THE EFFECT OF ALTERING THE CATION-ANION BALANCE OF THE PRE-CALVING DIET OF DAIRY COWS ON POST-CALVING MILK PRODUCTION AND HEALTH

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The feeding and management of a dairy cow in the period pre-calving can have a profound effect on subsequent milk yield by reducing the incidence of post-calving metabolic diseases (Johnson 1995). A feeding strategy to overcome some of these diseases is to reduce the dietary cation-anion difference (DCAD) of the dry cow diet in the last three weeks of pregnancy (Beede 1992). Dietary cation-anion difference is defined as the summation of the milliequivalents of Na and K minus the sum of the milliequivalents of Cl and S per kilogram.

In this experiment the treatment imposed on pre-calving dairy animals was feeding 3kg/head/day of a grain based pellet formulated by Ridley AgriProducts to reduce the DCAD of the animal's diet. The same amount of a grain based pellet formulated for milking animals was fed as a control. Based on pasture leaf and stem mineral analyses, and assuming 80% leaf in the forage diet and 10kg total DM intake, it was calculated that control animals in this experiment ingested a diet with a DCAD of +20 to +25 meq/100g DM, and the treatment animals ingested a diet with a DCAD close to zero. The DCAD of the treatment and control pellets were -75.6 and +9.2 meq/100g DM respectively.

Twenty-two pairs of Holstein Friesian animals from the Kairi Research Station herd, due to calve in April and May, were selected on expected date of calving, parity and liveweight, and within pairs randomly assigned to treatments. Feeding of treatment and control pellets commenced one month prior to expected calving. Pellets were fed once daily. Pre-calving and milking animals were weighed and body condition scored weekly. A jugular blood sample was taken from each animal on the first and subsequent morning milking following calving and the animal entering the milking herd. Two more blood samples were taken to represent 1 and 4 weeks post-calving. A range of blood parameters were measured. The main interest was in serum calcium concentrations immediately post-calving to indicate sub-clinical hypocalcaemia, and serum β hydroxy-butyrate concentration and liver enzyme activities in early lactation to indicate sub-clinical ketosis. Uterine involution was assessed by rectal palpation. Milk yield was recorded at each milking by a Westfalia Metatron milking system. A composite PM and AM milk sample was taken once a week for analysis of milk fat, true milk protein, and lactose percentages. Urine pH was measured both pre and post-calving. Yield and blood data were statistically analysed by analysis of variance. Blood parameter data were log transformed before analysis.

Animals fed treatment pellets pre-calving produced significantly ($P<0.01$) more milk over the first 70 days of lactation, 119 litres per cow, or 1.7 litres per day, than cows fed the control pellet. There were no significant differences ($P<0.05$) in milk component percentages between treatments.

Feeding of treatment pellets significantly reduced ($P<0.05$) urine pH of animals 6 hours after feeding; control animals had a mean pH of 8.3, and treatment animals 7.8. The pre-calving treatments had no effect on calf liveweight or ease of calving. No animals required assistance at calving. There were no treatment effects on pre or post-calving liveweight or body condition score changes, or on post-calving uterine involution. One animal in the control treatment received veterinary treatment for hypocalcaemia.

The only statistically significant treatment effect on serum composition was a reduction ($P<0.01$) in serum γ-glutamyl-transferase (GGT) activity in treatment cows. Treatment cows had slightly higher concentrations of β hydroxy-butyrate ($P=0.06$) post-calving (0.50 mmol/L) compared with control cows (0.41 mmol/L). The levels of β hydroxy-butyrate are within the normal range for diagnosis of sub-clinical ketosis, but as this metabolite is also derived from butyric acid produced in the rumen, the slightly higher levels in the treatment group may indicate higher DM intake immediately post-calving.

Pre-calving feeding to reduce dietary cation-anion difference increased post-calving milk yield when the incidence of post-calving metabolic disorders was low.

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