Kansas K-STATE Kansas State University
VETERINARY
FOR THE PRACTICING VETERINARIAN Quarterly

Spring 2006
Volume 9, Number 2

Those old batteries won't hurt my calves, will they?

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Lead continues to be an important, but sometimes overlooked, cause of mortality in cattle. Young calves are most susceptible to the effects of lead, but all ages of cattle can and are affected. This spring in a period of three weeks, three cases of lead poisoning were diagnosed at the K-State Diagnostic Laboratory.

The first case involved a group of 46, 9- to 10-month-old calves from Missouri. Three days after being vaccinated with a 4-way modified-live virus vaccine and a clostridial bacterin, there was an outbreak of respiratory disease that resulted in four deaths. Three calves were submitted to the University of Missouri Veterinary Diagnostic Laboratory where bovine respiratory syncytial virus was diagnosed.

The owner blamed the virus vaccine, but the virus infecting the calves was determined to be different from the vaccine virus. Six weeks later the owner unexpectedly found a dead bull calf. Because he was going to attend Cattlemen's Day at K-State, he brought the calf to Manhattan. The owner said that this was the second calf to die suddenly and that a heifer had recently become blind and displayed signs of CNS disease. The herd veterinarian suspected lead poisoning, but the owner blamed the vaccine. There were no diagnostic necropsy findings, but a kidney from the calf contained 50 ppm lead. Levels of 10 ppm or greater in the liver or kidney are diagnostic of lead toxicity. Since informing the veterinarian of the diagnosis, we have not had any feedback and do not know if the source of the lead was found.

The second case involved a group of adult cows on wheat pasture. The history indicated that several cows became recumbent and died. Some were blind, showing excessive salivation and chewing motions. Samples were submitted to be tested for rabies and organophosphate toxicity; both tests were negative. Because of the blindness, it was suggested that lead toxicity might be possible. Liver and kidney from one cow contained 39 ppm and 52 ppm lead, respectively, and kidney from a second cow contained 43 ppm lead. To date, six cows have died and the source of the lead has not been found.

The most devastating case was in a group of 250–750 lb heifers. The attending veterinarian phoned the laboratory on Sunday morning seeking help. Between Thursday and Sunday morning 24 heifers had died and several more were ill. One heifer had been necropsied on Thursday, and its lungs were wet and red. Another heifer, who was down and paddling, had a rectal temperature of 107 F shortly before she died.

Based on these findings, it was concluded that the deaths were due to infectious disease and the group was treated accordingly. The owner arrived at K-State on Sunday afternoon with three live, affected heifers. All three were ambulatory but appeared stuporous. They had to be pushed and guided off the trailer. Two ran in to pipe gates while being guided into pens. After a physical exam, whole blood was collected into EDTA tubes, the owner was told of the possibility of lead poisoning, and two heifers were euthanized and necropsied. While the calves were being examined, the owner was told that because of the apparent blindness, lead toxicity was possible. The owner insisted that was not possible. The only abnormalities at necropsy were a few hemorrhages in the abomasal mucosa of one heifer. On Monday morning the blood samples were analyzed and the lead levels were 0.88, 2.6, and 3.2 parts per million (ppm). Blood lead of 0.3 to 0.35 ppm indicates significant exposure to lead, and levels of 0.6 ppm or more are diagnostic of lead toxicity. The veterinarian was phoned at 10:30 am and informed of the diagnosis of lead toxicity.

After consultation with members of the K-State Large Animal Clinic and the Toxicology Laboratory, the owner moved the heifers, instituted treatment of clinically affected heifers, and began to look for a source of the lead. Initially, a rusted through paint container and a nearby "blob" of 1 to 2 gallons of paint were found. The paint contained approximately 9% lead. Later, a lead-acid storage battery was also found. The battery had been covered by pond water, but the recent drought had lowered the water level enough to uncover the battery. While the paint could have contributed to the deaths, it is likely

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Also in this issue

Thank you to the Pfizer Animal Health Group, Livestock Division, Cattle Products Group, for financial assistance in publishing this newsletter.

