DOES CALCIUM PROPIONATE ELICIT SIMILAR GROWTH AND REPRODUCTIVE RESPONSES AS MONENSIN IN DEVELOPING HEIFERS?

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Introduction

- Ionophores improve feed efficiency in heifers and decreases age at puberty (Goodrich et al., 1984)
    - Decrease in age to puberty likely due to increased propionate to acetate ratio (Sprott et. al. 1988)
- Propionate salts have been used as a supplement ingredient in past research
    - Young, postpartum range cows fed calcium propionate altered nutrient partitioning toward body weight gain and showed improved reproductive efficiency independent of measurable BW dynamics (Endecott et. al., 2012; Mulliniks et al., 2011; Waterman et al., 2006)

Objective

The objectives of the study were to investigate the growth and reproductive responses of developing heifers fed similar basal diets supplemented with pellets containing no feed additive, monensin or calcium propionate.

Materials and Methods

- Project Location: Bair Ranch, Martinsdale, Montana
- January 6, 2016 through May 4, 2016
- n=198 heifers stratified by BW and randomly assigned to 1 of 6 pens
- Treatments randomly assigned to pens (2 pens/treatment)
- Treatments consisted of 2.27 kg·heifer^{-1}·d^{-1} (65% TDN, 11% CP, DM basis) pellets containing:
    - control, no feed-additive (CON)
    - 200 mg·heifer^{-1}·d^{-1} monensin (Rumensin®, Elanco; MON)
    - 40 g·heifer^{-1}·d^{-1} calcium propionate (NutroCAL™, Kemin Industries, Inc.; PRO)
- Pellets had a TDN 70% and CP was 22% on a DM basis
- BW collected at the beginning and end of the study
    - Interim BW collected every 4 wk
- Serum samples (n = 4) collected via coccygeal venipuncture for progesterone analysis
    - Beginning (n = 2 samples, 10 days apart) and end (n = 2 samples, 10 days apart)
- Serum analyzed using an Elisa assay (Enzo Life Sciences, Farmingdale, NY)
    - Pubertal if one or both progesterone concentrations were > 1 ng/mL.
- Categorical data (puberty and pregnancy rate) analyzed using PROC CATMOD of SAS
- Body weight and ADG were analyzed using PROC MIXED of SAS
- Synchronized beginning May 4, 2016, with a Select Synch protocol
    - Turned out with cleanup bulls
- Pregnancy tested August 19, 2016 via rectal ultrasonography
    - Fetuses aged by ranch veterinarian and deemed either AI or cleanup-bull sired

Results and Discussion

Table 1. Effects of pellet treatments with differing feed additives on developing heifer reproductive and growth traits.

	Pellet Treatments				
	CON	MON	PRO	SE	*P*-value
Percent pubertal at experiment start	73 (48/66)	71 (47/66)	44 (29/66)	--	< 0.01
Percent pubertal at experiment end	80 (53/66)	82 (54/66)	64 (42/66)	--	0.03
Response to synchronization, %	98 (65/66)	86 (57/66)	79 (52/66)	--	0.02
Pregnancy rate to AI, % (pregnant/inseminated)	63 (37/59)	63 (34/54)	57 (29/51)	--	0.77
Overall pregnancy rate, %	90 (54/60)	81 (52/64)	94 (60/64)	--	0.32
Initial BW, kg	254	254	255	3.8	0.94
Final BW, kg	383	387	380	3.8	0.44
Overall ADG, kg/d	1.08	1.12	1.00	0.04	0.21

- A treatment effect for percent heifers pubertal was observed
    - Less than half of the heifers in PRO were pubertal compared to over 70% for CON and MON
    - Percent pubertal heifers increased in PRO by twice as much as the other groups
    - Still fewer pubertal heifers in PRO at end of experiment
- Percent of heifers responding to synchronization also impacted
- Similar numbers in each group were diagnosed pregnant to AI
- Overall pregnancy rates were similar among treatments
- Overall ADG and final BW similar among treatments
- A period × treatment interaction (*P* = < 0.01) was observed for ADG (data not shown)
- MON had similar growth and reproductive responses to heifers fed supplement with no feed additive, contrary to results reported in previous reviews (Sprott et al., 1998)

Conclusions and Implications

Conclusions regarding the effectiveness of calcium propionate as a supplement in heifer development programs are hard to draw from this study given that puberty achievement was not similar among treatment groups at the beginning of the experiment. Further research is warranted to elucidate the impact of calcium propionate as a feed additive for growing heifers.

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