The influence of long-term molybdenum supplementation (in drinking water or feed) on beef calf performance through weaning.

Thorndyke, M. P, O. Guimaraes, N. M Tillquist, B. V. Tangredi, J. Zervoudakis, and T. E. Engle.

Colorado State University

ABSTRACT

Fifty-four multiparous beef cows were used to examine the effect of molybdenum (Mo) supplemented in drinking water or feed on offspring performance. Cows were blocked by body weight (BW) and age into one of 6 groups. Group were then randomly assigned to treatment. Treatments consisted of: 1) Control (no supplemental Mo or Cu), 2) Control+Cu (3 mg Cu/kg DM from $CuSO_4 \cdot 5H_2O$ added to the basal diet), 3) Control + 500 µg Mo/L from $MoNa_2O_4 \cdot 2H_2O$ in drinking water (Mo 500-water), 4) Control + 1000 µg Mo/L of $MoNa_2O_4 \cdot 2H_2O$ in drinking water (Mo 1000-water), 5) Mo 1000-water plus 3 mg Cu/kg DM from $CuSO_4 \cdot 5H_2O$ added to the basal diet (Mo 1000-water+Cu, and 6) Control plus 3 mg Mo/kg DM from $MoNa_2O_4 \cdot 2H_2O$ added to the basal diet (3.0 Mo-diet). Cows were housed in dry lot pens (n=3 cows/pen; 3 pens/treatment) and fed a low-quality grass hay diet (DM basis: 6.6% CP; 0.14% S, 6.2 mg Cu/kg, 2.3 mg Mo/kg) and a protein supplement (30 %CP). Cows received their respective treatments beginning 60 d prior to breeding and remained on treatments until all calves were weaned at approximately 7 mo. of age. Calf birth weights were collected on the day of birth and all calves were weaned on the same day. Data were analyzed using a mixed effects model for a completely randomized block design. Birthweight, ADG, and 205d adjusted weaning weights were similar ($P > 0.05$) across treatments. These data indicate that Mo supplemented in the drinking water or the diet regardless of the inclusion of additional Cu did not impact calf performance through weaning.

INTRODUCTION

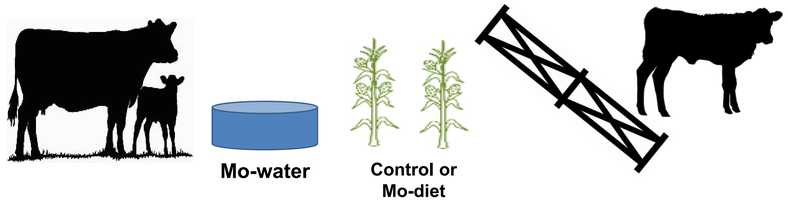
- The majority of research investigating the impact of Mo on Cu metabolism in ruminants has been conducted by supplementing varying concentrations of Mo to a basal diet. However, certain areas within the Rocky Mountains contain elevated Mo concentrations in livestock drinking water.
- Limited controlled research has been conducted investigating the impact of Mo water concentrations on beef cattle performance.
  - In 1980, Kincaid [1] conducted an experiment utilizing calves. Calves were allowed ad libitum access to drinking water containing targeted concentrations of 0.0, 1,000, 10,000, and 50,000 µg of Mo/L for 21 d. There were no differences in BW gain or water intake across all water treatments.
  - In 2017, Kistner et al [2] conducted an experiment utilizing growing feedlot steers. Steers were allowed ad libitum access to drinking water containing targeted concentrations of 1) 0.0 µg/L, 2) 160 µg/L, 3) 320 µg/L, 4) 480 µg/L, and 5) 960 µg/L for 131 d. There were no differences seen in performance, mineral status, water intake, or carcass characteristics.

RESULTS

Table 1. The effects of molybdenum exposure in drinking water on calf performance from birth to weaning.

	Treatment							
Item	Control	Control + Cu	Mo 500-water	Mo 1000-water	Mo 1000-water +Cu	Mo-diet	SEM	P<
n=, calf per trt	9.0	9.0	8.0	8.0	9.0	7.0	---	---
n=, calves born	9.0	9.0	8.0	8.0	9.0	7.0	---	---
n=, calves at weaning	8.0	8.0	5.0	7.0	9.0	7.0	---	---
Calf body weight (kg)								
birth	32.21(±7.25)	33.86(±10.90)	28.00(±4.30)	27.60(±7.12)	29.77(±8.42)	33.31(±3.47)	1.13	0.51
205d adjusted weaning	203.33(±22.07)	231.88(±29.37)	197.08(±13.20)	211.53(±47.77)	230.47(±18.84)	186.99(±26.22)	4.72	0.18
Calf ADG (kg)	0.84(±0.97)	0.95(±0.11)	0.78(±0.08)	0.91(±0.22)	0.93(±0.07)	0.77(±0.13)	0.02	0.24

MATERIALS AND METHODS



- Cows received one treatment ~60 d prior to breeding
  - No supplemental Mo or Cu (Control)
  - 3 mg Cu/kg DM from $CuSO_4 \cdot 5H_2O$ added to the basal diet (Control+Cu)
  - Control + 500 µg Mo/L from $MoNa_2O_4 \cdot 2H_2O$ in drinking water (Mo 500-water)
  - Control + 1000 µg Mo/L of $MoNa_2O_4 \cdot 2H_2O$ in drinking water (Mo 1000-water)
  - Mo 1000-water plus 3 mg Cu/kg DM from $CuSO_4 \cdot 5H_2O$ added to the basal diet (Mo 1000-water + Cu)
  - Control plus 3 mg Mo/kg DM from $MoNa_2O_4 \cdot 2H_2O$ added to the basal diet (Mo-diet)
- Calves received same treatments as dams until ~7mo of age
- At ~7mo of age calves were weaned from cows and stopped receiving treatments

DISCUSSION

- Birthweight, ADG, and 205d adjusted weaning weights were similar ($P > 0.05$) across treatments.
- Chronic increases in Mo concentrations in diet or water do not appear to affect growth or efficiency in suckling to weaning beef calves.
- Further investigation is needed to determine the effects of chronic Mo intake on beef animal life cycles.

CONCLUSION

- These data indicate that Mo supplemented in the drinking water or the diet regardless of the inclusion of additional Cu did not impact calf performance through weaning.
- Information from study is useful to determine the interactions of Mo in the body based on source of intake.

REFERENCES

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