Mediators of calcium homeostasis in cows with differing postparturient calcium dynamics

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Introduction

Many multiparous dairy cows experience subclinical hypocalcemia (SCH) in the immediate postpartum period as they adapt to the demands of lactation. Furthermore, differing dynamics of SCH in the days following parturition are associated with varied health and production outcomes, with cows experiencing transient SCH producing more milk and facing fewer negative health events than cows with delayed or persistent SCH. Our objectives were to describe differences in mediators of Ca homeostasis between cows experiencing different dynamics of SCH.

Materials and methods

A prospective cohort of 89 multiparous Holstein cows from 2 herds in New York were classified into 1 of 4 SCH groups based on mean serum total Ca (tCa) at 1 and 4 DIM: normocalcemic (NC; [tCa] >1.89 mmol/L at 1 DIM and >2.25 mmol/L at 4 DIM, n = 30); transient SCH (tSCH; [tCa] ≤1.89 mmol/L at 1 DIM and >2.25 mmol/L at 4 DIM, n = 12); delayed SCH (dSCH; [tCa] >1.89 mmol/L at 1 DIM and ≤2.25 mmol/L at 4 DIM, n = 23); and persistent SCH (pSCH; [tCa] ≤1.89 mmol at 1 DIM and ≤2.25 mmol/L at 4 DIM, n = 24). Serum was analyzed for tCa and parathyroid hormone (PTH), and whole blood will be analyzed for serotonin (ST). Explanatory repeated measures ANOVA models were used to analyze differences between SCH groups and changes over time for tCa and PTH for the first 10 DIM.

Results

Serum tCa was different between SCH group ($P < 0.001$) and was greatest in the NC cows compared to the tSCH, pSCH and dSCH cows (2.36 ± 0.03 mmol/L vs 2.20 ± 0.05, 2.02 ± 0.04, and 2.18 ± 0.04 mmol/L, respectively). Concentrations of PTH changed over time ($P < 0.001$) and were greatest for all cows at 1 DIM. There was a statistical tendency for a difference in PTH between SCH groups ($P = 0.1$) with dSCH and pSCH cows having greater concentrations of PTH than NC and tSCH cows (742.4 [95% CI = 691.6, 801.9] and 718.9 [95% CI = 673.9, 770.4] pg/mL vs 667.1 [95% CI = 631.7, 706.7] and 684.0 [95% CI = 628.1, 750.8] pg/mL).

Significance

Our results suggest that mediators of Ca homeostasis vary between cows experiencing different dynamics of SCH. Understanding these modulatory differences may aid in the prevention, management and treatment of SCH.

