

# Assessment of systemic inflammation following oral calcium supplementation in postpartum dairy cows – a pilot-scale randomized controlled trial

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## Introduction

A new line of thinking is emerging to link inflammation with calcium metabolism. Around parturition, dairy cows inevitably and perhaps necessarily experience some degree of systemic inflammation, but excessive or dysregulated inflammation likely contributes to inflammatory disease. Immune activation decreases blood Ca, so greater extracellular Ca availability may potentiate or sustain inflammation. Hypocalcemia may be an adaptive response to inflammation. The objective of this study was to investigate a possible role of supplemental calcium (Ca) in postpartum systemic inflammation in dairy cows. We hypothesized that in clinically healthy multiparous cows, postpartum administration of supplemental Ca may increase serum concentrations of markers of inflammation.

## Materials and methods

Healthy cows ( $n = 101$ ) from two commercial farms in Ontario (475 and 460 lactating cows) calving into parity 2, 3 or 4 between September and December 2021 were enrolled. Cows were balanced by parity group and randomly assigned to receive an oral bolus of Ca (42 g of Ca) within 12 h after calving and a 2nd bolus 12 h later (TRT;  $n = 51$ ), or no Ca supplementation (CON;  $n = 49$ ). The outcomes were serum concentrations of haptoglobin (Hp), albumin (ALB), lipopolysaccharide binding protein (LBP) and Serum Amyloid A (SAA). Total serum Ca (tCa), Hp and ALB concentrations were assessed at 0 (<12 h postpartum), 0.5, 1, 2, 4, 6 and 8 d after enrollment; and LBP and SAA were assessed at 0, 2 and 4 d after enrollment. Cows with clinical disease were excluded ( $n = 14$ ). Linear regression models of each outcome accounting for repeated measures included treatment, parity, farm, sampling d, baseline value (d0) of the outcome, and the interactions of treatment with farm, parity and sampling d. Results are presented as LSM and 95% CI.

## Results

Calcium concentration tended to be greater at 0.5 d (TRT 2.07 mmol/L [2.03-2.12]; CON 2.01[1.96-2.06],  $P = 0.06$ ) and was lesser at 2 d (TRT 2.18 [2.13-2.23]; CON 2.27 [2.23-2.32],  $P = 0.007$ ) in TRT than CON cows. Second parity TRT cows had greater LBP concentrations than 2nd parity CON cows (TRT 2.28 ng/mL [2.06-2.50]; CON 1.99 [1.77-2.21],  $P = 0.07$ ), with no difference in older cows; TRT cows had greater SAA concentrations at 2 d (TRT 135 ug/mL [124-146]; CON 114 [75-106],  $P = 0.009$ ) with no differences at 4 d ( $P = 0.72$ ). Treatment had no effect on ALB or Hp ( $P > 0.92$ ).

## Significance

In this small-scale trial, oral Ca supplementation produced a small transient increase in blood Ca and a modest increase of 2 of 4 measured markers of inflammation. Considered with larger clinical trials, calcium supplementation strategies should be implemented selectively by farm and by parity and risk factors within farms.

