# Differential effect of a single dose of oral Ca based on postpartum plasma Ca concentration in Holstein cows

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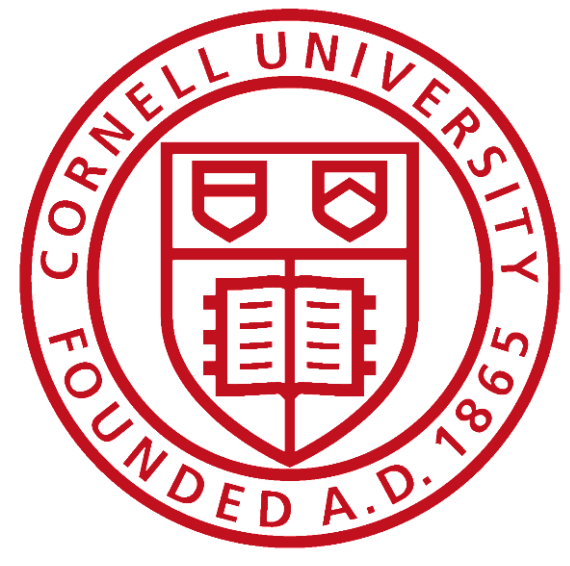
Introduction

o Subclinical hypocalcemia (SCH) impacts health and performance of dairy cows and preventative strategies can improve outcomes but do not eliminate the disorder (Martinez et al., 2012, Chapinal et al., 2012, Leno et al., 2017)

o A single dose of oral Ca at parturition requires less labor and cow handling and may avoid some of the negative responses observed as a result of multiple dosing strategies (Martinez et al., 2016)

Objectives

Determine the effect of a single oral dose of Ca within 24 h after parturition on:
1) Health and performance outcomes with consideration of differential responses due to periparturient risk factors
2) Differential health and performance outcomes based on plasma Ca status prior to treatment assignment

Materials & Methods

o 3,949 cows were enrolled on 6 commercial herds between February and December 2015
o **Treatment assignment**: randomized to control (CON) or bolus (BOL) within 24 h of parturition by parity group (1st, 2nd, ≥3rd)

| CON: No intervention | BOL: One dose of oral Ca (53-63 g of Ca in 3 boluses) Quadrical, Biovet, Barneveld, WI |

o **Data collection:**
  ▪ Blood sample collected prior to treatment assignment for plasma total Ca determination
  ▪ Body condition (BCS) and locomotion scores assigned between 0 and 10 DIM
  ▪ Health disorders [retained placenta (RP), metritis, mastitis, displaced abomasum (DA)], culling, reproduction and test day milk data collected from DairyComp 305

o **Statistical analysis:** separate primiparous (PP; n = 987) and multiparous (MP; n = 2,962) multivariable models developed using Poisson regression with cows clustered by herd or repeated measures ANOVA with the random effect of herd

Objective 1) Treatment, periparturient risk factors and relevant interactions considered and models derived with manual backwards stepwise elimination ($P \leq 0.10$ required for inclusion)
Objective 2) In addition to above predictors, Ca status was dichotomized at several thresholds (Figure 2) and forced into the model with the interaction with treatment. Models were developed at each threshold and the model with the treatment by Ca status interaction with smallest probability of type I error is reported

Conclusions & Implications

Objective 1:
o Responses to a single dose of oral Ca were dependent on periparturient risk factors including lameness, BCS, age, and parity

Objective 2:
o MP cows with lower plasma Ca responded to BOL with improved health
o PP and MP cows with higher Ca status had inconsistent responses to Ca supplementation

➢ Supplementation with a single dose of oral Ca could be targeted to lame cows, cows with high BCS, cows entering parity ≥ 3, and PP cows with higher age at calving

➢ Measuring plasma Ca within 24 h after parturition has the potential to be a valuable tool for identifying MP cows to target with Ca supplementation

