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Department of Animal Sciences

Dairy Update

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If you have questions, please let me know. Albert De Vries, editor. devries@ufl.edu or (352) 392-5594 ext. 227.

Rethink Your Strategies for Prevention of Hypocalcemia

José E.P. Santos and Natalia Martinez

Everyone knows that milk fever is an important problem that affects lactating dairy cows, particularly those starting their second or greater lactation. In the US, 5 to 7% of the dairy cows are diagnosed every year with milk fever, and those cows require intravenous administration of calcium (Ca) borogluconate to recover. A less recognized problem is the prevalence of subclinical hypocalcemia, which is typically characterized by serum total Ca < 8.5 mg/dL (or < 2.1 m*M*) or serum ionized Ca < 4.0 mg/dL (or < 1.0 m*M*).

Surveys in the United States indicate that 25% of primiparous (starting their first lactation) and 45% of the multiparous cows will develop subclinical hypocalcemia in the first week of lactation. Cows with less than adequate serum Ca concentrations have compromised health because of increased risk of developing uterine prolapse, retained placenta, metritis, displaced abomasum, and ketosis. Therefore, prevention of hypocalcemia should go beyond minimizing milk fever, but also reduce the prevalence of cows that develop subclinical hypocalcemia.

Subclinical hypocalcemia affects metabolism and impairs immune function

A recent work at the University of Florida demonstrated that induction of subclinical hypocalcemia altered metabolism and impaired some measures of immune function that are thought to be critical for protection against infections. The study was conducted with funds supported by the Southeast Milk Inc. Check-Off program and by Boehringer Ingelheim Vetmedica and recently published in Journal of Dairy Science (Martinez et al., 2014 J. Dairy Sci. 97:874–887). Basically, 10 nonlactating cows were induced to have subclinical hypocalcemia by intravenous infusion of a specific Ca-specific chelating agent (ethylene glycol tetraacetic acid or EGTA) that reduced blood ionized Ca from 1.2 m*M* to 0.8 m*M* for 24 hours. Another 10 cows remained as control (normocalcemic) and received a continuous infusion of saline solution.

As expected, infusion of EGTA successfully induced subclinical hypocalcemia in cows during 23 of the 24 h of infusion. No differences were detected in heart and respiratory rates, rectal temperature, and white blood cell counts between the two groups; however, subclinically hypocalcemic cows had a major decline in dry matter intake, from 26 lbs of dry matter/day on the days before, to 12 lbs of dry matter/day during hypocalcemia, whereas the decline in dry matter intake in normocalcemic cows during the infusion of saline was of only 4 lbs/day. They also had decreased rumen contractions compared with normocalcemic cows (1.9 vs. 2.7 contraction/2 minutes). Interestingly, cows induced to have subclinical hypocalcemia developed signs of insulin resistance with reduced blood insulin and increased body lipid mobilization. They also had white blood cells with less intracellular Ca and reduced ability to engulf and kill pathogenic bacteria in vitro. Some of these negative effects on cell function persisted up to 72 h after the end of treatments. What these data tell us is that marginal reduction in blood Ca, even in nonlactating cows, impair appetite, reduce rumen function, suppress immune cell function, and increase tissue mobilization, all aspects that are undesirable for early lactation cows.

Subclinical hypocalcemia increases the risk of uterine diseases

The impact of milk fever on the health of dairy cows is very conspicuous, as it can result in downer cows and death if left untreated. Nevertheless, milder depressions of serum Ca concentrations, as indicated above are often not diagnosed and can have a pronounced negative effect on postpartum health and fertility. One of the most common health problems affecting dairy cows is uterine disease, which affect 20 to 30% of the cows either in confinement or in grazing systems.

Recently, our group at the University of Florida (Martinez et al., 2012 J. Dairy Sci. 95: 7158–7172) documented that cows with subclinical hypocalcemia in the first 3 days postpartum had 3-fold greater risk of developing metritis and 11 times the risk of developing metritis concurrent with fever, compared with cows with normal blood Ca after calving. These cows with subclinical hypocalcemia also had increased incidence of endometritis, a disease that is less recognized by producers and characterized by presence of pus in the uterus after 3 weeks postpartum. It is thought that the inability to eliminate the typical bacterial contamination of the uterus after calving predisposes cows to develop inflammation of the uterus and extension of the period in which pathogens remain in the uterus of dairy cows. In fact, cows with subclinical hypocalcemia had immune cells with impaired function, which is thought to explain some of the inability to eliminate the bacterial contamination with the onset of parturition. Not only cows with subclinical hypocalcemia had increased risk of uterine diseases, but they also had compromised reproductive performance. The interval from calving to pregnancy extended from 109 days in normocalcemic to 124 days in cows with subclinical hypocalcemia. This means that the affected cows had more diseases and also had a 15-day delay to become pregnant.

