

# VETERINARY

## FOR THE PRACTICING VETERINARIAN

# Quarterly

Spring 2008  
Volume 11, Number 2

## Managing *Trichostrongylus axei* infections in beef herds

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*Trichostrongylus axei* causes early embryonic death, abortions, and infertility in beef herds. Definitive diagnosis requires culture and identification of the organism from an animal in the herd.

In infected herds, ranchers may not notice any indications of a problem until the time of pregnancy examination when an increased number of open cows are detected. If the breeding season is long (more than 90 days), the astute rancher may notice an increased number of cows cycling at the end of the breeding season. The number of cows that calve can be reduced by 20 to 40 percent, the mean calving date will be later, and the calving season will be spread out longer than in non-infected herds.

Proper herd management techniques are necessary to limit losses due to the disease in future years. Bulls colonized with *Trichostrongylus axei* are the primary reservoir for infection in the herd, yet are typically asymptomatic. The infection is localized in the prepuce and penile crypts and there is no known treatment to clear infection. Bulls less than 3 years of age may clear the infection, while those 3 years of age and older are usually infected for life.

All non-virgin bulls should be considered potential sources of infection for a herd. Although young bulls may not become permanent carriers, they can still spread the infection to susceptible females during the period that they are infected. Culturing bulls (preputial samples) for the organism is an important component of

control programs, but the test produces many false-negative results.

In order for a bull to be considered negative for trichostrongylosis, he must have three samples taken at weekly intervals be culture-negative. All positive bulls should be sent to slaughter. Bulls that were not previously tested should also be tested three times. All bulls including new imports should be tested in cases where *Trichostrongylus axei* is suspected. Infection in the cow occurs primarily by exposure to an infected bull at breeding. Initial infection of the female does not cause rapid conception failure, rather the pregnancy progresses to about 60-120 days with a peak loss at 70-90 days, at which time the embryo/fetus dies and is resorbed or aborted.

The first sign of Trichostrongylosis in a herd is that infected cows and heifers return to estrus one to three months after breeding. A period of infertility may last for another two to six months as a result of the infection. Cows that are infected with *Trichostrongylus axei* typically clear the infection within a few months. Immunity, however, is not permanent and the cow is subject to re-infection and abortion in subsequent breeding periods. Occasionally an open cow will fail to clear the infection or a pregnant cow will remain infected through pregnancy and be a source of infection for the herd at the next breeding season. Ideally open cows should be culled at the end of each breeding season.

Infected cows will also occasionally have an abortion due to *Trichostrongylus axei*. All abortions should be examined to be sure they are not caused by *Trichostrongylus axei*. Cervical mucus from the cow can be inoculated into the In Pouch and cultured for

identification. Cows that are open or abort due to *Trichostrongylus axei* should be culled prior to the breeding season.

### Recommendations for positive *Trichostrongylus axei* herds

#### Bulls

1. Send all *Trichostrongylus axei* test positive bulls to slaughter.
2. Retest bulls (three negative tests) for *Trichostrongylus axei* prior to each breeding season.
3. Test all imported bulls regardless of age (three negative tests to enter herd).
4. Keep the average bull age as young as possible. Some experts recommend removing bulls greater than 3 years of age. Others suggest that aggressive annual testing of bulls plus removal of bulls greater than 5 years of age is adequate.
5. Maintain a controlled breeding season to allow assessment of reproductive performance.

#### Cows

1. Cull all open cows.
2. Remove bulls after no more than a four-month breeding season. Examine the herd for pregnancy, and cull all open heifers and cows.
3. Cull all cows that have a *Trichostrongylus axei* positive abortion.
4. At pregnancy palpation watch for pyometras in cows. Cull any cows with a pyometra.
5. Increase efforts to keep neighbor cows and bulls out, and inform neighbors of the situation.
6. Optional: Vaccinate cows 8 weeks and 4 weeks prior to breeding.

# Investigating diarrhea outbreaks in kennel puppies

Brad M. DeBey, DVM, PhD, Diplomate ACVP; William Fortney DVM

## Problem-solving basics

Determining the cause for outbreaks of diarrhea in puppies can be challenging, especially if mortality is moderate to high. However, even if the puppies live, they are difficult to sell because of the possibility of spreading the problem to the broker and/or pet shop. Plus, poor body condition makes them less desirable. The list of possible causes is formidable, the cost of the work up can be significant, and the selection of the appropriate sample and sample submission is not always easy.

