How X-Zelit Works to Reduce Milk Fever and Hypocalcemia...

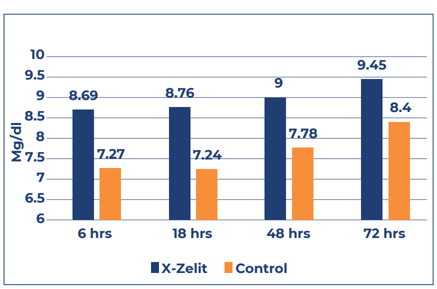
Introduction

Traditionally, milk fever prevention programs have attempted to directly alter Ca status of dairy cows at calving. Examples of common approaches include feeding pre-fresh dairy cows diets containing anionic salts, limiting dietary Ca, feeding hyper-dietary Ca and administering Ca boluses.

Improving Blood Calcium

New research (Cornell University, UW-Madison, UVM Germany) has discovered that restricting dietary P in pre-fresh cows significantly improves blood Ca status of cows at calving which greatly diminishes hypocalcemia and milk fever. These and other new studies have discovered that modestly restricting dietary P to pre-fresh cows reduces the release of a bone hormone called fibroblast growth factor-23 (FGF23). FGF23 plays a central role in P metabolism regulating P absorption from the kidneys, intestines and bone mobilization of both P and Ca.

Blood Calcium Levels



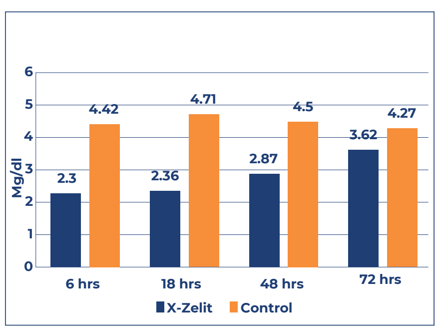
· Cornell data, Journal of Dairy Science 2019 (30 cows per treatment)

While X-Zelit is a Ca binder, it is an even more effective P binder. When X-Zelit is fed to pre-fresh cows for 12-18 days, in combination with feeding modest levels of dietary P and Ca, enough P is bound to likely cause a reduction in FGF23 yielding rapid release of both Ca and P from bone thereby increasing blood Ca. Elevation of blood Ca at calving induced by feeding X-Zelit and subsequent reductions in milk fever and hypocalcemia has been observed in numerous studies and on commercial dairies.

Blood Phosphorus

When X-Zelit is fed, inducing a modest dietary P restriction, blood Ca level at calving is significantly improved with far less variation between cows. This is a very consistent response observed in numerous studies, but lower blood P is also consistently observed.

Blood Phosphorus Levels

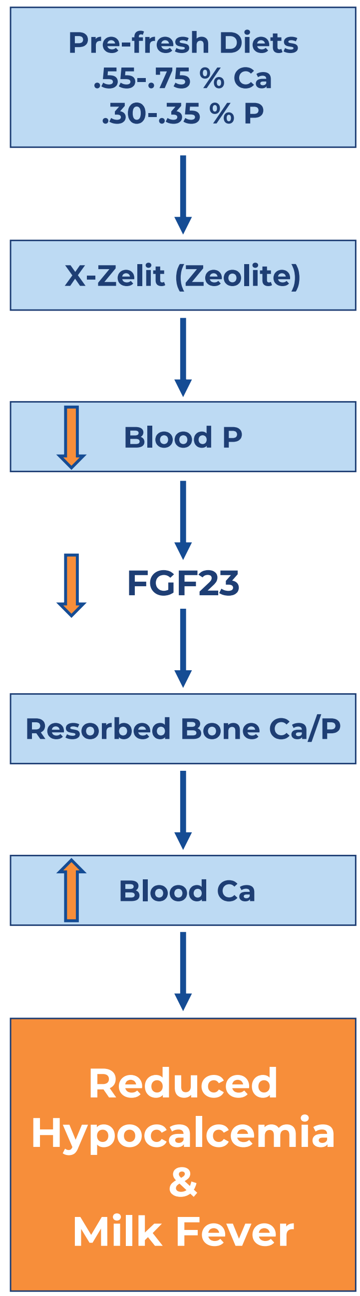


· Cornell data, Journal of Dairy Science 2019 (30 cows per treatment)

Which brings to question where did the mobilized bone P go? The short answer- is likely saliva. The dairy cow recycles a large fraction of P into saliva to form rumen buffers and she will maintain salivary P (and tissue) levels of P at the expense of blood P. These effects are temporary and blood P levels recover quickly after calving when X-Zelit is no longer fed.

Mechanism

Below is a simplified mechanism adapted from Crenshaw et al., 2010. J. Anim. Sci. The effects of FGF23 on kidney function are omitted for brevity.



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KEY RESEARCH

X-Zelit Research

Thilsing-Hansen, T., and R.J. Jorgensen. 2001. Hot Topic: Prevention of parturient paresis and subclinical hypocalcemia in dairy cows by zeolite A administration in the dry period. J. Dairy Sci. 84:691-693.