Hypocalcemia is also prevalent in grazing dairies

Many assume that hypocalcemia and other peripartum diseases are not common in grazing cows. We have surveyed grazing dairy farms in Florida and evaluated the prevalence of subclinical hypocalcemia in the first week of lactation in 957 cows. Overall, the prevalence was 43.3%, and it affected 35.2% of the Holsteins, 46.7% the Holstein-Jersey crosses, and 49.1% of the Jerseys in those farms. Therefore, like in confinement herds with high-producing cows, dairy cows in grazing systems are also susceptible to subclinical hypocalcemia and almost half of them have low blood Ca in the first week of lactation.

The most effective prevention is still through dietary means

One of the major dietary reasons for cows to develop hypocalcemia is the feeding of diets that are high in sodium and potassium, which tend to keep the blood pH in the high side of the physiological scale. When blood pH is slightly alkaline, the body of the cow is less capable of responding to abrupt shifts in blood Ca concentrations, making them more susceptible to hypocalcemia at the onset of lactation. Conversely, slight acidification of the blood by dietary means improves the mechanisms of Ca resorption from bone, and also intestinal absorption, which allows the cow to more rapidly adjust to changes in blood Ca.

Manipulating the prepartum diet still is the best method of preventing clinical and subclinical hypocalcemia. Selecting forages and other dietary ingredients that are low in potassium and sodium, and high in chloride, and then complementing those dietary ingredients with acidogenic salts, commonly referred as “anionic salts”, such as calcium chloride, magnesium chloride, ammonium chloride or commercial products high in chloride remains the most practical and effective method to minimize the risk of hypocalcemia. This is often referred as “DCAD” diets (from dietary cation-anion difference). It is important to emphasize that these dietary programs should not be based only on adding acidogenic salts, but using these salts to complement dietary ingredients that already are low in potassium.

Feeding acidogenic salts is routine today in most farms, but one cannot forget that hypocalcemia can also occur when the prepartum diet is high in phosphorus and low in magnesium. Certain protein meals and by-products such as fish meal, canola meal, distiller’s grains, corn gluten, sunflower meal, and cottonseed meal have more than 1% phosphorus, and prepartum diets containing more than 0.35 to 0.40% phosphorus (dry matter basis) might attenuate the mechanisms for Ca resorption and intestinal absorption. Similarly, diets with low content in magnesium, usually <0.35%, particularly when coarse sources of magnesium oxide are used, might reduce the ability of the cow to regulate blood Ca. You should discuss with your nutritionist the dietary strategies in place to prevent clinical and subclinical hypocalcemia in your herd.

Monitoring is critical for success of preventive programs

If you are feeding prepartum diets that contain acidogenic salts, then it becomes really important to monitor if they are doing what they are intended to do, which is to acidify the blood and reduce the incidence of hypocalcemia. A practical method for monitoring is by measuring urine pH in a group of prepartum cows that have been on that diet for at least 2 days. You can stimulate cows to urinate by massaging the perineal area, just below the vulva, with the back of your hand wearing a palpation sleeve. Let a good stream of urine flow and collect 10 or 15 mL on a plastic vial, such as a blood or milk tube. If the sample is clean and devoid of manure, then the pH is stable for several hours if protected from sunlight and at room temperature. Contamination and bacterial growth can alter the pH. It is suggested that 8 to 10 cows should be sampled and most of them should have urinary pH between 5.8 and 6.5. If more than 2 out of the 8 cows have urinary pH ≤ 5.5, then you should reduce the amount of acidogenic salts fed. Similarly, if more than 2 cows have urinary pH > 6.8, you should consider small increments in the amount of salts fed. You should always reassess forage analysis whenever major changes occur in the proportion of cows with urinary pH outside the desired range.

Good record keeping and monitoring the proportion of cows that require intravenous Ca treatment after calving is very important. In the US, 5 to 7% of the dairy cows initiating their second or greater lactation require intravenous Ca to treat milk fever. When diets are formulated properly and a monitoring system is in place, this incidence should drop to below 1%. However, a considerable proportion of cows still have inadequate serum Ca concentrations. In large herds, in which many calvings occur in short periods of time, producers should take advantage of monitoring serum Ca concentrations of recently freshened cows. This can be done by taking a blood sample in a red top tube (without anticoagulant), let it clot at room temperature for 20 to 30 minutes, and then place the tube in the refrigerator. Again, it is suggested to sample 8 cows that are 1 to 2 days after calving and before any oral or intravenous Ca treatment. Sample preferably cows starting their second or greater lactation. These samples can be submitted to a veterinary clinical pathology laboratory such as the one at the College of

Veterinary Medicine at the University of Florida or through your veterinary services. Ideally, all cows should have serum Ca > 8.0 mg/dL, or 2.0 m*M*, but you should reassess your prevention strategies whenever the prevalence of cows with low serum Ca (< 8.0 mg/dL or < 2.0 m*M*) is more than 30% (more than 2 out of the 8 sampled cows).