While infectious diseases are probably the most common causes, poor nutrition and suppressed immunity caused by environmental stressors in combination with poor management practices make solving, managing, and containing the problem arduous.

When investigating a kennel diarrhea outbreak, the following suggestions may help improve the outcome.

1. There is no substitute for an on-site kennel visit. Problem solving over the phone or in your examination room is difficult at best.
  2. Look for stressors of the puppy's immune system. Poor nutrition, poor ventilation, inadequate temperature control, over vaccinations, weaning stress, etc.
  3. Carefully review deworming protocols, vaccine protocols and vaccine handling procedures.
  4. Carefully review the disinfection/sanitation schedule including specific products used and the dilutions.
  5. Endemic problems (diseases firmly established in the kennel) are difficult if not impossible to control.
- Many of those infectious agents are environmentally resistant.
- There may be a carrier animal(s) that is acting as the continuous source for exposure. Infected fomites are common causes of disease spread through the kennel.
6. The proper diagnostic samples and sample submission are critical in confirming the diagnosis and separating the opportunists. Ideally, diagnostic specimens should be submitted to the laboratory for

identification of the primary infectious agent. With many diseases, particularly respiratory disease, multiple infectious etiologies are present when death of a puppy occurs, while finding the initiating pathogen will usually provide the most important information to the breeder. For that reason, specimens should be collected from acutely affected animals that have not been treated with antibiotics (that could interfere with bacterial cultures). Deterrents to gaining useful diagnostic information are the lack of sufficient sample quantities, improper samples for needed diagnostic tests, autolysis of tissues or overgrowth of environmental bacteria in specimens, and freezing of specimens for histopathologic examination.

## Kennel diarrhea in puppies

Diarrhea is one of the most common and potentially serious problems encountered in kennel situations today. Occasionally the diarrheal disease will affect the entire kennel. Fortunately most diarrheas are either self-limiting or respond favorably to symptomatic treatments, and the exact cause is seldom investigated. Since the recognition of canine parvovirus in 1978, increased efforts have been made to identify ALL the causative agents, those factors responsible for the diarrhea, and to develop improved preventative programs.

The common etiologies of acute diarrhea are complex, often multifactorial and include diet, medications, stress, and various infectious agents including endoparasites, viruses, and bacteria. We now know not all cases of bloody diarrhea are caused by canine parvovirus. Canine distemper virus, canine adenovirus 1, canine coronavirus, coccidiosis, hookworms, enterotoxigenic *Clostridium perfringens*, *Clostridium difficile*, enteropathogenic *E. coli*, *Salmonella sp.*, and occasionally *Giardia sp.* have all been found in Kansas commercial kennels and pet shops. In fact it is common to have more than one "infectious" agent involved in the pathogenesis of the diarrhea. While the infectious agents can be identified in the laboratory, those environmental factors i.e. malnutrition, poor mothering, temperature changes, poor disinfection/sanitation practices, overcrowd-

ing, weaning, shipping, cannot. It goes without saying that the key to managing diarrhea in kennel situations requires a thorough knowledge of the facility, complete diagnostic work up, and institution of appropriate management strategies.

Canine parvovirus (CPV) continues to be problematic in commercial kennel puppies despite improvements in parvo vaccines and rigorous vaccination programs. Despite adequate vaccinations, CPV continues to be the most common cause of diarrhea that is identified in puppies at KSVDL and should be the top differential diagnosis for bloody diarrhea in sick puppies. CPV is easy to diagnose, simple to confirm (pet side diagnostic tests, fecal HA or on necropsy), but difficult to eliminate from a kennel environment. There are recent reports of identification of a new strain of CPV called 2C with a much higher mortality in Kansas, Oklahoma, and Texas. With the 2C strain, it is believed that the high mortality exists despite adequate CPV vaccination programs. To determine if 2C is the causative agent requires viral sequencing. The Oklahoma Animal Disease Diagnostic Laboratory is set up for the diagnostic procedure. The test requires a fresh, tied off 2-inch section of jejunum shipped on ice, and the cost is \$100.