Results

o Risk ratios with 95% CI, and contrast P-values, are presented above the respective comparisons. Asterisks and crosses indicate that the threshold for significance is adjusted using a Bonferroni correction (* = $P \leq 0.025$, † = $P \leq 0.016$).
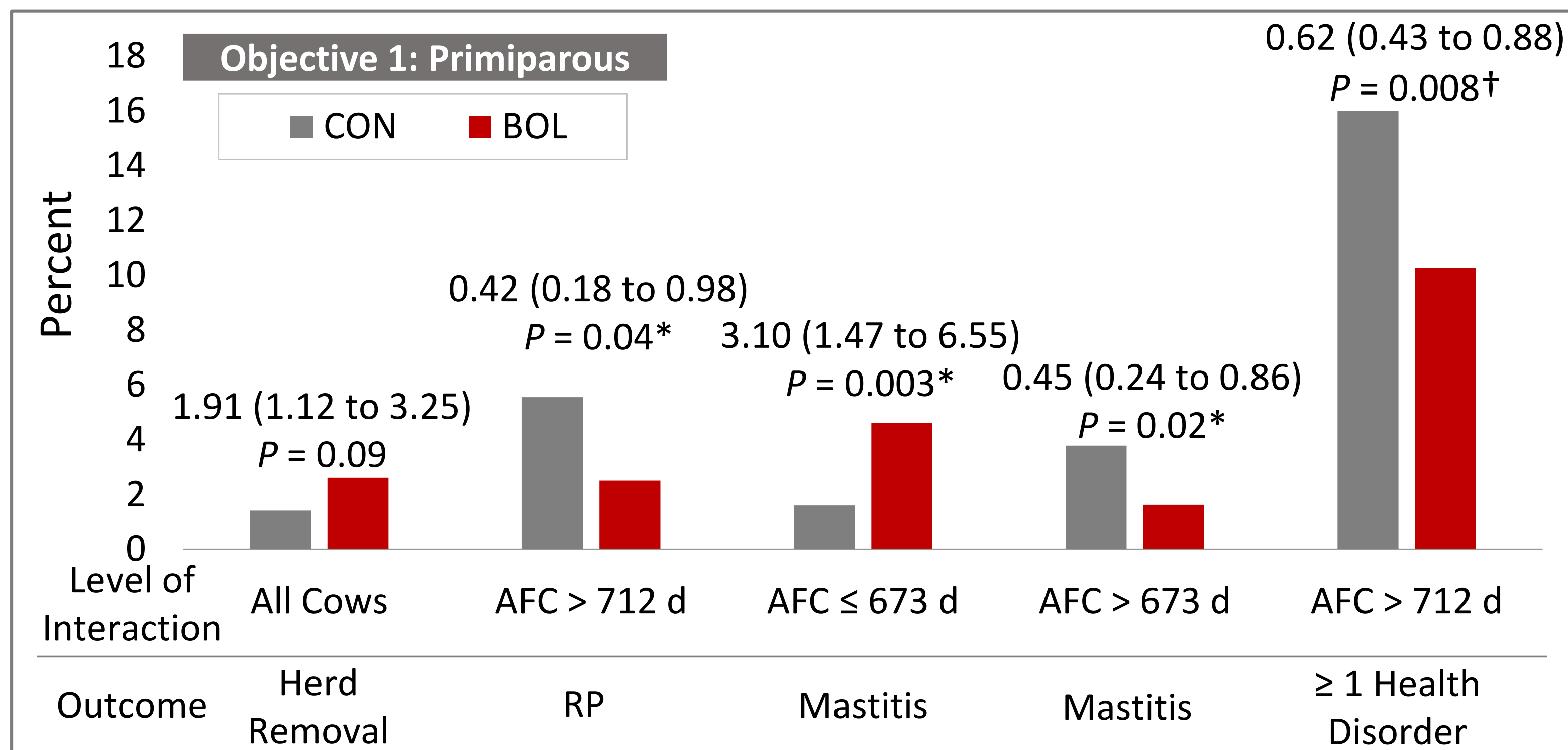

