

Prevention of postpartum hypocalcemia with calcitriol in dairy cows

Danil Kim

Laboratory of Bovine Clinical Medicine, College of Veterinary Medicine, Seoul National University, Seoul, Republic of Korea

Most parturient dairy cows producing experience hypocalcemia temporarily near or at parturition. Loss of Ca has to be replenished from the diet or the bone, but some of the cows fail to activate these processes, resulting in developments of postpartum hypocalcemia, commonly referred to as milk fever or parturient paresis. Many prevention strategies have been suggested because subclinical milk fever occurring about 50% of multiparous parturient cows is known to affect the incidence of periparturient diseases. Among, calcitriol (1,25-dihydroxyvitamin D) has been known to be available for the prevention of milk fever since 1979 but has not been developed as a drug for an animal due to some side effects. In this study, optimal administrating method of calcitriol was examined in nonpregnant dairy cows through evaluation of drug formulation, administrating routes, doses and the effects on renal function. An oleaginous formulation of calcitriol has a more potent hypercalcemic effect than an aqueous, and subcutaneous and intramuscular route showed a similar effect. In addition, subcutaneous administration of an aqueous formulation of calcitriol showed a dose-dependent hypercalcemic effect without impaired renal function in all dosage levels. However, the supraphysiological calcitriol concentrations in the blood were observed at the dose of 0.25 and 0.5 $\mu\text{g}/\text{kg}$. The supraphysiological calcitriol concentration in the blood seems to be effective in increasing the plasma calcium level whereas it induces inhibition of endogenous calcitriol synthesis and its effects on other physiological processes are unknown. These results suggested that for obtaining the physiologically acceptable calcitriol concentration as well as for inducing moderate hypercalcemia a dosage level of calcitriol should be determined below 0.25 $\mu\text{g}/\text{kg}$. For the clinical application of calcitriol for the prevention of postpartum hypocalcemia in future, further study is needed to confirm the suggested regimen is effective in parturient cows and a dairy herd.

Keyword: Postpartum hypocalcemia, Calcitriol, Prevention, Dairy cow