Canine coronavirus is regarded as an infrequent cause of infectious diarrhea in dogs, but does exist in Kansas kennels. Neonatal pups are more severely affected than those of weaning age or adult dogs. Coronaviral infections sometimes occur simultaneously with parvoviral infections, and may enhance the severity of the parvoviral infection. Occasionally, coronaviral infections may result in bloody diarrhea, mimicking parvoviral disease. Coronavirus can be identified by electron microscopy of feces and by fluorescent antibody staining of the intestines. Confirmation of infection with coronavirus is sometimes difficult, especially when postmortem autolysis of the diagnostic specimen is advanced, or if feces have been frozen, because freezing destroys the normal conformation of coronavirus particles.

*Giardia sp.* is one of the most clinically important and under-diagnosed enteric

problems in dogs and cats. The reported incidence in kennels and catteries is 1 to 36 percent in dogs and 1 to 5 percent in cats.

*Giardia* exists in two forms: trophozoite and cyst. Trophozoites are the feeding stage and can be found in fecal smears made directly from the animal. Cysts are the environmental state that can be found by fecal flotation with centrifugation. Zinc sulfate flotation solution is preferred because the cysts maintain their classic shape. A drop of Lugol's iodine placed on the slide before the coverslip is added will stain the cysts nicely. Because shedding is intermittent, one negative sample does not rule out *Giardia*. It is recommended that samples collected for three consecutive days be submitted. The parasitologists and technicians at the K-State Veterinary Diagnostic Laboratory are happy to answer questions concerning diagnosis and treatment of this important pathogen.

*Clostridium perfringens* is a normal intestinal bacterium that has been incriminated in causing diarrhea in dogs and cats. *C. perfringens* is part of the normal intestinal microflora of the dog, and is commonly isolated from dogs without diarrhea. *C. perfringens* enterotoxin is regarded as the potential major virulence factor of *C. perfringens* isolates from dogs, however this toxin can be found in the

intestinal content of dogs that do not have diarrhea. Studies have not focused on the role of *C. perfringens* in neonatal dogs. Currently, there is little evidence that *C. perfringens* plays a significant role in kennel diarrheal disease. If desired, the K-State Laboratory can test for enterotoxins in feces using a commercially produced ELISA.

*Clostridium difficile* is also commonly found in the intestinal tract of dogs without diarrhea. Toxins A and B are the principle virulence factors of *C. difficile*. Levels of toxins that would cause diarrhea in adult humans, guinea pigs, and horses can be detected in the feces of neonates of these species that do not have diarrhea, and this phenomenon is also believed to be possible in dogs. If true, identification of toxin in the diarrheic feces of neonatal dogs would be incidental to the true cause of diarrhea. We do not have enough information regarding a role of *C. difficile* in puppy diarrhea. The K-State Laboratory is also able to test feces for *C. difficile* using a commercial ELISA for toxins A and B.

Coccidiosis is probably the least understood yet most common endoparasites in commercial kennels. An overt infection results in a mild to fatal enteritis in kittens and puppies. Following any exposure, unless stressed or unhealthy, most animals have little or no disease. But once infected,

this parasite can develop an internal cystic (tissue) form, which lays dormant for long periods of time. These tissue forms are quite resistant to any medication. During periods of stress, such as pregnancy, overcrowding, weaning, or shipping, these cysts are activated and released to re-infect the dog and/or the rest of the kennel. Because the oocysts are very resistant to common disinfectants and because of the tissue form, once coccidia are well established in a kennel, termed endemic, it is probably impossible to totally eliminate the problem.

*E. coli* related diarrhea can be problematic in very young puppies. Within the 100 recognized *E. coli* strains identified in domestic animals are the normal *E. coli* strains necessary for normal digestive function; the enteropathogenic strains of *E. coli* capable of causing serious disease; and the opportunistic strains, which only cause disease if some previous damage to the intestinal lining exists. Isolation of *E. coli* from the intestine of a puppy with diarrhea is meaningless unless the *E. coli* isolate has been tested for, and found to have a virulence factor, such as toxin and adherence (pilus) gene, or if there is histologic evidence of infection by an enteropathogenic strain (by microscopically finding, attaching, and effacing *E. coli*).