Inherited and BVD induced osteopetrosis in calves

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A red Angus fetus that was born dead approximately 1 month before the expected due date was presented to the Kansas State Veterinary Diagnostic laboratory for necropsy. This was the first calf born dead this year in this herd; however, the year before there were three calves with similar blood lines that were born dead and had similar skeletal abnormalities.

The fetus was fully haired with a crown to rump length of 73 cm, which corresponds to a gestation age of approximately 270 days. External examination of this fetus revealed a sloped forehead, brachygnathia, protruding tongue and impacted mandibular molars (*figure 1*).

The calf had transverse mid-diaphyseal fractures of both metacarpals and both femurs. The humerus and femurs were relatively short for a fetus of this size. The humerus and femurs were dissected from the surrounding musculature and transected longitudinally. The medullary cavity of these bones was replaced by bony triangular wedges with the base of the triangles adjacent to the proximal and distal physes and the apex extending to mid-diaphyses(*figure 2*).

Histologically these bony triangular wedges were composed of primary spongiosa. All other tissues were grossly and histologically normal. Fluorescent antibody testing and viral isolation was performed on multiple fetal tissues and was negative for BVD virus.

Osteopetrosis was diagnosed due to the characteristic gross and histologic findings. Osteopetrosis is a congenital skeletal deformity that occurs due to failure of resorption of primary or secondary spongiosa. This is suspected to be due to decrease numbers of functional osteoclasts in the bone, which prevents normal remodeling. It has been reported in humans, dogs, horses and cattle including, black and red Angus, Herefords, Simmental, and Holstein breeds.

Osteopetrosis is inherited as an autosomal recessive trait in red and black Angus calves. Because of the gross and histologic findings, this calf most likely had the inherited form. In addition, there was no evidence of an infectious cause and this calf was from the same line of breeding as the calves with similar abnormalities the previous year.

Angus calves with inherited osteopetrosis are born premature at approximately 250-275 days in gestation and are usually still born. Diagnosis of this disease in calves can be made by documenting the following characteristic gross findings: sloping forehead (with or without prominent domed head), brachygnathia, retained

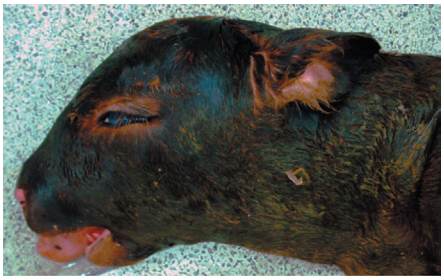

Figure 1: Fetus with sloped forehead, brachygnathia, and protruding tongue.

mandibular molars, protruding tongue and abnormal long bones. The long bones may appear shorter than normal and should be transected to verify the presence of the triangular wedges of dense bone occluding the medullary cavity. The long bones are also frequently fractured as they were in this case due to the fragility of the non-remodeled bone. In addition the bones frequently appear to have a "dumb bell" shape because the diaphysis appears thin due to the marked flaring of the metaphysis. Definitive confirmation of osteopetrosis can be made by histologic examination of fixed specimens.

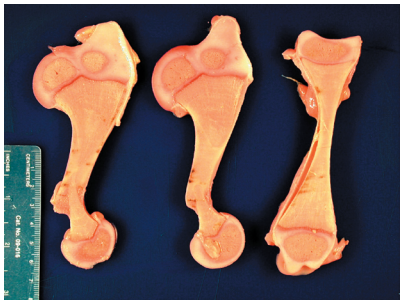

Figure 2: Humerus and tibia from osteopetrosis Angus calf with triangle shaped wedges of dense bone filling the medullary cavity.

Osteopetrosis in Hereford and Simmental cattle has similar gross findings and is also inherited in an autosomal recessive manner. Herefords will usually have thick frontal bones and domed heads that may be mistaken for hydrocephalus. But the medullary cavity of long bones will also be filled by triangle-shaped bony wedges. The Hereford calves also can have variably sized cystic spaces in the metaphyseal region of long bones and frontal bones.

