Short communication

Continuous *vs* intermittent supplementation of urea to beef cows on range during winter

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Two groups of cows had either free and continuous access to a urea supplement or access to the same supplement for only four days per week. Cows from both projects overwintered on rested summer range while all the cows received equal quantities of a daily supplement of *Eragrostis curvula* hay during the latter part of the winter. Neither body mass change of the cows, sex-corrected birth and 205-day weaning mass of the calves nor reconception of the cows were affected detrimentally when cows had access to a urea supplement for four days per week only, compared to those that had continuous access.

Twee groepe koeie het onderskeidelik onafgebroke toegang gehad tot 'n ureumlek of vir slegs vier dae per week toegang gehad tot dieselfde lek. Koeie uit albei groepe het oorwinter op geruste somerveld en 'n gelyke hoeveelheid *Eragrostis curvula* hooi as byvoeding ontvang gedurende die laat winterperiode. Die verandering in liggaamsmassa van die koeie, geslagsgekorrigeerde geboorte- en 205-dag-speenmassa van die kalwers en herkonsepsie van die koeie is geensins nadelig beïnvloed nie waar die koeie slegs vier dae per week toegang gehad het tot 'n ureumlek, teenoor die koeie wat onafgebroke toegang gehad het.

Keywords: Urea, intermittent supplementation, winter

South Africa rank among the top countries in the world with regard to the use of urea in rumen stimulating lickblocks. Louw (1979) estimated that the total cost involved in stock licks for beef production in Southern Africa was approximately R20 million per annum.

Although it is generally accepted that true protein is more beneficial than urea in supplying protein to beef cattle wintered on low quality forage (Oltjen, Burns, & Ammerman, 1974; Clanton, 1978; Grant, 1979), natural protein is not used extensively in this country owing to inconsistent and low supplies and accompanying high prices.

There are many factors which influence the efficiency with which urea-N is utilized by ruminants and these factors have been comprehensively reviewed by Reid (1953); Tillman (1967) and Loosli & McDonald (1968). The adaptation of ruminants to diets containing non-protein nitrogen (NPN) can be regarded as one of the factors that have led to contradictions in the literature. Several researchers (cited by Bond, Oltjen & Weinland, 1978) have reported that only after a period of four to six weeks will diets high in NPN be utilized to a maximum. In a series of metabolism trials, Oltjen, Williams, Slyter & Richardson (1969) found that steers fed urea adapted after seven days. However, Johnson & McClure (1964) and Oltjen *et al.* (1974) found little, if any, changes in utilization of NPN.

Following the adaptation phenomenon, one of the problems frequently encountered by beef producers using urea supplements is whether cattle should at all times have continuous and uninterrupted access to urea. The objective of this study was therefore to determine whether it would be detrimental to the beef cow if she had access to a urea supplement for only four days per week compared to cows which had continuous access.

Two separate experiments were conducted. Experiment 1 was initiated during the autumn of 1979 and was terminated in November of the same year. Experiment 2 commenced during the autumn of 1981 and terminated in the autumn of 1982. The cows from both experiments had free access to a protein supplement consisting of 48,4% sodium chloride, 19,4% yellow maize meal, 16,1% urea and 16,1% dicalcium phospate while they grazed rested winter range for the full duration of the winter. The protein supplement had a protein equivalent content of 48%.

Both experiments consisted of the following two treatments.
Group 1: Control — cows had free access to the protein supplement at all times.
Group 2: Cows had access to the protein supplement for only four days per week, i.e. from Monday morning until Friday morning and then no supplement until the following Monday morning.

The two treatment groups were rotated every 14 days, thereby eliminating any possible paddock effect.

In Experiment 1, 18 non-pregnant Africander × Sussex cows, aged between four and five years, were randomly allocated according to age to the two treatments already described. From 14 August until 6 November the cows from both groups received a daily supplementation of 6 kg *Eragrostis curvula* hay.

Forty-nine pregnant Africander × Sussex cows, aged between four and five years, were randomly allocated, according to age, to the two treatment groups in Experiment 2. From approximately three weeks prior to and until the start of the calving season (from 12 August – 6 September) all the cows were supplemented with 6 kg *E. curvula* hay per day. From 6 September until 13 November the cows from both treatments received a daily supplement of 8 kg *E. curvula* hay. The supplementation of protein was terminated on 13 November. The breeding season extended from 1 December until 5 February and only one Sussex bull was put to each group of cows. A pregnancy diagnosis was performed during May to record the percentage cows which had conceived. The calves were weaned the same day.

The birth mass of heifers was adjusted to a bull equivalent (birth mass × 1,048) and the weaning mass was converted to a 205-day steer equivalent by multiplying the age-adjusted mass of heifers by 1,05 (Rush & Totusek, 1976).

The cost of the protein supplement was R192 per 1000 kg. Student's t-test was used to compare treatment means (Snedecor & Cochran, 1967).

