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Research Update

Transition health: Preventing subclinical hypocalcemia

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Clinical milk fever is not usually much of an issue on dairies any more. Subclinical hypocalcemia, however, can increase the cow's risk for a variety of transition health disorders.

The cow's blood calcium level normally decreases near calving because of the sudden need for calcium in colostrum and subsequent milk formation. Ideally, the blood calcium decrease is small, the cow quickly recovers, and she is on her way to a great lactation (Goff, 1992). However, a large drop in blood calcium (i.e., to approximately 5 mg/dL or less) leads to milk fever and a "down cow." Smaller decreases in blood calcium, where the cow still appears normal, may cause subclinical hypocalcemia.

Today, subclinical hypocalcemia appears to be a bigger problem than previously thought and has been the focus of some recent, interesting research.

Guidelines from only a few years ago suggest blood calcium of 8.0 mg/dL as the lower limit, below which hypocalcemia occurs. However, more recent studies point to an increase in metritis, nonesterified fatty acids (NEFA), and β-hydroxybutyrate (BHBA) levels when blood calcium levels drop below approximately 8.6 mg/dl within the first few days of calving (Chapinal et al., 2011; Martinez et al., 2012).

Other research suggests that cows with blood calcium levels less than 8.4 mg/dL during the first week post-calving may produce nearly 6 lb less milk per day than their counterparts with higher calcium levels (Chapinal et al., 2012).

There are two main nutritional approaches used in pre-fresh diets to help "turn on" the cow's calcium system: Decreasing the DCAD (dietary cation-anion difference), or formulating for a very low dietary calcium level. Although both approaches can solve milk fever, there remains the challenge of hypocalcemia. Comparing the results from two different DCAD studies, it appears that lowering the DCAD so that urine pH is 6.0 or slightly less resulted in less hypocalcemia than when urine pH was approximately 6.2 (Ramos-Nieves et al., 2009; Sweeney et al., 2015).

Although hypocalcemia in the more acidified cows was reduced by approximately 20 and 40 percentage points on days 0 and 1 as compared to control cows, hypocalcemia was still present in approximately 75 and 58% of acidified cows on days 0 and 1 post-calving. Clearly, hypocalcemia is still a problem even when cows are highly acidified.

What other techniques are under consideration to reduce the risk of hypocalcemia in both the pre-calving and post-calving periods?

Intravenous calcium borogluconate?
Research with intravenous (IV) calcium showed blood calcium levels shooting up, followed by "a rebound effect" that lasted for up to 48 hours, resulting in treated cows having lower blood calcium levels than untreated cows (Blanc et al., 2014).

Likewise, although calcium solutions administered subcutaneously absorb into the blood stream more slowly than IV, they still result in high blood calcium levels with the same rebound effect the next day. Considering these results, IV calcium should only be used for cows down with milk fever.

Oral calcium boluses?
A leading oral calcium bolus product consists of soluble calcium sulfate and calcium chloride with 43 g of calcium. Researchers found that providing such calcium boluses once per day for the first 2 days of lactation increased production in a subset of cows that were lame or whose previous lactation 305ME was above 105% of herd average. However, the boluses had no significant effect overall or on the other subsets of cows (Oetzel and Miller, 2012).

In other research, excessive administration of calcium boluses (4 or 7 boluses delivered over 2 or 5 days, respectively) actually increased metritis in cows at low risk for metritis, with no benefit in cows at high risk for metritis (Martinez et al., 2014).

Higher feed intake in the immediate pre-calving and post-calving periods?
Cows fed a supplement containing Diamond V Original XP™ consumed significantly more of the supplement on the day of calving, had significantly less hypocalcemia, and went on to produce significantly more milk than control cows (Zaworski et al., 2014).

We believe there was less hypocalcemia in cows fed Original XP because they were eating more feed, which provided more calcium for potential absorption than what was available to the control cows. A number of management approaches (bunk space, crowding, heat abatement, feed availability, etc.) also can help improve dry matter intake (DMI) immediately before and after calving.

Increasing calcium levels in the fresh cow diet?

An additional consideration worthy of a research project is the calcium level in the diet of the fresh cow immediately post-calving. Often these cows are fed the same as the lactating cows, and the calcium level may be approximately 0.85%. Would a higher calcium level (1.1%, for example) help to reduce hypocalcemia? It certainly would substantially increase her intake of calcium.