Osteopetrosis-like lesions have been documented in calves infected in utero by bovine viral diarrhea (BVD) virus (*figure 3*). Bovine viral diarrhea infection can cause several congenital defects including cerebellar hypoplasia, arthrogryposis, brachygnathia, and intrauterine growth retardation like the osteopetrosis calves; however, the gross and histologic changes in the long bones are different. There will not be total loss of the marrow cavity on cross section, although the bones in the metaphyses will be denser and there will be bands of increased bone density

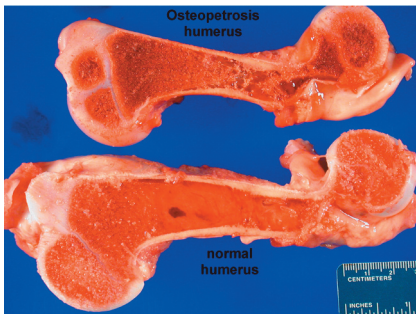

Figure 3: Osteopetrosis-like changes in a calf with BVD infection, the affected humerus (top) is shorter with a smaller marrow cavity and dense bone extending into the diaphysis, compared to a normal humerus (bottom).

that are roughly parallel to the physis in the epiphyses and metaphyses, which are called "growth retardation lattices." Histologically these bands have large numbers of straight primary trabeculae that are arranged parallel to the long axis of bone. These same growth retardation lattices have also been associated with lead and phosphorus toxicity.

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When performing a gross nescropsy on a late term abortion it is important to look for these characteristic lesions of osteopetrosis. Some calves will not have the obvious head malformations, so it is best to transect the long bones to visualize the size of the marrow cavity and the bone density of the metaphyses and diaphyses.

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Use of MGA in cows is illegal use of medicated feed

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Use of MGA as part of any estrous synchronization protocol in cows (not heifers) constitutes an extralabel use of medicated feed that is prohibited by the Animal Medicinal Drug Use and Clarification Act and regulation 21 CFR 530.11(b).

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that the main culprit was the battery, because in our experience, by far the most common cause of lead toxicity in livestock is old batteries. One additional heifer died, but the other clinically affected animals responded to treatment. In addition to the loss of 27 heifers, the owner was advised to collect whole blood from the other calves in the group and have them analyzed for lead because of the possible health concerns posed by lead residues.

Although veterinarians recognize the danger posed by old batteries, many people apparently do not recognize lead-acid batteries as a hazard. Three examples come to mind.

The first was in a group of finisher calves in which six had recently died after displaying signs of CNS disease and blindness. The owner was sure that the first four calves died of polioencephalomalacia. Because none of the calves had responded to treatment for polio, he was now having second thoughts. Because of the blindness and the lack of response to treatment, the owner was told that lead poisoning was a real possibility.

He said that was not possible because there was no source of lead. He mentioned using old batteries to hold down feeder lids but said the calves could not get to them. Then he admitted that the batteries had fallen and the cases cracked. When he was told that battery acid that leaked from the cracked batteries contained lead, he agreed to have the two calves tested. Their kidneys contained toxic levels of lead.

The second case involved sheep. Intestines from one sheep were submitted but were not diagnostic. The owner also had water from the stock tank in the sheep pen and water from the hydrant tested. Water from the tank, but not water taken directly from the hydrant, contained lead. When batteries were mentioned as a possible lead source, the owner said that there was an old battery in the tank. She did not know how the battery got there, but had never considered it as a potential hazard.

The third case is one where someone who knew that old batteries can be hazardous probably prevented deaths in a group of calves. My wife was at the feed store to purchase some cracked corn when a customer told the clerk that he was going to put some calves in a lot where there were a couple of discarded batteries.

He asked the clerk "those batteries won't hurt the calves, will they?" The clerk replied "Those batteries will kill your calves dead! You better get those batteries out of there."

Remember that when told that lead or some other toxin is the probable cause of death of their livestock, owners are often unaware of sources of toxins in their operation. If the owner knew that the environment contained something that could kill their livestock, they would have removed it.

Advanced Feedlot Production Medicine Rotation

Dr. Dan Thomson and Dr. Mike Apley
K-State College of Veterinary Medicine
Department of Clinical Sciences

This year three new courses were developed for the fourth-year students at the Kansas State University College of Veterinary Medicine. The courses are involved in production medicine in the areas of cow/calf, dairy and feedlot.

