

Effect of prophylactic calcium supplementation on regulators of calcium homeostasis in multiparous Holstein cows

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Post parturient subclinical hypocalcemia (**SCH**) in dairy cows, a common metabolic disease which arises from the increased calcium demands of early lactation, has been associated with decreased milk production and negative health outcomes. Our objective was to determine how postpartum calcium supplementation methods, and the timing of their administration, affect blood calcium concentrations and regulators of calcium homeostasis, specifically parathyroid hormone and calcitonin. We conducted a randomized controlled trial on 62 multiparous dairy cows on a commercial dairy in Cayuga County, New York. Each cow was assigned to 1 of 4 treatment groups immediately after calving: 1) control (**CONT**; no calcium supplementation, n = 15); 2) conventional bolus (**BOL-C**; 43 g oral calcium bolus administered immediately after calving and 24 h later, n = 17); 3) delayed bolus (**BOL-D**; 43 g oral calcium bolus administered 48 h and 72 h after calving, n = 15); or 4) subcutaneous infusion (**SQ**; 500 mL 23% calcium borogluconate infused subcutaneously once immediately after calving, n = 15). Blood was collected at calving and every 8 h through 96 h, then at 120 and 168 h postpartum. Linear mixed models were created to analyze changes in serum total Ca (**tCa**) over the first 168 h after parturition and assess differences between treatment groups. Serum tCa was not different at the time of enrollment between treatment groups ($P = 0.92$), but mean tCa over 168 h postpartum differed between groups ($P < 0.001$). Cows in the BOL-C group had higher mean tCa (2.11 [95% CI = 2.05, 2.17] mmol/L) than SQ cows (1.99 [1.95, 2.05] mmol/L; $P = 0.008$); however, we did not observe differences in mean tCa between CONT cows (2.08 [95% CI = 2.02, 2.14] mmol/L) and cows in the BOL-D (2.07 [95% CI = 2.01, 2.14] mmol/L; $P = 0.99$), BOL-C ($P = 0.75$), or SQ ($P = 0.16$) groups. Our findings suggest that subcutaneous infusion of calcium at calving might interfere with calcium homeostasis postpartum, and analysis of parathyroid hormone and calcitonin might provide further insight into this disruption.

Key words: hypocalcemia, calcium supplementation, parathyroid hormone