## Model best practices for preventing disease transmission

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Iatrogenic transmission of cattle diseases such as Anaplasmosis, Bovine Leukosis, and BVD may occur any time even a tiny amount of blood is transferred animal-to-animal. We know that Anaplasmosis is carried by the *Anaplasma marginale* organism in infected red blood cells. Similarly, we know that the Bovine Leukosis virus is carried in infected lymphocytes in the blood. Additionally, we know that BVD virus can potentially be spread when blood from a viremic animal is transferred to a naïve animal. Iatrogenic blood-borne transmission can occur any time needles, ear taggers, castration or dehorning equipment, tattoo pliers, OB sleeves, ultrasound probes, surgical instruments, etc., are used on multiple animals

in succession. While livestock industry "norms" may indicate that we should work as rapidly as possible and reuse durable equipment until it becomes unusable, we need to make sure that our attempts at efficiency do not create different problems than the ones we are trying to solve.

As veterinarians, we are trained to understand the biology of various disease agents. We are also trained to use that understanding to determine effective ways to interrupt transmission of the disease in question. As we work for our producers, we need to set the example by performing procedures in such a way as to eliminate the possibility of blood-borne transmission of disease. If livestock producers observe us performing a procedure in a certain way, they often assume that they are observing things being done to the best

of our medical knowledge and ability (or stare in disbelief that we would use some of the techniques observed). As we work to educate our producers to do some of their own work, we need to instruct them properly and completely in the procedures that we recommend or facilitate them to carry out (i.e., vaccinations, estrus synchronization, implanting, metaphylactic use of antibacterials, etc.). This includes advice relative to proper use and/or disinfection of potential blood-transmitting equipment. As producers become more aware of the potential for blood-borne transmission of diseases, the associated liability for veterinarians also increases. Biosecurity and biocontainment procedures should be practiced — and preached.

# New strain of canine parvovirus found in the U.S.

*Jerome Nietfeld, DVM, PhD*

At the annual meeting of the American Association of Veterinary Laboratory Diagnosticians (AAVLD) in late October, there were presentations by researchers from the veterinary diagnostic laboratories at Oklahoma State University (OSU) and the University of Georgia (UGA) concerning a new strain of canine parvovirus type 2 that they have identified as being widespread in the United States.

## Background

In the late 1970s a new type of severe enteritis suddenly appeared in dogs, quickly spread across the globe, and became the most important cause of enteritis in dogs. It was found to be caused by a previously unknown parvovirus, which was designated as canine parvovirus type 2 (CPV-2) to differentiate it from canine parvovirus type 1, which is also referred to as the minute virus of canines and is rarely associated with clinical disease in dogs.

By the mid-1980s, CPV-2 had been replaced by CPV-2a and CPV-2b, which have co-circulated throughout the world since then. Because experimental studies have shown that vaccination with CPV-2 protects dogs infected with CPV-2a and CPV-2b against clinical disease, canine parvovirus vaccines in the U. S. are derived from the CPV-2 virus that was originally isolated in the late 1970s.

In 2000, a new variant of CPV-2 was identified in Italy and designated as CPV-2c. Since then CPV-2c has been identified in Germany, Spain, Vietnam, Japan, and South America. Because of its wide distribution, researchers at OSU and UGA began to collect samples from dogs with diarrhea. Samples positive for CPV-2 were subsequently analyzed by polymerase chain reaction (PCR) and DNA sequencing to subtype the strain of CPV-2 in the samples. The presentations at the AAVLD meeting summarized findings that have been recently published or accepted for publication.<sup>1,2</sup>

## Results

In the Georgia study, 27 samples were positive for CPV-2. Seven of the 27 samples contained CPV-2c, 19 samples

contained CPV-2b, and one contained CPV-2a. None of the samples were positive for the vaccine strain, CPV-2. The seven CPV-2c samples were from five states and originated from dogs 3 to 8 months old, and all of the dogs had been vaccinated twice with CPV-2 vaccine. The dog infected with CPV-2a and 17 of 19 dogs infected with CPV-2b were 2 to 14 months old and all had received 2 to 4 doses of CPV-2 vaccine. The other two dogs infected with CPV-2b had been vaccinated two days prior to development of clinical signs indicating that they were probably infected with field virus prior to being vaccinated. The clinical signs and outcomes in dogs infected with CPV-2c were not different than those in dogs with CPV-2a or CPV-2b.

