenance of biuretolytic activity.

Methods and Materials

Two experiments were designed to study the biuretolytic activity of the rumen microorganisms when biuret was supplemented to roughage fed ruminants at intervals of two and four days as compared to daily feeding.

Trial 1.

Poor quality prairie hay was fed free choice to 9 rumen cannulated sheep. The animals were placed in groups of 3 with each group receiving biuret supplement at either 1, 2, or 4 day intervals, at the levels indicated in Table 1. The trial was conducted for a 33 day test period, with rumen samples being collected on days 0, 2, 4, 8, 12, 16, 24 and 32 to observe the biuretolytic activity just prior to the days feeding. Additional samples were collected on days 5, 9, 13, 17 and 33 to observe the activity the day following biuret supplementation.

Each rumen sample was mixed with a biuret solution and incubated in a water bath (39°C) for 24 hours. The extent of biuretolytic activity was then determined by measuring the disappearance of biuret from each sample after 8 and 24 hours of incubation. High biuretolytic activity was indicated by a more rapid and complete disappearance of biuret.

Trial 2.

For this experiment 6 rumen cannulated steers were preadapted to biuret prior to the initiation of the experimental period. After sufficient biuretolytic activity was established in all animals, the steers were grouped such that some continued to receive daily supplementation while others received supplement every 2 or every 4 days at the levels indicated in Table 1. In this manner we were able to measure the animals ability

Table 1. Levels of feeding and frequencies of feeding biuret supplement in Trials 1 and 2.

Frequency of Feeding	Level of supplement, grams		
	Daily	Every 2 days	Every 4 days
Trial 1	160	320	640
Trial 2	1660	3320	6640

to maintain the biuretolytic activity over the extended feeding intervals. Daily feeding of poor quality prairie hay was continued for all animals throughout the entire test period. Rumen samples were collected from each animal on days similar to those in experiment 1, for laboratory analysis.

Results and Discussion

In the first trial little or no biuretolytic activity could be detected in the animals before the initiation of the biuret feeding (Figure 1, day

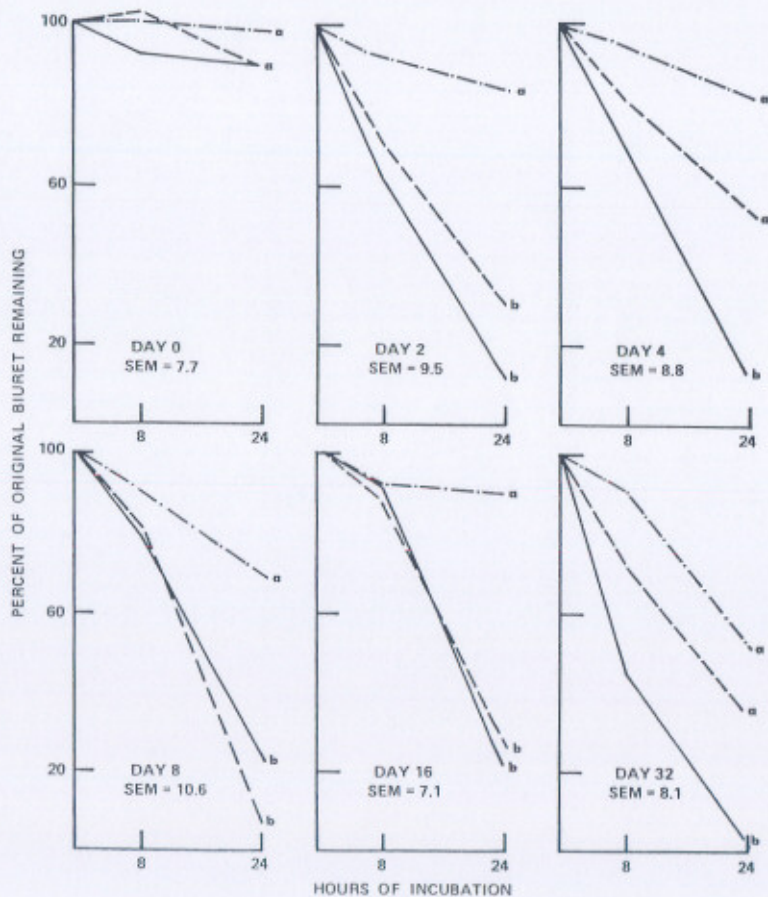


Figure 1. Biuret disappearance in rumen contents from sheep fed biuret supplement daily (—), every 2 days (- - -), or every 4 days (- · -). Samples taken just before the days feeding— trial 1.

0). However, on day 2 those animals receiving biuret supplement daily or every 2 days revealed substantial biuretolytic activity, while minimal activity was observed for those fed every 4 days. Similar results were observed throughout the remainder of the experimental period, for rumen samples collected just prior to the days' supplementation. In samples of rumen liquor collected the day following biuret supplementation (Figure 2) the biuretolytic activity in animals fed biuret every 2 days was equal to that in animals supplemented daily. Those animals receiving supplement every 4 days failed to demonstrate any increase in activity.

For the second trial all animals were pre-adapted to biuret before the start of the trial (Figure 3, day 0). At this point the variation in the frequency of feeding program began. No differences were detected after 2 days; however, by day 4 a marked difference was observed. Those steers receiving the daily supplementation maintained a high level of biuretolytic activity. Those receiving supplement every 2 days appeared to have lost a portion of their activity, and those receiving supplement every 4 days lost nearly all of their biuretolytic activity over the extended feeding intervals.