What about giving oral or subcutaneous Ca after calving?

Many producers opt to give every cow that freshens Ca either orally or by subcutaneous injection. Those supplements will aid in the prevention of milk fever, but unfortunately, they have little or no impact on minimizing subclinical hypocalcemia or the diseases that are linked to inadequate blood Ca. In general, administering 40 to 80 g of Ca orally will increase blood Ca by 1 mg/dL for approximately 4 to 6 hours only. When a bottle of Ca borogluconate is administered subcutaneously, which provides 10 g of Ca, it will increase blood Ca 1 to 2 mg/dL for only 5 hours. Although these strategies will minimize the risk of down cows because of milk fever, they will not reduce the risk of other health disorders in dairy cows.

For more information, contact José Santos at jepsantos@ufl.edu or call (352) 392-1958 ext. 251

Dr. Samantha Brooks Joins UF Animal Sciences in Equine Science

Dr. Samantha Brooks recently joined the faculty in the Department of Animal Sciences. She is one in a fairly long list of new faculty members already in or coming to Animal Sciences. Here is an introduction for all interested in the livestock industries in Florida.

A lifelong horse woman, Dr. Samantha Brooks was diverted from vet school by a budding passion for equine research. Born and raised in Lexington KY, she attended the University of Kentucky to pursue a degree in Agricultural Biotechnology. After completing her bachelor's degree Dr. Brooks remained at the University of Kentucky to study at the Gluck Equine Research Center. While there she earned her PhD in Veterinary Science, specializing in Equine Genetics under the mentorship of Dr. Ernest Bailey. Her dissertation work focused on genetic polymorphism in the *KIT* gene and resulted in commercially available genetics tests for two coat spotting patterns: Tobiano and Sabino-1. Coat colors are not only a classic model for genetic study, but in the horse are also very important economic traits. Following her PhD she was awarded the Paul Mellon Postdoctoral Fellowship to remain at the Gluck Center and study the expression of inflammatory genes in horses affected with laminitis. Aspects of this project are still an important component of her research program today.

Dr. Brooks spent five and a half years as an assistant professor in the Animal Science Department at Cornell University. At Cornell her primary teaching responsibility was to recreate the Equine Biology and Management course. As this was the only equine course at Cornell, Dr. Brooks was responsible for providing an introduction to diverse topics including evolution, reproduction and nutrition. While there she also developed new courses in Comparative Animal Genomics and DNA Diagnostics for Livestock. Dr. Brooks also currently mentors three PhD students and several undergraduate researchers.

The Brooks Equine Genetics Lab explores a variety of topics relevant to horse health using modern genomic techniques. Currently, traits under investigation include several coat colors and patterns, heritable neurologic disorders like juvenile epilepsy and degenerative myeloencephalopathy, gait pattern and reflexive behavior, as well as diversity in genome structure. The Brooks lab also has a number of projects on body size and conformation in the horse. As an athletic animal, appropriate physiology and soundness are key for function and well-being in the horse. Using a measurement protocol developed in partnership with Dr. Nate Sutter (La Sierra University) they have discovered at least three primary loci controlling body size in the horse. Ongoing work is also examining potential links between these loci and several disorders and orthopedic conditions.

A primary focus of the Brooks research group is laminitis. Equine laminitis is one of the most significant diseases affecting horses, by any measure. The cause of the disease appears to be heterogeneous, occurring as a result of injury, infection, toxins or metabolic disorder. Two major, long term objectives in the Brooks lab are the development of 1) a prognostic tests to identify horses at risk, and 2) novel therapeutic treatment to prevent or ameliorate the disease. In collaboration with Dr. Hannah Galantino-Homer (New Bolton Center, U. Penn.), the Brooks lab is working to discover novel genes key for a normal and healthy hoof, as well as genes that play a role in laminitis pathology. An imbalance in gut microbiota and their relationship with host immune system seems to contribute to some types of laminitis. Preliminary studies of these topics are underway in collaboration with Dr. Burt Staniar at The Pennsylvania State University.

Overall, Dr. Brooks and her team of researchers aim to benefit the health and well-being of the horse and they look forward to working with the thriving equine industry of central Florida! Contact Samantha Brooks at samantha.brooks@ufl.edu

Development of a Dairy Farm Evaluation System to Reduce Mastitis and Antimicrobial Use

Ray Mobley

Mastitis is the most common disease and biggest cause of antimicrobial use in adult dairy cattle in the United States. Despite considerable knowledge regarding the prevention and therapy of mastitis, many farms continue to look for ways to better adopt mastitis control practices. Additionally, the U.S. dairy industry is increasingly diverse in terms of herd size, housing, labor, and management models.

