Dry Cows Ration Level of Calcium, Phosphorus, Magnesium and K/Ca+Mg Ratio, and Its Effect on Incidence of Milk Fever

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Keywords : Cows, Calcium, Phosphorus, Magnesium, Milk Fever

Introduction
Parturient paresis (milk fever, parturient hypocalcemia, paresis puerperalis, parturient apoplexy) is a production disease of cattle, sheep, and goats occurring around the time of parturition and characterized by progressive neuromuscular dysfunction with flaccid paralysis, circulatory collapse, depression of consciousness and ultimately shock and death. The main cause of disease is a depression of ionized calcium in serum and tissues. Hypophosphatemia and variations in levels of serum magnesium also occur in milk fever and have secondary roles. The incidence of milk fever generally increased with parity and with higher levels of milk production. Older dairy cows, cows with a history of parturient paresis during a previous lactation and high-producing cows are at highest risk for developing parturient paresis (1-4).

Milk fever is a metabolic disorder of calcium homeostasis that affects about 2 to 6% of postpartum cows (2). Calcium is tightly regulated in mammals because of the critical role of calcium ion concentrations in many physiological functions (1). Sudden calcium outflow occurs most commonly at the time of the initiation of lactation. The calcium demand associated with colostral production in dairy cows exceeds the total prepartum calcium requirements (mineralization of fetal skeleton).

As mentioned earlier several factors have been consistently associated with increased incidence of milk fever, including parturition and initiation of lactation, advancing age, breed, and diet. Of the various methods used in attempts to control the disease, the most progress has been made in dietary management. Most attention has focused on manipulating the levels of dietary calcium, use of dietary anions (Cl– and SO42–) and determination of dietary K in dry period, to control milk fever incidence. For these reasons and to determine the factors that contribute in milk fever incidence this research was carried out in Shahrekord district (Iran).

Material and Methods
This research was conducted on forty industrial cattle farms which contain 1124 heads of dairy cattle in Shahrekord district (Iran). 40 samples of dry period diet were taken and milk fever occurrence were assessed in a prospective study. Level of phosphorus, calcium, magnesium and the ratio of Ca/p and k/Ca+Mg were determined. Statistical analysis was performed at the level of $p<0.05$ by Sigmastat (Ver 2) program.

Results and Discussion
Results indicated that the incidence of milk fever was approximately 5.03% and there was no significant relationship between levels of dietary calcium and magnesium intake and also the ratio of Ca/p and incidence of milk fever. But a significant relationship were observed between level of daily phosphorus intake and ratio of k/Ca+Mg and the incidence of milk fever ($p<0.05$). Dry cows that intake more than 80 grams phosphorus per day and someone that has k/Ca+Mg ratio less than 1 (one) had a maximum incidence rate of milk fever.

Some factors influenced the ability of dairy cattle adaptation to parturient hypocalcemia: acid-base status at the time of parturition, animal magnesium status, dietary potassium level, dietary phosphorus level, blood estrogen concentration. Metabolic alkalosis appears to alter physiological activity of PTH so that bone resorption and production of 1, 25-dehydroxycholecalciferol are impaired.

Low blood magnesium levels can reduce PTH secretion and also tissue responsiveness to this hormone. High dietary potassium reduces ruminal magnesium absorption. Excessive dietary phosphorus (>80 g/day) during late gestation can rise blood phosphorus concentration. When blood phosphorus level is in the range of 8 mg/dl, renal synthesis of 1, 25-dehydroxycholecalciferol is inhibited. Blood estrogen concentrations rise dramatically at the end of gestation and may blunt the effects of PTH on bone resorption (1, 3).
Sechen et al (1988) suggested that high estradiol concentrations in late pregnancy inhibit bone resorption and predispose aged cows to parturient paresis. The earlier decrease in progesterone concentration at parturition and lower concentrations throughout late pregnancy might have contributed to the greater inappetence in paretic cows at parturition (5).

Pyorala et al. (1992) suggest that oestradiol plays a role in the aetiology of milk fever, because serum oestradiol and serum calcium concentrations correlated negatively in milk fever cows (6).

Fenwick (1988) postulated that there were significant differences $p<0.05$ in the mean±SD concentrations of serum magnesium and plasma sodium concentrations, and the plasma sodium/serum magnesium ratio of 0.8±0.28 vs 1.2±0.37 mmol/l, 155±3.0 vs 147±6.4 mmol/l and 180±40.1 vs 116±34.1 for normal vs milk fever cows, respectively (7).

References