Figure 1. Incidence of health disorders for BOL vs. CON PP cows by level of interaction when applicable. AFC = age at first calving. Metritis and pregnancy to 1st service were not associated with treatment.
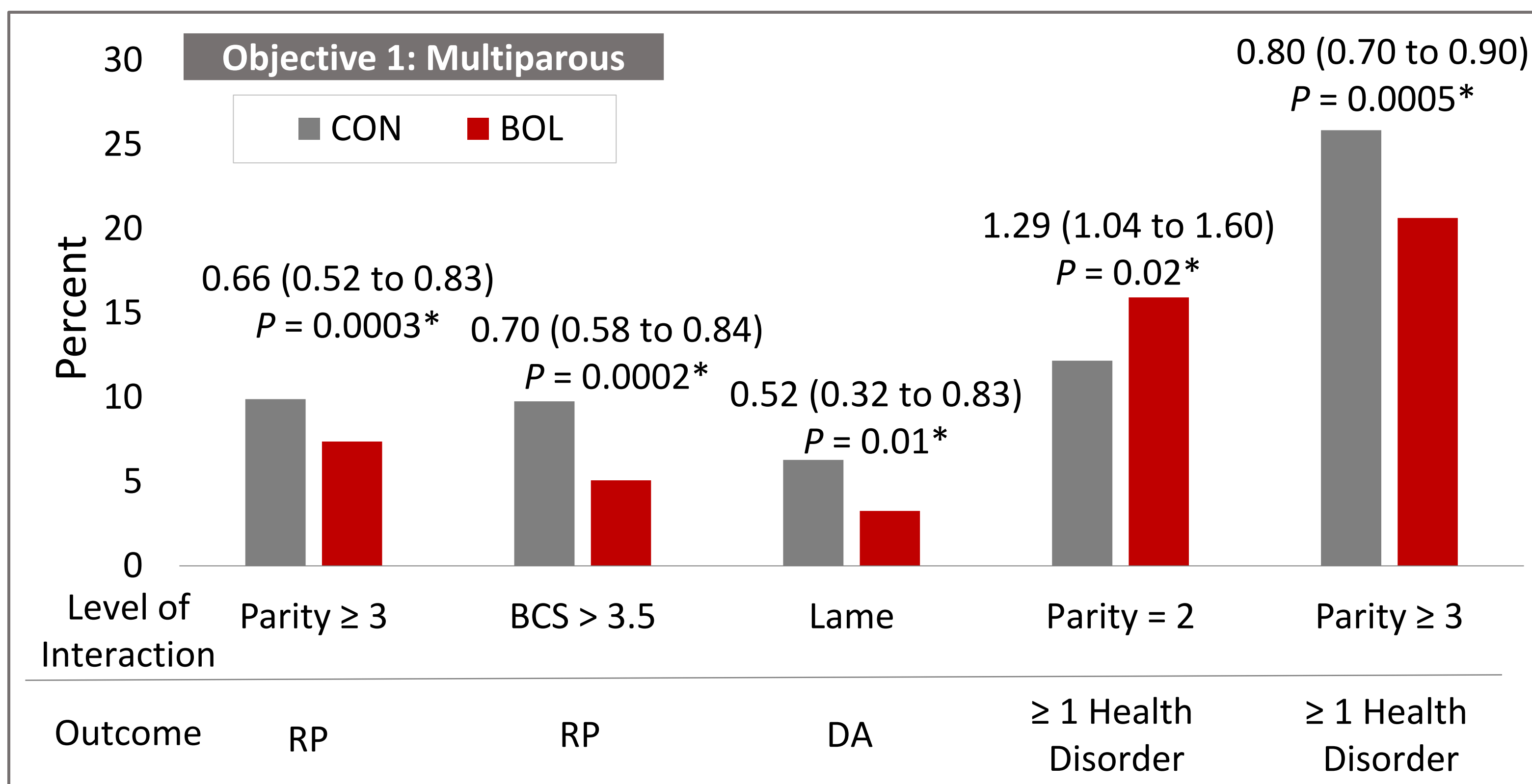

Figure 2. Incidence of health disorders for BOL vs. CON MP cows by level of interaction. Additional Ca treatment, metritis, mastitis, culling and pregnancy to 1st service were not associated with treatment.

