

The Effects of Dietary Calcium Content and Dietary Cation-Anion Difference on Calcium Homeostasis in Dairy Cattle

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The capability of dairy cows to maintain Ca homeostasis is improved by limiting dietary Ca intake or feeding diets that are low in dietary cation-anion difference (DCAD) during the pre-partum transition period, but their interaction effects on Ca metabolism are not well understood.

The objective of this study was to determine whether dietary Ca content affects the ability to maintain Ca homeostasis in dry dairy cows fed diets differing in DCAD. Eight non-lactating and non-pregnant multiparous Holstein cows were fed diets low or high in DCAD (-5.4 vs. 9.7 mEq/100 g DM, respectively) in combinations with low or high dietary Ca content (0.30 vs. 0.90%) in a replicated 4 × 4 Latin square design with 14-d periods. Diets consisted of low or high DCAD timothy hay (70% of dietary DM) supplemented with low or high Ca concentrate mix (30% of dietary DM). Following 13-d diet adaptations, animals were subjected to an EDTA challenge (an intra-jugular infusion of EDTA solution that decreases blood Ca concentration to 60% of the pre-challenge values; inducing an artificial milk fever). In this protocol, the time required to recover to 90% of the pre-challenge values after the challenge is called recovery time. Feeding high Ca diet shortened the recovery time (106 vs. 134 min) when DCAD is low, while low Ca diet shortened the recovery time (125 vs. 159 min) when DCAD is high. These results indicated that cows had greater ability to maintain Ca homeostasis when a high Ca diet is fed with low DCAD or when a low Ca diet is fed with high DCAD.

Implications: The optimum dietary Ca content to minimize the risk of hypocalcaemia is likely different depending on the DCAD values. Dietary Ca content in pre-partum diets should be minimized unless you feed low DCAD diets.