

Field trial of two calcium supplements on early lactation health and production in multiparous Holstein cows

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Introduction

Subclinical hypocalcemia is a common and costly metabolic disorder of dairy cows in the early postpartum period and has been associated with hyperketonemia, displaced abomasum, retained placenta, metritis and mastitis, decreased reproductive performance, and decreased milk production. Prevention of subclinical hypocalcemia thus represents a sizable opportunity for avoiding other postpartum diseases in dairy cows, thereby improving animal well-being and farm economics. To our knowledge, oral and injectable calcium supplements have not been compared in a field trial on a commercial dairy. Our objectives were to 1) observe serum Ca concentrations in the first 48 h postpartum in cows supplemented with oral Ca or subcutaneous Ca and non-supplemented cows and 2) evaluate the association of these supplements with diagnosis of metritis, displaced abomasum, mastitis, and early lactation disease (any of the diseases milk fever, retained placenta, metritis, or displaced abomasum), removal from the herd, pregnancy to first insemination, and average d milk yield by wk for the first 10 wk of lactation.

Materials and Methods

We conducted 2 experiments on 1 commercial herd in New York State. In our first experiment, multiparous Holstein cows ($n = 30$) were blocked by parity (parity 2 vs parity ≥ 3) and sequentially assigned at calving to: 1) non-treated control (CON, $n = 10$), 2) subcutaneous administration of 500 mL 23% Ca gluconate at calving (SC, $n = 10$), or 3) administration of an oral Ca bolus containing 43 g of calcium at calving and again 12 h later (OB, $n = 10$). Blood was collected before treatment and at 1, 2, 4, 8, 12, 24, and 48 h thereafter for measurement of serum total Ca concentration. Differences in serum Ca concentration between treatment groups were analyzed using mixed-effects repeated-measures ANOVA. In our second experiment, 1,478 multiparous Holstein cows were sequentially assigned by calving date to the same 3 treatments (CON, n

= 523; SC, $n = 480$; OB, $n = 475$), with administration of the second oral Ca bolus at 7 to 32 h postpartum. Fixed-effects multivariable Poisson regression was used to assess differences between treatment groups for the risk of pregnancy to first insemination, disease outcomes, and removal from the herd, and differences in average d milk production were analyzed using mixed-effects repeated-measures ANOVA.

Results

For experiment 1, OB cows had higher Ca concentrations from 1 through 24 h post treatment, and SC cows had higher Ca concentrations from 1 through 12 h post treatment compared with CON cows. In experiment 2, there was no difference in risk of metritis, displaced abomasum, or early lactation disease diagnosis between treatment groups or in risk of pregnancy to first insemination. Treatment with OB or SC had no effect on average d milk yield by wk for the first 10 wk of lactation compared with CON cows (OB = 47.0 kg; SC = 47.1 kg; CON = 46.7 kg). Cows treated with OB or SC that had above average herd milk production in the previous lactation were half as likely to be diagnosed with mastitis in the first 60 DIM compared with CON cows (risk ratio for both OB or SC versus CON = 0.5, 95% confidence interval = 0.3 to 0.9).

Significance

Although Ca supplementation raised serum total Ca compared with no supplementation, and the effect of oral Ca supplementation was more persistent than that of subcutaneous Ca supplementation, blanket Ca supplementation had no effect on milk yield, pregnancy to first insemination, early lactation disease incidence, or early lactation herd removal. Whereas herds using appropriate prepartum nutrition and management strategies may not benefit from blanket Ca supplementation, Ca supplementation might be warranted in targeted sub-populations as we found that it halved the risk of mastitis in high-producing multiparous cows.