In the Oklahoma study, 54 samples were positive for CPV-2 of which three were vaccine virus (CPV-2), 25 were CPV-2b, and 26 were CPV-2c. The CPV-2c samples originated from dogs in nine states, including Kansas. The CPV-2 vaccination status was known for two dogs infected with CPV-2, 15 dogs with CPV-2b, and 19 dogs with CPV-2c infection; all dogs had been vaccinated. Clinically, the cases of CPV-2c were manifest as either mucoid, yellow diarrhea or hemorrhagic diarrhea.

The genetic changes among the various strains of CPV-2 are small as all CPV-2 isolates are about 99% identical.<sup>2</sup> The CPV-2c strain is distinguishable from CPV-2a/2b by a single amino acid change in the capsid protein VP2 at residue 426. In addition to finding the "classical" CPV-2c variant reported from Italy, UGA reported that four of their 7 CPV-2c isolates had two additional single-nucleotide mutations. Similarly, OSU found three CPV-2c isolates that differed from the Italian strain at a single codon.

## Discussion

One thing that is evident is that clinical parvovirus occurs in vaccinated dogs when infected with CPV-2b and CPV-2c, and the clinical manifestations of the two viral strains are basically the same. Experimentally, vaccine containing the original CPV-2 strain protected dogs against dis-

ease caused by the Italian CPV-2c.<sup>3</sup> In that study, 6 of 6 unvaccinated beagles infected with CPV-2c became severely ill to the point that three had to be euthanized. All six dogs shed virus in their feces and became leukopenic beginning 3 to 4 days after challenge. Six beagles vaccinated twice with CPV-2 vaccine remained clinically normal after challenge with CPV-2c and they did not develop leukopenia or shed virus in their feces. However, it is still open to question whether the CPV-2 vaccine protects against the American variants of CPV-2c found by the OSU and UGA workers.

The diagnostic virology group at the K-State Veterinary Diagnostic Laboratory has been working with field samples from dogs with clinical parvovirus and has the reagents and soon will have the ability to subtype the various parvovirus strains. If you have questions concerning the proper samples, tests, etc. concerning parvovirus typing, contact Dr. Richard Hesse, director of Diagnostic Virology at the K-State Lab. The laboratory's phone number is 785-532-5650.

## References

1. Hong C, Decaro N, Desario C, et al. 2007. Occurrence of canine parvovirus type 2c in the United States. *Journal of Veterinary Diagnostic Investigation* 19:535-539.
2. Kapil S, Cooper E, Lamm C, et al. 2007. Canine parvovirus types 2c and 2b circulating in North American dogs: 2006-2007. *Journal of Clinical Microbiology*. Accepted for publication.
3. Spibey N, Greenwood NM, Sutton D, et al. 2007. Canine parvovirus type 2 vaccine protects against virulent challenge with type 2c virus. *Veterinary Microbiology* (in press; E-publication ahead of print).

# Proper animal health product handling maximizes benefits

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Pharmaceutical and biological companies carefully research and develop products for the cattle industry. Many quality control steps are incorporated into their manufacturing processes to ensure that the products they sell to cattle producers and veterinarians will work as intended. However, once the product is sold, companies lose control of how the product is cared for and used. It becomes the purchaser's responsibility to see that the product is handled and administered in such a way to maximize the potential benefits of the product. Below are some suggestions that may help your products work to their full potential:

## All products

Read the label. Instructions for handling and administration should be there. If products require refrigeration, make certain that they are refrigerated when you purchase them, keep them refrigerated before use, and keep them refrigerated while chuteside. Ice packs or a frozen gallon jug of water inside an ice chest work well to keep products cool.

Be careful – you can get too much of a good thing. Some products that require refrigeration may be damaged if allowed to freeze. If products are designed to be stored at room temperature, or within a specified temperature range, it is important to follow the manufacturer's temperature guidelines. These products may be inactivated if allowed to get too cold or too hot. The dashboard of a pickup exceeds room temperature quite regularly.

You cannot always see physical changes that indicate that a product has been damaged by excessive cold or heat, so you have to know how it was cared for prior to use to ensure that it will work as intended.

Mark all syringes so that you know which product they contain while chuteside. A piece of masking tape, or better yet a piece of colored tape (different color for each product), with the name of the product written on the tape with a Sharpie pen is ideal.