Table 1. Milk yield across the first 4 test days for CON and BOL by level of interaction or Ca status group

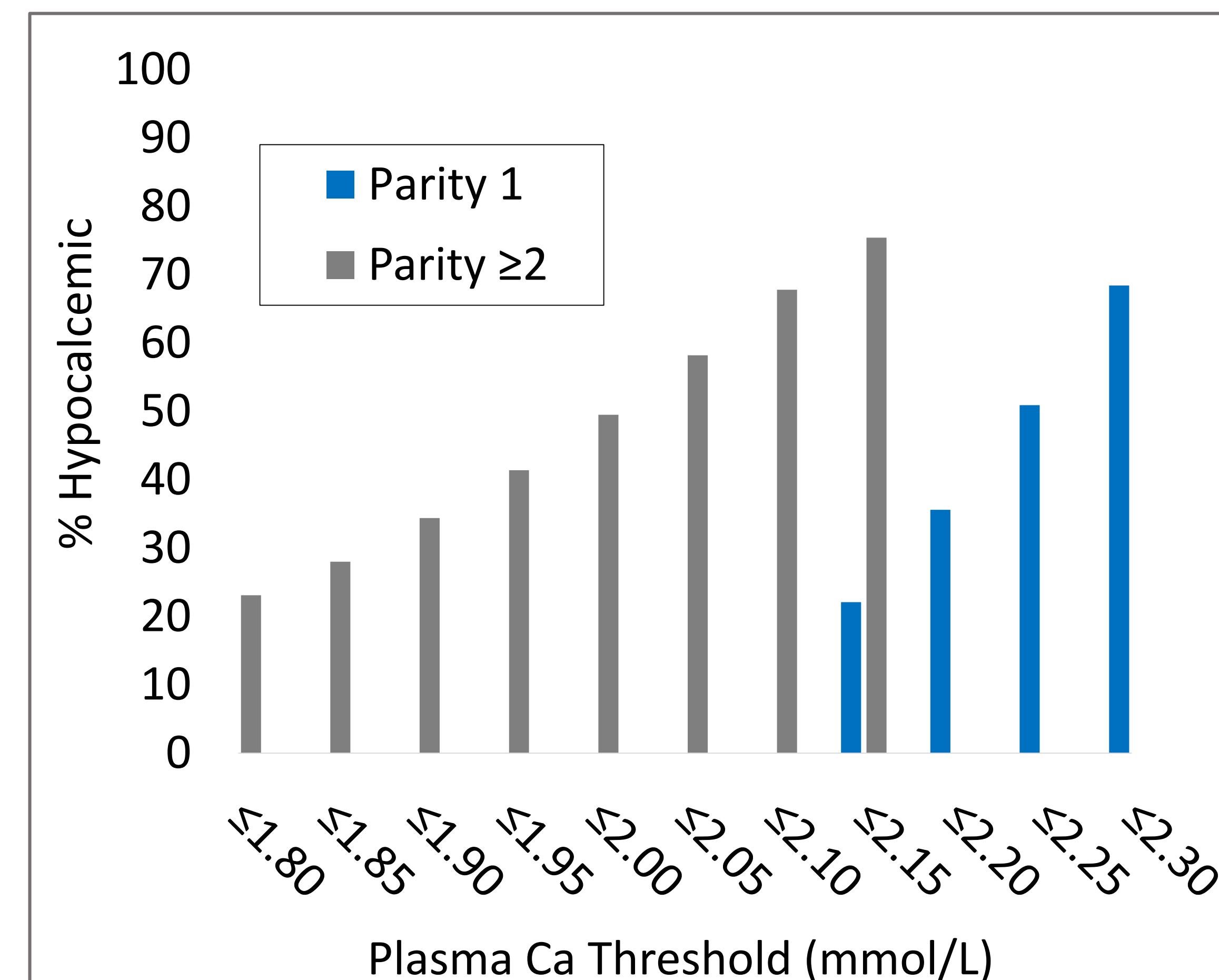| Outcome	Level of Interaction	Treatment CON	BOL	P-value*
Objective 1				
PP milk yield, kg/d	BCS > 3.5	31.7 ± 1.1	35.1 ± 1.1	0.003
	DCC > 277[1]	31.9 ± 1.0	34.7 ± 1.0	0.0009
MP milk yield, kg/d	DCC > 277[1]	46.8 ± 1.2	47.7 ± 1.2	0.03
Objective 2				
PP milk yield, kg/d	> 2.2 mmol/L	32.1 ± 1.0	33.3 ± 1.0	0.03
	≤ 2.2 mmol/L	34.2 ± 1.1	33.4 ± 1.1	0.32
MP milk yield, kg/d	> 2.15 mmol/L	46.2 ± 1.2	45.8 ± 1.2	0.55
	≤ 2.15 mmol/L	47.1 ± 1.1	47.8 ± 1.1	0.06