When rumen samples were collected the day following supplementation the animals supplemented daily and those supplemented every 2 days showed comparable biuretolytic activity. The animals fed biuret

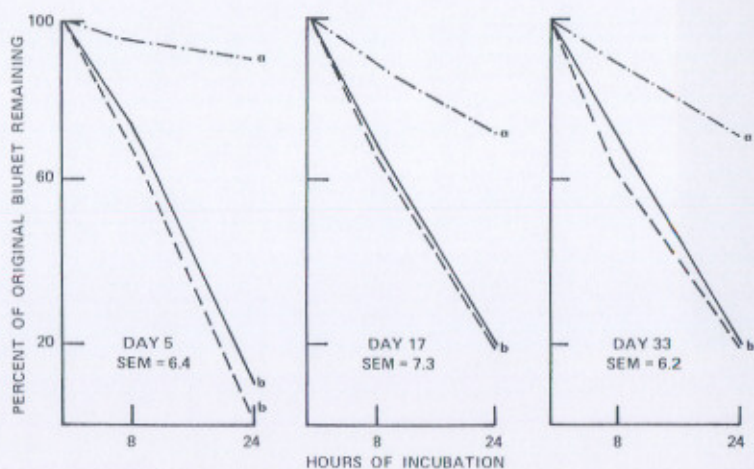


Figure 2. Biuret disappearance in rumen contents from sheep fed biuret supplement daily (—), every 2 days (---), or every 4 (-.-). Samples taken the day following supplementation—trial I.

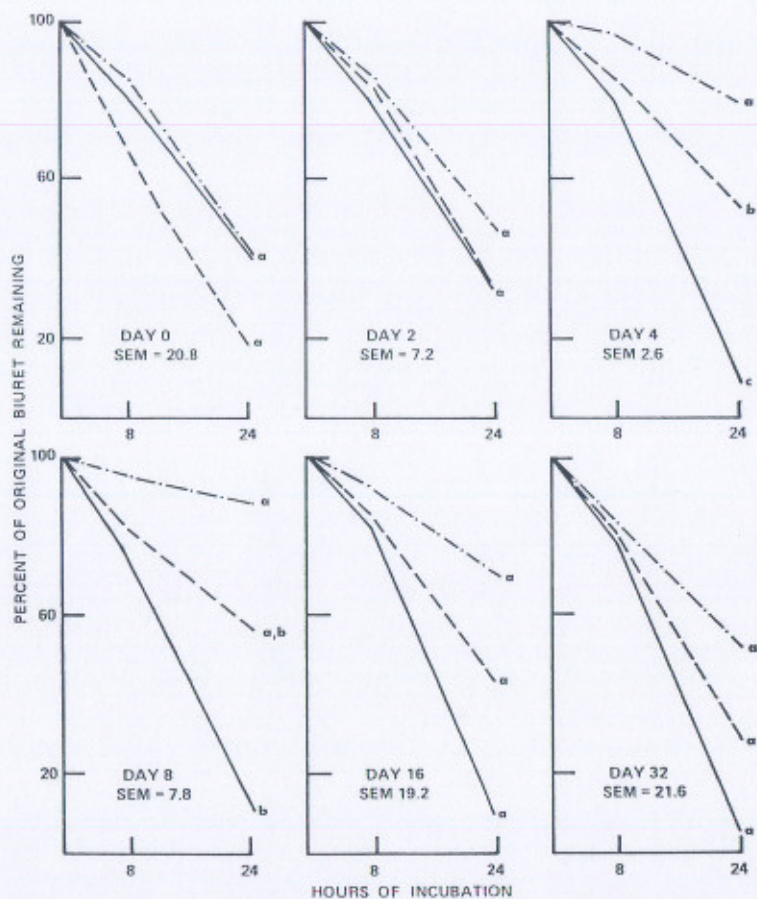


Figure 3. Biuret disappearance in rumen contents from steers fed biuret supplement daily (—), every 2 days (---) or every 4 days (-.-). Samples taken just before the days feeding—trial 2.

every 4 days again failed to demonstrate an increase in biuretolytic activity.

From the results of these trials it would appear as though supplementation of winter range cattle with biuret daily or every 2 days would be satisfactory in developing and maintaining adequate biuretolytic activity to meet the protein needs of these animals. On the other hand, if biuret is fed at intervals of 4 days or greater the rumen microorganisms could neither develop nor maintain sufficient biuretolytic activity to

degrade biuret to NH_3 rapidly enough to support microbial protein syntheses.

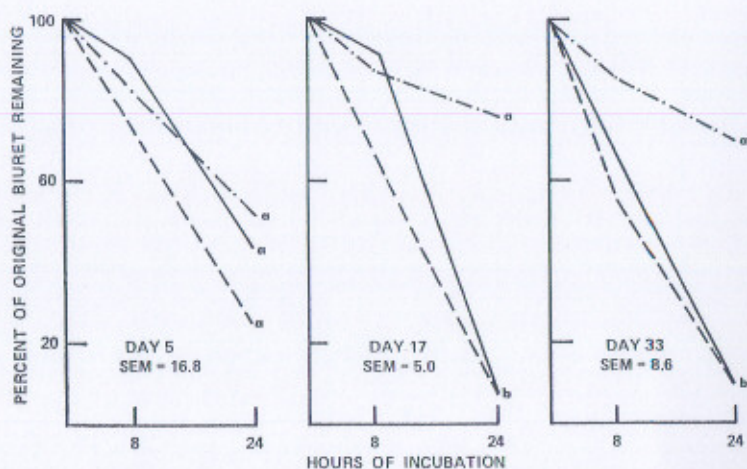


Figure 4. Biuret disappearance in rumen contents from steers fed biuret supplement daily (—), every 2 days (---), or every 4 days (-.-). Samples taken the day following supplementation—trial 2.