

Deficient Serum α -Tocopherol Concentrations Precede Left Displaced Abomasum In Early Lactation Dairy Cows

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Left displaced abomasum (LDA) is a costly disease in early lactation dairy cows. Cows with LDA have elevated hepatic lipid content and peroxidation and recover slowly. α -tocopherol (ATOC) is an antioxidant that can limit lipid peroxidation and is decreased in plasma or serum of cows with LDA. It is, however, unknown whether low circulating ATOC concentrations precede or are caused by clinical onset of LDA in early lactation dairy cows and whether ATOC concentrations remain low after LDA surgery. The objective of this study was to determine serum ATOC concentrations of multiparous dairy cows with LDA and without disease during the transition period and early lactation. We hypothesized that cows with LDA have serum ATOC concentrations that are indicative of deficiency ($< 7.4 \mu\text{M}$) prior to clinical diagnosis of LDA and that serum ATOC concentrations remain lower after surgery. In a nested case-control study, blood samples were taken at day -21, -14, -7, -3, -1, 0, 1, 3, 7, 14, 21, 28, 35, 42, and 49 postpartum from 7 cows that were diagnosed with LDA at d 6, 7, 13, 13, 17, 22, and 32, respectively, and 10 age-matched cows that were not treated for diseases during the sampling period. Blood samples were analyzed for serum concentrations of ATOC and cholesterol. During the sampling period, cows with LDA had lower serum ATOC concentrations ($P = 0.003$) and ATOC to cholesterol mass ratios ($P < 0.03$) than control cows. In healthy cows, serum ATOC concentrations decreased after calving to a nadir of $9.1 \pm 0.9 \mu\text{M}$ at day 7 postpartum (3 cows had ATOC concentrations $< 7.4 \mu\text{M}$), and increased back to prepartal concentrations ($\sim 15 \mu\text{M}$) by 28 days postpartum. By contrast, LDA cows' serum ATOC concentrations decreased after calving to a nadir of $5.1 \pm 1.0 \mu\text{M}$ at day 7 postpartum (all cows had ATOC concentrations $< 7.4 \mu\text{M}$) and remained lower ($< 10 \mu\text{M}$) than control cows until day 49 postpartum (all $P < 0.03$). At the last blood sampling before the clinical diagnosis of LDA, cows in the LDA group had lower serum ATOC concentrations (5.0 ± 0.9 vs. $9.1 \pm 0.9 \mu\text{M}$; $P = 0.004$) and ATOC to cholesterol mass ratios (1.90 ± 0.31 vs. 3.21 ± 0.26 ; $P = 0.008$) than control cows at day 7 postpartum. Our results suggest that low serum ATOC concentrations precede and remain after clinical diagnosis and subsequent LDA surgery and, thus, ATOC alimentation may play a role for the prevention and treatment of LDA.

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