Association of subclinical hypocalcemia dynamics on dry-matter intake, milk yield, and plasma mineral status during the periparturient period

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Introduction

Subclinical hypocalcemia (SCH) affects many high-producing dairy cows in the postpartum period. Recent work has shown that cows experiencing prolonged or delayed SCH are at increased risk for disease and produce less milk than cows experiencing a transient reduction or normal concentrations of plasma Ca. Our objective was to determine the association between the dynamics of SCH with pre- and postpartum dry matter intake (DMI), milk yield, and plasma mineral concentrations.

Materials and Methods

Data were retrospectively collected from multiparous Holstein cows (n = 78). Daily individual intakes were recorded from 14 d relative to calving until 21 days-in-milk (DIM). Cows were milked thrice daily, and daily milk yield was recorded for the first 6 wk of lactation. Blood samples were collected from the coccygeal vessels for the first 6 DIM and at 10 DIM for analysis of plasma total Ca (tCa), P, and Mg. Prior to statistical analysis, cows were classified into 1 of 4 SCH groups based on mean plasma tCa concentrations at 1 and 4 DIM: normocalcemic (NC; [tCa] > 1.95 mmol/L at 1 DIM and > 2.2 mmol/L at 4 DIM, n = 28); transient SCH (tSCH; [tCa] ≤ 1.95 mmol/L at 1 DIM and > 2.2 mmol/L at 4 DIM, n = 27); delayed SCH (dSCH; [tCa] > 1.95 mmol/L at 1 DIM and ≤ 2.2 mmol/L at 4 DIM, n = 6); and persistent SCH (pSCH; [tCa] ≤ 1.95 mmol at 1 DIM and ≤ 2.2 mmol/L at 4 DIM, n = 17). Linear mixed models were created to analyze the change in pre- and postpartum DMI, milk yield, and plasma mineral concentrations over time as well as the differences between SCH groups.

Results

Intake decreased during the prepartum period and rose steadily after calving (P < 0.001). Postpartum DMI differed by SCH group (P < 0.001), with NC and tSCH cows consuming more than the dSCH cows (P < 0.001; 45.7 ± 0.9, 46.6 ± 1.1, and 40.9 ± 2.0 lb/d [20.8 ± 0.4, 21.2 ± 0.5, and 18.6 ± 0.9 kg/d], respectively). Milk yield increased as lactation progressed (P < 0.001) and was different by SCH group, with tSCH cows producing more milk than the NC, pSCH, and dSCH cows (P = 0.01; 107.5 ± 2.2, 105.2 ± 2.2, and 91.9 ± 4.8 lb/d [48.9 ± 1.0, 47.8 ± 1.0, 44.8 ± 1.4, and 41.8 ± 2.2 kg/d], respectively). Plasma tCa increased over time and was different between SCH groups (P < 0.001), with NC experiencing greater tCa concentrations than the other 3 groups. Plasma Mg changed over time (P < 0.001) and was different by SCH group (P = 0.03), with NC cows experiencing the greatest concentrations of plasma Mg.

Significance

The increase in postpartum DMI and milk yield observed in the NC and tSCH cows suggest that these animals experienced a more appropriate homeostatic response to the increased Ca demands of lactation than their counterparts experiencing prolonged or delayed episodes of SCH.