The **Quality Milk Alliance**, a five-year project funded by USDA-NIFA, is dedicated to reducing mastitis and antibiotic use in dairy cows. Project investigators include veterinarians, dairy scientists, sociologists, economists, media and

education specialists, and extension educators from four institutions. Florida A&M University is partnering with Michigan State University (lead), Pennsylvania State University, and Mississippi State University to develop a program to address this significant issue. This program will develop a farm evaluation that will not only assess traditional key areas of a herd quality milk program, but also will help dairy producers become better employee coaches and their veterinarians grow into the role of "science teachers" for the employees. The farm evaluation will also be the basis for a combined online and "hands on" educational program to certify specialists who will be familiar with and can apply the evaluation on dairy farms. Additionally, the system will be tested in over 120 dairy herds in three states to determine if the approach can reduce mastitis and antibiotic use on dairy farms, improve employee education and participation in herd quality milk practices, and determine if the system is economically viable for dairy operations.

As a preliminary step for the project, a survey was sent to dairy herds in Florida, Michigan, and Pennsylvania. In Florida, this process was greatly aided by Dr. Mary Sowerby, UF Regional Dairy Extension agent in Live Oak. From the 3 states, 628 herds (overall 41% response rate) responded to the survey. The average herd size was 104 cows, although there were significant differences in average herd size between states. At least 86% of the farms reported practicing pre-and post-milking teat disinfection and drying teats. Likewise, 80% or greater of herds reported always or frequently using alcohol pads before teat infusions, dry cow therapy, and cleaning the alleys and gutters in barns at each milking. However, critical behaviors that are believed to reduce the use of unproductive antibiotic therapy for mastitis, such as recording all treatments (47%), review of records to identify previous treatments (42%) and bacterial culture milk for clinical mastitis cases (15%) were less frequently reported as always or frequently done. Thus, preliminary results from the survey suggest that while standard mastitis control practices are widely adapted, decision making in antibiotic therapy for mastitis is a critical area that should be targeted during the course of the project.

Further information about this project can be attained at http://qualitymilkalliance.com. Contact Dr. Ray Mobley, Director of Animal Health Programs, Florida A&M University, Tallahassee, at (850) 445-7423 or email ray.mobley215@gmail.com

Post script:

A similar project to improve milk quality in the Southeast is the **Southeast Quality Milk Initiative** (SQMI, http://sequalitymilk.com). This too is a five-year project, funded by USDA-NIFA, and led by the University of Tennessee. Other collaborating universities in the SQMI project are the University of Kentucky, University of Georgia, Virginia Tech, Mississippi State University, and the University of Florida. The objectives of the Quality Milk Alliance and SQMI projects are similar but with a somewhat different emphasis.

Both the Quality Milk Alliance and SQMI projects target dairy producers in Florida. To make sure both projects do not compete but collaborate, there is frequent communication between Florida A&M and UF. Both projects are still in a start-up phase. Stay tuned for more news from both the Quality Milk Alliance and SQMI.

Contact Albert De Vries, devries@ufl.edu, (352) 392-5594 ext. 227 for more information.

Prediction of the Future Florida Mailbox Price: April 2014 - March 2015

Using the Class III and Class IV futures settle prices of April 3, 2014, the University of Wisconsin predicts the Florida mailbox prices for April 2014 to March 2015 as follows:

Month	Class III settle price*	Class IV settle price*	Predicted FL mailbox price
Apr-14	24.23	23.46	27.37
May-14	22.70	22.07	25.93
Jun-14	21.07	21.11	24.63
Jul-14	20.60	20.70	25.48
Aug-14	20.25	20.40	25.15
Sep-14	19.88	20.20	24.87
Oct-14	19.44	19.90	24.68
Nov-14	19.00	19.70	24.35
Dec-14	18.60	19.40	24.00
Jan-15	18.28	18.50	22.79
Feb-15	18.08	18.00	22.45
Mar-15	17.83	17.51	22.09

* Class III and IV settle prices ($/cwt) as of April 4, 2014.

Daily updated Florida mailbox price predictions are found at http://future.aae.wisc.edu/predicted_mailbox/?state=Florida
Contact Albert De Vries, devries@ufl.edu, (352) 392-5594.227

Dairy Extension Agenda

- **May 7-9, 2014.** 63th Florida Beef Cattle Short Course, Gainesville, Florida. http://animal.ifas.ufl.edu/beef_extension/bcsc/2014/short.shtml
- Thursday **May 29, 2014**. Corn Silage and Forage Field Day, Citra, Florida. http://animal.ifas.ufl.edu/extension/CSFD/CSFD/

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