Typical sources of dietary calcium are limestone, calcium chloride, and calcium propionate. Calcium chloride is a concern, however, because it is unpalatable, an anion, and would act to decrease the DCAD in the fresh cow (which we don't want to do). Calcium propionate is much more absorbable than limestone. Therefore, if trying this approach, limestone or a mixture of limestone and calcium propionate may be the best option. While I would not consider this solution a panacea, it could help to reduce the risk of hypocalcemia.

Subclinical hypocalcemia can negatively affect transition cow performance and health. Preventing the condition means giving special attention to nutrition in both the pre-calving and post-calving periods. Other interventions also can help to increase DMI in the time period immediately around calving, which can reduce the risk of hypocalcemia.

References

Blanc, C.D., M. Van der List, S.S. Aly, H.A. Rossow, and N. Silva-del-Rio. 2014. Blood calcium dynamics after prophylactic treatment of subclinical hypocalcemia with oral or intravenous calcium, University of California, Tulare; Pacific Rim Dairy; and Boehringer Ingelheim. ADSA abstracts, Poster #884.

Chapinal, N., M. Carson, T.F. Duffield, M. Capel, S. Godden, M. Overton, J.E.P. Santos, and S.J. LeBlanc. 2011. The association of serum metabolites with clinical disease during the transition period. J. Dairy Sci. 94:4897-4903.

Chapinal, N., M.E. Carson, S.J. LeBlanc, K.E. Leslie, S. Godden, M. Capel, J.E. P. Santos. 2012. The association of serum metabolites in the transition period with milk production and early-lactation reproductive performance. J. Dairy Sci. 95:1301-1309.

Goff, J.P. 1992. Cation-anion difference of diets and its influence on milk fever and subsequent lactation: The good and the bad news. Proc. of the Cornell Nutr. Conf, Rochester, NY, 148-159.

Martinez, N., C.A. Risco, F.S. Lima, R.S. Bisinotto, L.F. Greco, E.S. Ribeiro, F. Maunsell, K. Galvao, and J.E.P. Santos. 2012. Evaluation of peripartal calcium status, energetic profile, and neutrophil function in dairy cows at low or high risk of developing uterine disease. J. Dairy Sci. 95:7158-7172.

Martinez, N., L.D.P. Sinedino, R.S. Bisinotto, R. Daetz, G.C. Gomes, L.F. Greco, W.W. Thatcher, C.A. Risco, and J.E.P. Santos. 2014. Effects of oral calcium supplementation on body temperature, incidence of uterine diseases, and milk yield in dairy cows. University of Florida. ADSA abstracts, poster #883.

Oetzel, G.R. and B.E. Miller. 2012. Effect of oral calcium bolus supplementation on early-lactation health and milk yield in commercial dairy herds. J. Dairy Sci. 95:7051-7065.

Ramos-Nieves, J.M., B.J. Thering, M.R. Waldron, P.W. Jardon, and T.R. Overton. 2009. Effects of anion supplementation to low-potassium prepartum diets on macromineral status and performance of periparturient dairy cows. J. Dairy Sci. 92:5677-5691.

Reinhardt, T.A., J.D. Lippolis, B.J. McCluskey, J.P. Goff, and R.L. Horst. 2011. Prevalence of subclinical hypocalcemia in dairy herds. The Veterinary Journal, 188:122-124.

Stone, W.C., L.E. Chase, T.R. Overton, and K.E. Nestor. 2012. Brown midrib corn silage fed during the peripartal period increased intake and resulted in a persistent increase in milk solids yield of Holstein cows. J. Dairy Sci. 95: 6665-6676.

Sweeney, B. M., C. M. Ryan, T. Stokol, K. Zanzalari, D. Kirk, and T. R. Overton. 2015. The effects of decreasing dietary cation-anion difference in the prepartum diet on urine pH and plasma minerals in multiparous Holstein cows. J. Dairy Sci. Suppl. 2, M339 on page 128.

Zaworski, E.M., C.M. Shriver-Munsch, N.A. Fadden, W.K. Sanchez, I. Yoon, and G. Bobe. 2014. Effects of feeding various dosages of *Saccharomyces cerevisiae* fermentation product in transition dairy cows. J. Dairy Sci. 97:3081-3098.

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