In both experiments, the cows that had access to the protein supplement for four days a week (Group 2), consumed less of the supplement than the cows that had uninterrupted access (Table 1). This tendency was evident throughout the experimental periods (Exp. 1: 213 days, Exp. 2: 203 days), but was more pronounced during the initial stages of the experiments, i.e. when the cows had access to rested winter range

Table 1 Average daily intakes of protein supplement and crude protein and protein supplement costs.

	Access to protein supplement	
Daily supplement intake (g/animal)	Continuous	4 Days per week
Experiment 1		
Range only	617	422
Range plus *E. curvula* hay	215	189
Full period (213 days)	360	273
Crude protein intake (213 days)	173	131
Cost of protein supplement (R/cow/213 days)	14,75	11,19
Experiment 2		
Range only	500	405
Range plus *E. curvula* hay	196	158
Full period (203 days)	292	235
Crude protein intake (203 days)	140	113
Cost of protein supplement (R/cow/203 days)	11,41	9,18

Table 2 Average body mass differences, sex corrected birth and 205-day weaning mass of calves.

	Access to protein supplement		
	Continuous	4 Days per week	Significance
Experiment 1			
Number of cows	9	9	
Average live body mass (kg/cow)			
Start of experiment	405,3 ± 57,4	412,2 ± 86,2	NS
End of experiment	429,2 ± 43,4	430,6 ± 84,0	NS
Difference	23,9	18,4	
Experiment 2			
Number of animals	25	24	
Average live body mass (kg/cow)			
Start of experiment	438,8 ± 42,4	442,3 ± 46,3	NS
Pre partum	436,3 ± 38,3	431,5 ± 40,5	NS
Post partum	412,8 ± 33,9	416,3 ± 43,2	NS
Weaning	419,0 ± 28,5	442,1 ± 37,0	$P \leqslant 0,05$
Difference (Start-weaning)	− 19,8	− 0,2	
Sex corrected birth mass (kg/calf)	36,1 ± 4,0	35,8 ± 3,5	NS
Sex corrected 205-day weaning mass (kg/calf)	185,7 ± 16,7	193,8 ± 21,3	NS
Reconception (%)	79,2	83,3	

only. Immediately after the supplementation of *E. curvula* hay commenced, there was a drastic decrease in the consumption of the protein supplement. This same tendency was observed for both experiments (Table 1).

Not only was there no indication of greedy feeding the first day following the reintroduction of the lick supplement amongst the cows that had been deprived of the supplement for three days (Group 2), and hence no signs of urea poisoning, but there was also a considerable saving observed, favouring the interrupted supplementation of urea-licks to cows (Group 2, Exp. 1 — R3,56; Exp. 2 — R2,23).

The findings recorded in these studies are therefore contrary to the general belief that urea-licks fed only once weekly and consumed within approximately four days, could lead to accidents where greedy animals die owing to urea poisoning (Loosli & McDonald, 1968; Van der Merwe, 1970; Fonnesbeck, Kearl & Harris, 1975).

The most important aspect to the producer is not only whether a saving is incurred by feeding urea supplements once a week but whether this practice will lead to impaired production. The results from both studies indicated that when urea was fed for four days followed by no urea for three days, there was no detrimental effect to the animals (Table 2). Although no consistency prevailed with regard to changes in live body mass, it can be concluded that interrupted feeding of the urea supplements (Group 2, four days urea, three days no urea) is not disadvantageous to the cow.

In fact, although non-significant, the results from Exp. 2 indicated an improved sex-corrected 205-day weaning mass for calves and reconception rates for cows that received urea for four days followed by three days without any urea (Table 2). These results should certainly not be interpreted as a negative response to urea supplementation, but rather that interrupted supplementation of urea had no adverse effect on the cows.

Contrary to the results recorded in this study, a series of wintering trials by Oltjen *et al.* (1974) revealed that when steers were fed a urea-corn meal supplement on a daily basis, this was superior to feeding an equivalent amount three times a week. Similarly, Raleigh & Wallace (1965) found that calves wintered on grass hay and a urea containing supplement fed in small amounts three times daily gained more than calves fed the same hay and all the supplement once daily.

The discrepancy between the results recorded in these studies and for instance those by Oltjen *et al.* (1974), may lie in the nature of their trials, i.e. few animals (six per treatment), a very short wintering period (112-day trials) and artificially penned conditions. The conditions which prevailed in the trials reported here simulated the conditions in practice, i.e. at least a 200-day trial period during which urea was supplemented and greater animal numbers.

The results recorded in these studies tend to substantiate the belief that the action of urea-licks is very often misunderstood. Hence, divergent interpretations of advisors cause confusion among producers. For example, farmers are often advised that their cattle should have access to urea-supplements at all times, whereas according to the findings in both these trials, the absence of urea for three days per week appeared to have no detrimental effect. However, the findings must be viewed with caution, since no evidence is available to indicate what would happen if animals were deprived of urea for say four or even five days per week.

In the light of the detrimental effects of interrupting urea supplementation as shown by basic research the relevance of the present findings under practical ranching conditions should be evaluated or given greater prominence. It is clear that not enough cognizance is taken of the ability of the ruminant to recirculate urea.

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