Stability of vitamin A in dry season supplements

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Introduction

High perinatal calf mortality associated with gestational vitamin A deficiency has been reported during extended dry seasons in the Mitchell grass rangelands (Hill *et al.* 2009). Adding vitamin A to supplements may aid prevention however it is inherently sensitive to degradation. Stability depends upon the manufacturing conditions (heat, moisture and pH), oxidising potential of ingredients and storage conditions (Shurson *et al.* 2011). The objective of this study was to determine the stability of Vitamin A when included in dry season supplements manufactured using different methods.

Methods

Three commercially available dry season supplements were manufactured using contrasting manufacturing methodologies; loose lick (LL), molten blocks (MB) and cold pour blocks (CB). All supplements were blended in a horizontal ribbon mixer. The LL supplements were decanted directly into 25 kg bags. The MB mixture was transferred to a heat jacketed mixing vessel, and then poured into cardboard cartons at 90°C prior to hardening. Manufacturing of CB used a patented manufacturing method (IP No. 725349) under ambient temperature. The major ingredients in LL and MB were salt (275 - 300 g/kg as fed) and urea (250 - 300 g/kg). Composition of CB included 200 g/kg molasses, 150 g/kg urea and 100 g/kg salt. Rovimix® A 1000 (DSM) was included in each supplement to deliver 40 000 iu vitamin A/day. Expected concentrations were 240, 335, 270 iu Vitamin A/g for LL, MB and CB respectively. Samples were collected at day 0, 90 and 180 to determine Vitamin A status.

Results and Discussion

Vitamin A degradation was both immediate and extensive for LL and MB relative to target concentrations (see Table 1). The levels decreased between manufacturing and day 90 for LL and MB ($P<0.05$), approaching the limit of detection by 180 days. Vitamin A concentrations of CB remained stable for the duration of the trial. The use of a CB manufacturing process is likely to have greater efficacy than either LL or MB when attempting to deliver vitamin A via dry season supplements.

Table 1. Mean concentration of Vitamin A (iu/g) in dry season supplements stored over 180 days.

Day	LL*	MB*	CB*
0	80^{A} (33)	117^{A} (35)	307 (114)
90	21^{B} (9)	17^{B} (5)	257 (95)
180	10^{C} (4)	10^{B} (3)	267 (98)

Within columns, means with different superscript letters are significantly different ($P<0.05$).
*The percentage recovery of vitamin A relative to target concentrations is shown in brackets.

References

Hill BD, Holroyd RG, Sullivan M (2009) Clinical and pathological findings associated with congenital hypovitaminosis A in extensively grazed beef cattle. *Australian Veterinary Journal* **87**, 94-98.

Shurson GC, Salzer TM, Koehler DD, Whitney MH (2011) Effect of metal amino acid complexes and inorganic trace minerals on vitamin stability in premixes. *Animal Feed Science and Technology* **163**, 200-206.

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