[1]DCC = Days carried calf

Figure 3. Hypocalcemia prevalence at different plasma Ca thresholds by parity group
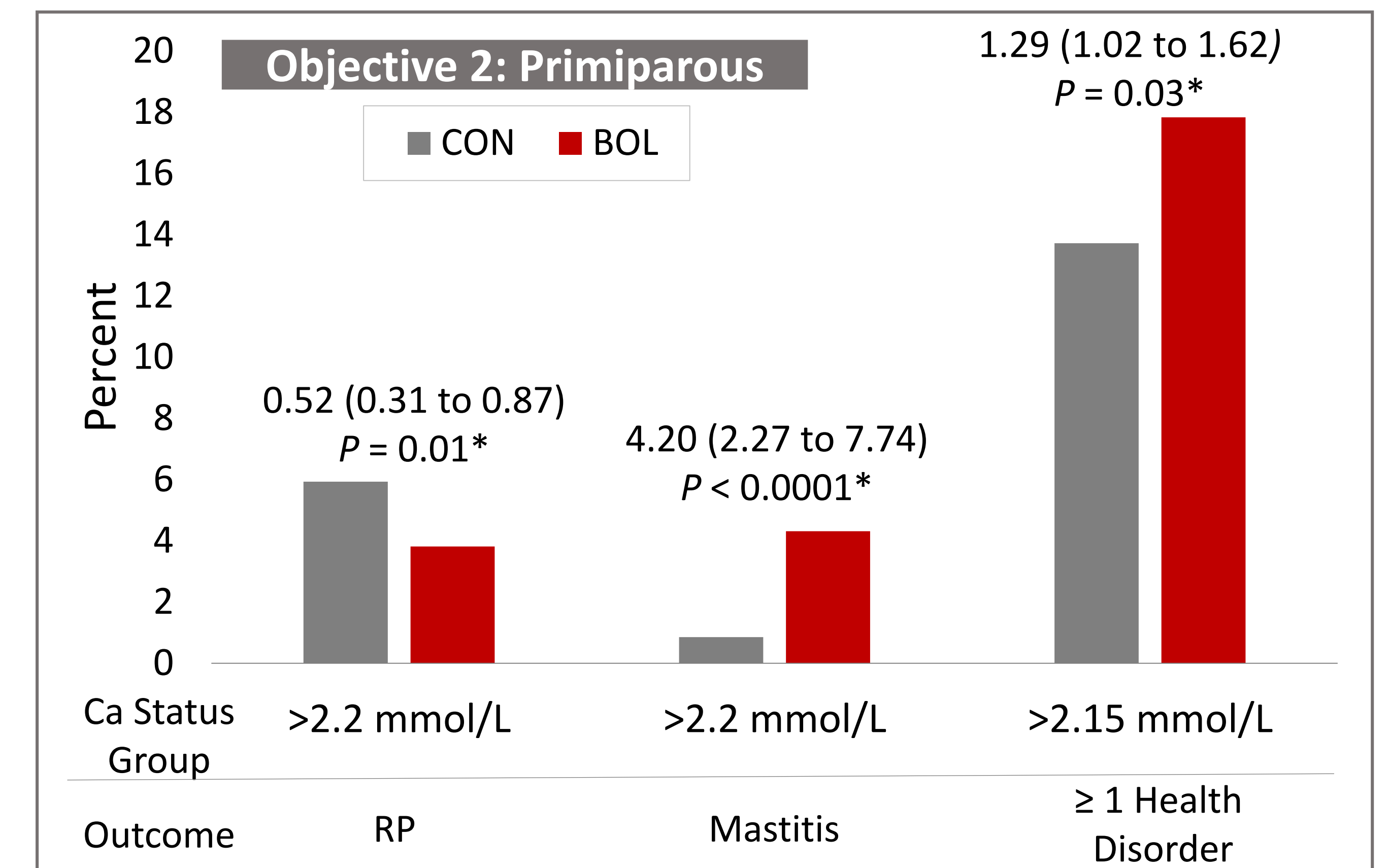

