

Effect of Oral Calcium Propionate on Blood Calcium and Energy Metabolite Concentrations in Dairy Cows with Dystocia Fed a Prepartum Anionic Diet

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Introduction

Results from research on the calcium and energy status of cows affected with dystocia have not been conclusive. We hypothesize that during early post-partum (pp), similar to cows with retained placenta and uterine prolapse, cows with dystocia develop subclinical hypocalcemia, as well as ketosis. Therefore, the objectives of this study were: (1) to describe the total blood calcium (tCa), betahydroxybutyrate (BOHB) and non-esterified free fatty acid (NEFA) concentrations in blood during the first 12 days pp in dairy cows with dystocia, 2) to determine if an oral calcium propionate drench at calving and 72 hours later improves blood calcium concentration and energy status.

Materials and Methods

The study was a randomized therapeutic trial conducted in a 600-Holstein cow dairy farm in north Florida. Transition cows were fed a TMR and the prepartum diet was supplemented with anionic salts to attain a DCAD of -70 to -90 mEq/kg [-32 to -41 mEq/lb] dry matter. Multiparous cows that required calving assistance for > 15 minutes with moderate difficulty for extraction were included in the study. The outcomes of interest were tCa, NEFA and BOHB concentrations in blood during the first 12 days pp. Cows with dystocia were randomly assigned into two groups. Treated orally (Dy-t: n = 21) with 516 g of calcium propionate (providing 110 g of calcium, 400 g of propionate, 1.5 g of zinc and 0.5 g of copper) plus 110 g of potassium chloride and 150 g of magnesium sulfate, mixed with 10 gallons of water and not treated (Dy: n = 20). Twenty-eight cows without dystocia and no treatment were considered as controls (N-ctrl, n = 28). Treatments were administered within six hours after calving assistance and again 72 hours pp by the principal investigator. A blood sample from each cow was obtained within six hours after calving (day 0) before treatment and at days 1, 2, 3, 6 and 12 pp. Concentrations of tCa, NEFA and BOHB, during days 0, 1, 2, 3, 6, and 12 pp were compared between groups using ANOVA for repeated measures by the mixed procedure of SAS 9.1.

Results

No differences on tCa at parturition was found between groups on day 0 (Dy: 7.8 ± 0.16 ; Dy-t: 8.0 ± 0.17 and N-ctrl 7.5 ± 0.14 mg/dL; $P < 0.2$). Thirty four percent (24/69) of cows had subclinical hypocalcemia (calcium levels < 7.5 mg/dl) at parturition (Dy: 38%; Dy-t: 27% and N-ctrl: 37%). A day-by-group interaction was found to be significant ($P < 0.01$). Cows in the N-ctrl and Dy groups increased their tCa levels during the first 48 h pp. However, tCa levels in the Dy group were lower ($P < 0.05$) than N-ctrl cows on day 2 pp. In contrast, cows in the Dy-t group did not have an increase on tCa during the first two days pp and on days 2 and 3 pp, tCa concentrations were lower ($P < 0.01$) when compared to Dy and N-ctrl cows. After day 3 pp, no differences on blood tCa were found between groups. No difference on BOHB concentration at parturition was found between groups (Dy: 8.1 ± 0.12 ; Dy-t: 8.5 ± 0.12 and N-ctrl: 9.0 ± 0.22 g/dL; $P < 0.4$). Neither dystocia nor treatment had an effect on BOHB concentration ($P < 0.7$). At parturition NEFA concentration were similar between groups (Dy: 0.52 ± 0.09 ; Dy-t: 0.53 ± 0.08 and N-ctrl: 0.62 ± 0.1 mEq/L). A day-by-group interaction was significant ($P < 0.05$) for NEFA concentrations. Cows in the Dy group had higher NEFA concentrations on day two pp compared to Dy-t and N-ctrl ($P < 0.05$).

Significance

Dystocia affects blood NEFA and calcium concentrations during the first 12 days pp. Oral drenching with calcium propionate to cows with dystocia decreased blood NEFA concentrations 48h after calving. Dystocia with or without treatment did not have an effect on BOHB concentrations during the first 12 days pp. Oral drenching with calcium propionate within six hours after calving lowered blood calcium concentration during the first three days pp in cows with dystocia fed a prepartum anionic diet.