The Dairy Production Medicine course has been taught in collaboration with University of California at Davis. Our students spent three weeks in the UC Davis Production Medicine group in Tulare, Calif. The Cow/Calf Production Medicine Rotation will take place this spring with Drs. Brad White and Mike Sanderson coordinating the course. This last fall the Feedlot Production Medicine Rotation was coordinated by Drs. Dan Thomson and Mike Apley.

In the feedlot course, 15 fourth-year students completed the rotation. The goal was to help students understand evidence-based medicine, non-medicine topics associated with feedyard management and new areas of emphasis that veterinarians are being asked to confront every day.

Drs. Apley and Thomson covered many areas of production medicine in the classroom and in the field. These topics included classifying cattle, processing protocols, animal welfare, pregnant heifers, bullers, pen riding, hospital pen management, therapy protocols, respiratory disease, musculoskeletal disease, metabolic upsets, and digestive tract disorders. We then discussed working facility design and cattle handling at the Beef Cattle Research Center.

Producers feed cattle to make money. Therefore, two days of the class were set aside for Drs. Ted Schroder and Jim Minert from the Ag Economics department to discuss cattle marketing, the cattle cycle and how commodities (corn, protein, etc.) affect cattle profitability. The class instruction included risk management and the fundamentals of cattle pricing. Students learned about different marketing grids and how health can affect the bottom line of any operation. Joining efforts with the College of Agriculture is important to the instruction of our food animal students.

Julie Christopher, MS, and Dr. Dan Thomson spent a day on applied ruminant nutrition. Students learned how to find the nutrient requirements of cattle using current publications. We also discuss feed bunk management and how to transition cattle from one ration to the next. Non-nutritive feed additives and steroid implants were discussed during the day. The students were asked to formulate diets for the cow herd and newly weaned calves using the Oklahoma State University Ration Balancing program in the Food Animal Computer Laboratory.

Environmental issues at the feedyard level are becoming more and more on the forefront of everyone's mind. Mandy Fox, MS, from the Kansas Livestock Association, worked with the students on feedyard environmental issues. She discussed the importance of containing runoff water in the feedyard. She also discussed air quality and ways to control dust. Lastly, there was a discussion on fly control. All students were required to become certified in BQA standards through the Kansas Livestock Association (KLA). We are very lucky to have KLA as a partner when it comes to teaching and service with the College of Veterinary Medicine.

Research and evidence-based decisions are the future of veterinary medicine practice. The students spent time with Drs. Dave Renter, Mike Sanderson and Brad DeGroot discussing basic field study design and study interpretation. Many times as practitioners we need to make decisions on drugs, management decisions and other things that impact the health and well-being of cattle on feed. This group of epidemiologists discussed how to set up a simple study that is randomized and has minimal variation to answer a production question. The students were also exposed to methods for sorting through data that is presented to them in advertisements. They learned about variation, sample size, replication and other items that make studies stronger or weaker.

As explained by the Ag Economists, carcass characteristics and performance are important to the cattle feeder's profitability. Dr. Shelie Laflin spent time with the students discussing carcass quality. She later conducted an ultrasound wet lab where students were able to get some hands-on ultrasound training of steers

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Advanced feedlot production medicine class, Kansas State University, Fall 2005.

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brought in from the Beef Cattle Research Center. Dr. Brad White followed up this discussion by teaching the students individual animal variation and what criteria operations need to record to make profitable decisions. Dr. White then led a discussion on practice philosophy and explained to students how to make money using production animal medicine.

The class took numerous field trips. The first field trip was to a feed mill in Seneca, Kan. that is owned and operated by Midwest Ag. Dr. White, Dr. Thomson and Dr. Larry Hollis accompanied the students. The students learned about ingredient selection, mill operations and feed batching. They also learned how Coops function with their stakeholders. Lastly, the students experienced how producers can order a specific diet/supplement and the service that goes along with the diet formulations.

Our next field trip was to a grow yard in Centralia, Kan. We processed some 400 lb. cutting bulls with the producer. We talked with Mr. Gene Holthaus and his son Kevin who own the operation. They discussed with students what they expect from a veterinarian and then showed us their operations. Mr. Holthaus has been generous in allowing students to come work at his facility.