Figure 4. Incidence of health disorders for BOL vs. CON PP cows by Ca status group. Metritis and pregnancy to 1st service were not associated with treatment for either Ca status group.
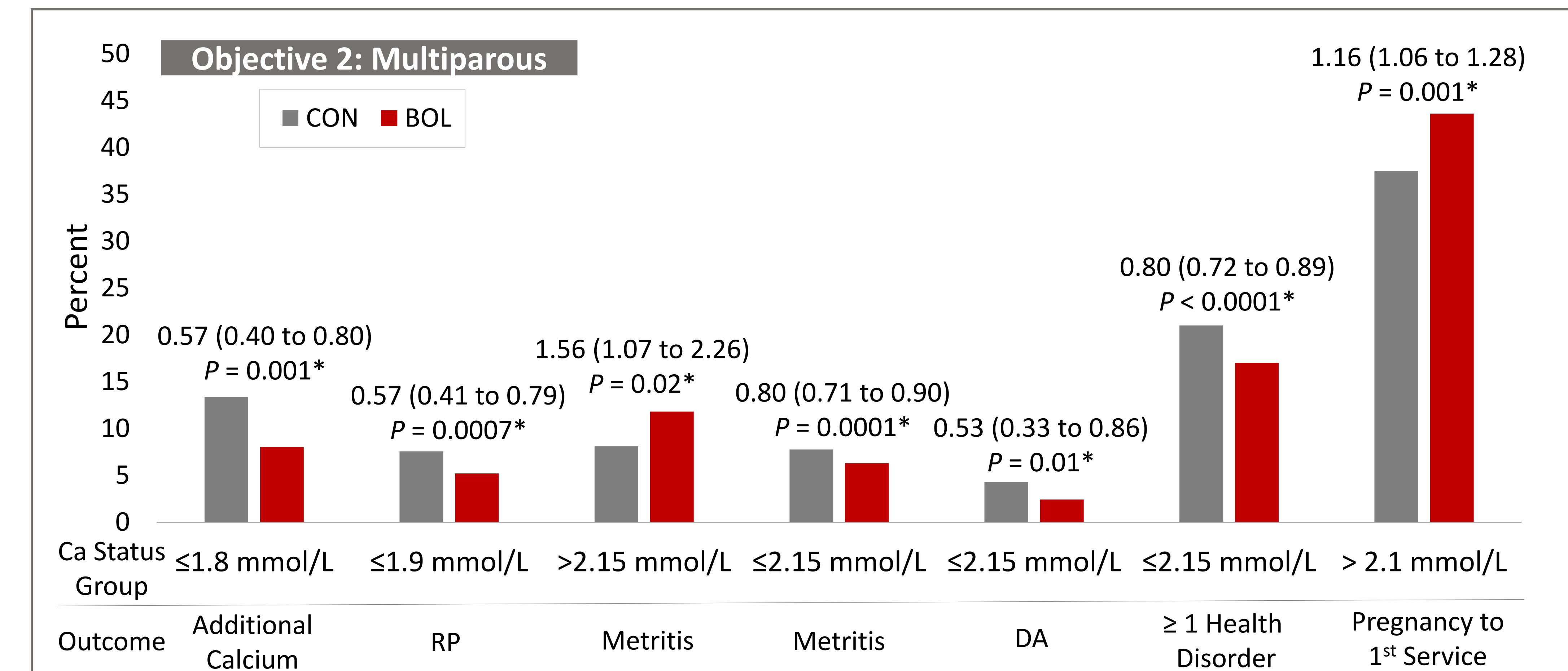

Figure 5. Incidence of health disorders for BOL vs. CON MP cows by Ca status group. Culling was not associated with treatment for either Ca status group.

Chapinal et al. 2012. J. Dairy Sci. 95:1301-1309, Leno et al. 2017. J. Dairy Sci. 100:4604-4622, Martinez et al. 2012. J. Dairy Sci. 95:7158-7172, Martinez et al. 2016. J. Dairy Sci. 99:8397-8416, Oetzel et al. J. Dairy Sci. 95:7051-7065.