

**Plasma calcium concentrations are decreased at least 9 hours before parturition in multiparous Holstein-Friesian cattle in a herd fed an acidogenic diet during late gestation**

ABSTRACT

Calcium homeostatic mechanisms are challenged in periparturient multiparous dairy cattle due to the rapid transport of large amounts of calcium into the mammary gland associated with colostrogenesis, resulting in decreased plasma total calcium concentration ([Ca]). An unresolved issue is the timing of the decrease in plasma [Ca] relative to the time of parturition, with the consensus view being that plasma [Ca] does not decrease until after parturition. The objective of this study, therefore, was to characterize the change in plasma [Ca] over time in periparturient dairy cattle. Plasma and mid-stream urine samples were collected daily starting 3 d before calving from 104 periparturient Holstein-Friesian dairy cows in a herd fed an acidogenic total mixed ration during the late dry period. Mixed-models ANOVA and linear and multivariable regression analyses were conducted. Plasma [Ca] decreased in periparturient multiparous cattle ( $n = 70$ ) but not in primiparous cattle ( $n = 34$ ). Compared with mean values approximately 72 h before parturition ([Ca] = 2.32 mmol/L), mean plasma [Ca] in multiparous cattle first decreased at 9 h before parturition (2.13 mmol/L) and remained decreased for up to 48 h after parturition, with the lowest mean value (1.87 mmol/L) occurring at 28 h after parturition. Mean 24-h urine Ca excretion was calculated to decrease by 3.5 to 3.8 g in periparturient multiparous cattle. Regression analysis indicated that plasma [Ca] in the 12-h period before and 24-h period after parturition was strongly and negatively associated with age but was also negatively associated with milk production indices. We conclude that plasma [Ca] was decreased at least 9 h before parturition in multiparous dairy cattle fed an acidogenic diet in late gestation, and that calcium homeostasis was disrupted for 2 to 3 d around parturition.

**Keyword:** Colostrogenesis; Hypocalcemia; Lactogenesis; Urinary calcium excretion