

Dietary calcium absorption in the dairy cow*ML Hyde, DR Fraser*

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The small intestine is generally considered the major site of calcium absorption in the dairy cow although some studies have shown rumen absorption of calcium (1). We have developed a simple non invasive method of assessing calcium absorption in ruminants using stable strontium. This method has been used to examine calcium homeostasis in dairy cows.

Our studies present evidence that the key to understanding milk fever may be an understanding of the relative importance of the site of calcium absorption (rumen or small intestine) in normal and milk fever susceptible cows in the periparturient period. Our studies present evidence that rumen absorption of calcium is controlled at least in part by local factors. Milk fever has been noted to occur more frequently in herds with unlimited access to lush pastures in the periparturient period than in cows fed mainly hay. We have observed increased calcium absorption in cows fed a hay diet compared with lush rye-grass pasture based diet ($P=0.04$), without evidence of increased bone resorption of calcium. Many workers have shown that an increased dietary acidity (eg anionic diet) reduces the incidence of milk fever. In this study, no changes were seen in blood pH and any changes in urine pH were erratic and did not show a clear diet effect. Thus it appears as if rumen calcium absorption on the hay diet was increased despite a failure to produce a metabolic acidosis. We further investigated the effects of acidosis upon calcium absorption in a group of cows fed either a control diet or an anionic diet. Preliminary results show that treated cows have a significantly greater rumen absorption of calcium at calving ($P= 0.02$) again with no changes in bone resorption of calcium. These findings strongly support the hypothesis that local rumen factor(s) influence calcium absorption.

Our results suggest that the rumen may be an "emergency" site of calcium absorption during the immediate post calving period and that the small intestine is the "normal" absorptive organ. Milk fever cows may be reliant on rumen absorption of calcium at this time due to an inadequate response from the small intestine. Longitudinal studies in periparturient cows (10 normal cows: four milk fever cows) showed that rumen calcium absorption was significantly lower in milk fever cows than normal cows on the day of calving ($P= <0.05$) but tended to increase in the post calving period. Normal cows showed a tendency to decrease calcium absorption in the post calving period without any evidence of decreased lactation or milk calcium output. It is thus postulated that normal cows use the rumen as a "back up" site of calcium absorption at calving until efficient absorption of calcium from the small intestine takes over, thus allowing a relative decrease in rumen calcium absorption post calving. In contrast, milk fever affected cows are slow to respond to the hypercalcaemic stimuli at the onset of lactation and are reliant on (inadequate) rumen absorption of calcium. Thus any factor which disturbs rumen calcium absorption at calving will predispose these animals to severe hypocalcaemia at this time.

1. Beardsworth L, Beardsworth, P, Care AD. Calcium fluxes across the wall of the ovine reticulum in vivo. *Res Vet Sci* 1989;47:404-05.