Effect of Chloride-Enriched Timothy Hay on the Capability to Maintain Calcium Homeostasis in Dairy Cows

M. Oba, V. S. Heron, G. F. Tremblay

Department of Agricultural Food and Nutritional Sciences, University of Alberta, Edmonton, AB, T6G 2P5
Email: masahito.oba@ualberta.ca

Lowering the dietary cation-anion difference (**DCAD**) in the close-up diets decreases the incidence or severity of milk fever although the use of anionic salts or hydrochloric acid to decrease the DCAD often decreases feed intake. It has recently been demonstrated that feeding chloride-enriched (or low DCAD) timothy hay (*Phleum pretense* L.) in a close-up diet can reduce the incidence of sub-clinical milk fever without decreasing feed intake. However, the threshold of forage DCAD required to exert physiological responses in dairy cows is not known. Thus, the objective of the study was to evaluate the effectiveness of timothy hay differing in DCAD at maintaining calcium homeostasis.

Three lots of timothy hay differing in Cl content were obtained by $CaCl_2$ fertilization. The Cl concentrations of three lots of timothy hay were 1.18 ± 0.05, 0.73 ± 0.06, and 0.07 ± 0.02 %, and the DCAD were 4.1 ± 3.6 (**LOW**), 14.1 ± 3.0 (**MED**), and 25.1 ± 2.5 (**HIGH**) mEq/100g DM, respectively. Experimental diets, consisting of a concentrate mix (30% of dietary DM) and timothy hay LOW, MED or HIGH (70% of dietary DM), had DCAD values of 0.72, 7.26, and 14.4 mEq/100g DM, respectively. Non-lactating, non-pregnant multiparous cows were used for this study. Cows were subject to an EDTA challenge that is the induction of artificial milk fever by infusion of EDTA solution into a jugular vein; EDTA binds to calcium in the blood and makes it unavailable. The EDTA challenge protocol determined the resistance time and recovery time (time required to reduce blood calcium concentration to 60%, and the time to recover to 90% respective to the pre-challenge values, respectively). Urine pH was 6.88 ± 0.21, 7.15 ± 0.21, and 7.83 ± 0.21 for cows fed LOW, MED, and HIGH, respectively. The resistance time was not affected by treatment, averaging 155 min, but the recovery time was shorter for cows fed LOW compared to cows fed MED or HIGH (185 vs. 248 and 263 ± 13.2 min, respectively).

Implications - The diets with DCAD values of 7.26 mEq/100g DM or less (LOW and MED) were effective at decreasing the extent of metabolic alkalosis. However, the capability of dairy cows to maintain calcium homeostasis was enhanced by the diet with 0.72 mEq/100g DM (LOW), but not by the diet with 7.26 mEq/100g DM (MED). If the DCAD value is sufficiently lowered (< 1 mEq/100g DM), chloride-enriched timothy hay can be used to enhance the capability of dairy cows to maintain calcium homeostasis.