Industry partnerships are important to veterinary practices and veterinary schools. Pfizer Animal Health took the class on a trip to Lincoln, Neb. In Lincoln, the students toured the Pfizer biologics plant. That afternoon they enjoyed a discussion with Dr. Vic Cortese on the topics of immunology and vaccinology. Mr. John Havens and Dr. Mitch Blanding of Pfizer were on the trip with the students. The students socialized and got to know Dr. Brad White, who was new at the time, while in the van to and from Lincoln.

Later in the week the students hit the feedyards. Dr. Mike Apley and Julie Christopher escorted the students to Heritage Beef in Parsons, Kan. Dr. Apley discussed how to handle an outbreak type problem in the feedyard. The students were exposed to feedyard health records, how to read a yard sheet, and how to implement programs in a feedlot.

Great Bend Feeders and Mr. Andrew Murphy, MS, have been great supporters of Kansas State University. The field trip to Great Bend Feeders in Great Bend, Kan., was no exception. The class spent part of the morning with Mr. Murphy discussing the expectations that feedyard management and employees have for a veterinarian, the changing role of the practitioner in the feedyard and how evidence-based medicine is the future for making animal health decisions that affect the bottom line.

Dr. Nels Lindberg, DVM, faculty met us at Great Bend Feeders. He conducted a walk through of load out and processing facilities, receiving pens, home pens and hospital facilities at the feedyard.

After a lunch sponsored by Great Bend Feeders, the class participated in a necropsy wet lab. Students were paired up and waited for their specimen to be delivered to the necropsy area. Drs. Thomson and Apley demonstrated a proper field necropsy and the students then conducted their own. We discussed proper tissues to submit and in what form they should be submitted for different diseases and illnesses in feeder cattle. Thanks again to Pfizer Animal Health for sponsoring the wet lab.

The students completed many projects during the evenings after the course work or field trips were completed. They were all instructed to develop therapy protocols for treatment of different disorders or illnesses in feedyard cattle (i.e. foot rot, respiratory disease, etc).

Students developed a set of standard operating procedures for a feedyard animal health crew (i.e. syringe cleaning, implant technique, etc). The SOPs were then put into a manual for the students to take with them to practice. Working through an Internet exercise allowed them to establish a "favorites" list for the web for quick access for answers common in the field.

Then the students completed a written and oral final. The oral final was conducted with Drs. Apley and Thomson posing as feedyard managers with questions pertinent to their operation.

After taking finals, the class met for one last time in the Practice Management Center. Pfizer Animal Health sponsored necropsy kits that all students were awarded for completion of the rotation. The necropsy kits included tool box, blood tubes, formalin mailers, whirl packs, knives, steels, a hatchet, protective glasses, pH paper and *purple* latex gloves. The students loved the kits, and one student said she used hers while on call at the American Royal.

This course was extremely fun because we have great students at KSU. It will be exciting to follow their careers. I recommend that the practitioners get in here and see what our students have to offer.

We are also proud to see what the future has to offer with our fourth-year curriculum offerings. Currently, Dr. White and Dr. Sanderson will be completing a cow/calf elective in the spring. We have advertised with and received interest from many other veterinary medicine colleges across the United States on sending their students to our feedyard elective next year.

We are planning a six-week beef cattle production medicine elective for fourth-year students and new graduates. This course will be an important step in Kansas State University establishing itself as the National Center of Excellence in Beef Cattle Medicine.

We hope to provide a course that will attract students that want to be leaders in beef production medicine from all over the country. We thank everyone for giving us a chance to succeed at KSU. We also thank Pfizer Animal Health for sponsoring our beef production electives.

Continuing Education

May 1-12, 2006

VetBytes Seminar Series: Clinical Diagnostic Parasitology: Highlighting the inefficiency of commonly used techniques to recover and identify GI parasites of the dog and cat.

June 4-7, 2006

68th Annual Conference for Veterinarians and KVMA Veterinary Trade Show

Brochures for these conferences will be available approximately two months before their scheduled date.

This is the conference schedule as of April 2006. More conferences may be added.

For the most complete, up-to-date conference information visit our Web site at: *www.vet.ksu.edu* and click on Continuing Education, or contact: Linda M. Johnson, Ph.D., at 785-532-5696 or *johnson@vet.ksu.edu*

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Kansas K-STATE VETERINARY FOR THE PRACTICING VETERINARIAN Quarterly

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