Kerwin, A.L., C.M. Ryan, B.M. Lenon, M. Jakobsen, P. Theilgaard, D.M. Barbano, and T.R. Overton. 2019. Effects of feeding synthetic zeolite A during the prepartum period on serum mineral concentration, oxidant status, and performance of multiparous Holstein cows. J. Dairy Sci. 102:

W. Frizzarini, J. Diniz, A. Vang, P. Monteiro, and L. Hernandez. 2022. Effects of 3 different prepartum diets on dry matter intake, beta-hydroxybutyrate, and mineral concentrations in multiparous Holstein cows. J. Dairy Sci. (abstr) Suppl. 1 105:350.

Thilsing, T., T. Larsen, R.J. Jorgensen, and H. Houe. 2007. The effect of dietary calcium and phosphorus supplementation in zeolite A treated dry cows on periparturient calcium and phosphorus homeostasis. J. Vet. Med. 54:82:89.

Pallesen, A., F. Pallesen, R.J. Jorgensen, and T. Thilsing. 2008. Effect of pre-calving zeolite, magnesium and phosphorus supplementation on periparturient serum mineral concentrations. Vet. J. 175:234-239.

Grabherr, H., M. Spolders, M. Furll, and G. Flachowsky. 2009. Effecct of several doses of zeolite A on feed intake, energy metabolism and on mineral metabolism in dairy cows around calving. J. Anim. Phys. and Anim. Nutr. 93:221-236.

Grabherr, H., M. Spolders, P. Lebsien, L. Huther, G. Flachowsky, M. Furll, and M. Grun. 2009. Effect of zeolite A on rumen fermentation and phosphorus metabolism in dairy cows. Arch. Of Anim. Nutr. 63:4, 321-336.

R. Souza Saraiva de Oliveira. 2017. An alternative strategy to prevent hypocalcemia by adding zeolite A to the prepartum diet of dairy cows. MS Thesis. Kansas State University, Manhattan, KS.

Jørgensen R.J., Hansen T, Jensen M.L., and Thilsing Hansen T. 2001. Effect of oral drenching with zinc oxide or synthetic zeolite A on total blood calcium in dairy cows. J. of Dairy Sci. 84:609–613.

Thilsing-Hansen, T., R.J. Jorgensen, J.M.D. Enemark, and T. Larsen. 2002. The effect of zeolite A supplementation in the dry period on periparturient calcium, phosphorus and magnesium homeostasis. J. Dairy Sci., 85:1855-1862.

Dietary Phosphorus Research

Cohrs. I., M.R. Wilkens, and W. Grunberg. 2018. Short communication: Effect of dietary phosphorus deprivation in late gestation and early lactation on the calcium homeostasis of periparturient dairy cows. J. Dairy Sci. 101:9591-9598.

Grünberg, W., P. Scherpenisse, P. Dobbelaar, M. J. Idink, and I. D. Wijnberg. 2015. The effect of transient, moderate dietary phosphorus deprivation on phosphorus metabolism, muscle content of different phosphorus-containing compounds, and muscle function in dairy cows. J. Dairy Sci. 98:5385–5400.

Peterson, A. B., M. W. Orth, J. P. Goff, and D. K. Beede. 2005. Periparturient responses of multiparous Holstein cows fed different dietary phosphorus concentrations prepartum. J. Dairy Sci. 88:3582– 3594.

Wachter, S., I. Cohrs, L. Golbeck, M.R. Wilkens and W. Grunberg. 2022. Effects of restricted dietary phosphorus to dry cows on periparturient calcium status. J. Dairy Sci. 105:748-760.

Wachter, S., I Cohrs, L. Golbeck, T. Scheu, K. Eder, and W. Grunberg. Effects of restricted dietary phosphorus supply during the dry period on productivity and metabolism in dairy cows. J. Dairy Sci. 105:4370-4392.

Julien, W.E., H.R. Conrad, J.W. Hibbs, and W.L. Crist. 1976. Milk fever in dairy cows. VIII. Effect of injected vitamin D3 and calcium and phosphorus intake on incidence. J. Dairy Sci. 60:431-436.

Anderson, S. T., L. J. Kidd, M. A. Benvenutti, M. T. Fletcher, and R. M. Dixon. 2017. New candidate markers of phosphorus status in beef breeder cows. Anim. Prod. Sci. 57:2291–2303

Keanthao, P., Goselink, R.M.A.; Schonewille, J.T. Dijkstra, J. and W.H. Hendriks. 2019. Effect of phosphorus intake during the transition period on plasma phosphorus content and hypocalcemia in dairy cows. Proc. of the 17th Inter. Conf. on Prod. Disease in Farm Anim. (abstr), P 191.

Barton, B.A., Jorgensen, N.A., DeLuca, H.F., 1987. Impact of prepartum dietary phosphorus intake on calcium homeostasis at parturition. J. of Dairy Sci. 70, 1186–1191.

FGF-23 Reviews

Crenshaw, T.D., L.A. Rortvedt and Z. Hassen. 2011. A novel pathway for vitamin D-mediated phosphate homeostasis: Implications for skeleton growth and mineralization. J. Anim. Sci. 89:1957-1964.

Shimada, T., H. Hasegawa, Y. Yamazaki. 2004. FGF-23 is a potent regulator of vitamin D metabolism and phosphate homeostasis. J. of Bone and Mineral Res. 19:429-