Do not pour injectable products from original packaging into a larger container. The injectable product was sterile when

manufactured, but when you change containers there is a high probability of contaminating the whole container of product.

Never re-enter a bottle with a used needle. The likelihood of contaminating the rest of the bottle of product is high. Put a new needle on the syringe each time you have to re-enter the bottle.

To avoid having to re-enter a bottle, use a draw-off assembly and automatic refill syringe.

Change to clean equipment any time existing equipment gets dirty enough that it creates a risk for injection site contamination.

Clean and disinfect syringes and equipment at the end of each day's use. Washing them out with water from the horse tank does not constitute proper cleaning.

## Pharmaceuticals

If products are in a brown bottle, the contents inside can be inactivated by sunlight. Keep them out of the direct sunlight. This means off the dashboard of your pickup.

The injectable avermectins (Ivomec®, Dectomax®) are susceptible to inactivation by sunlight. The cardboard carton containing the plastic bottle of Ivomec will protect the bottle from sunlight, but the product is susceptible to inactivation once the plastic bottle is outside the carton. Don't leave the plastic bottle laying on the tailgate of your pickup all day while processing cattle. Dectomax comes in a brown bottle, so it is less likely to be damaged by sunlight. However, once you load either product into a syringe, the sunlight can affect it while in the syringe.

Do not get water in syringes or equipment used to administer injectable Dectomax. More importantly, be sure not to inject any water back into the product bottle. Water will cause the product to precipitate out (you will see little crystals) and render it useless.

Even when using injectable antibiotics, cleanliness is essential. The antibiotic in the bottle will not necessarily kill any and all contamination that you get in it.

Do not mix different antibiotics in the same syringe or bottle – some cause

an obvious physical reaction, some cause an unseen chemical reaction, and some antibiotics work by conflicting modes of action which may neutralize the activity of each other.

## Vaccines

All modified live viral (MLV) vaccines are susceptible to inactivation by sunlight. When using them, keep the bottles in the cooler out of the sunlight. Also, keep the syringes out of the sunlight – sunlight will kill the vaccine in the syringe if left exposed to sunlight for more than a few minutes. Use of a cardboard box laid on its' side with the open side facing away from the sun will serve as a shade over the syringe.

Modified live bacterial vaccines should be handled in the same manner as MLV vaccines.

Do not reconstitute (mix up) more MLV vaccine than you will use in 1 hour. As soon as this type of vaccine is reconstituted, the viral particles come to life then gradually start to die off. If you take too long to use the product up after reconstitution, enough virus particles may die to make the vaccine ineffective. Keep the reconstituted product cool.

Do not combine different vaccines in the same syringe unless they are manufactured to be mixed together (i.e., do not mix Lepto-5 from one manufacturer with MLV IBR-BVD from another manufacturer, even though each manufacturer may sell a combination product containing both MLV IBR-BRD and Lepto-5. Unless the components are specifically made to be mixed together by the manufacturer, one portion of your mix may inactivate the other portion.)

Keep vaccines thoroughly mixed until bottle is completely used up. This is especially critical with any non-clear vaccines (such as blackleg). Suspended particles will settle out over time.

Do not "beat" vaccines to get them into suspension. Swirl them gently to keep from damaging cellular particles and/or releasing endotoxins.

Use disinfectant-soaked sponges in a plastic paint tray to disinfect needles between animals. Stick the needle into

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the sponge to physically clean the needle. Change the sponge when it becomes visibly soiled.

In addition to common bacterial contaminants, blood-borne diseases such as Bovine Leukosis and Anaplasmosis can be transmitted animal-to-animal via needles. Also, BVD virus may possibly be transmitted via needles while in the viremic state.

DO NOT use disinfectants with MLV vaccines. The disinfectant will kill the vaccine. Wash out the syringe and other equipment utilized with MLV vaccines with sterile water only. Change needles at least every 10 head instead of using the disinfectant-soaked sponge and paint tray.

It is generally safe to use disinfectants with killed vaccines (blackleg, killed IBR-BVD, etc.), antibiotics and other pharmaceuticals.

#### Implants:

Make sure the ear is clean before implanting. Clean it with disinfectant and dry with paper towel if necessary.

Ear tag before implanting – avoid knocking out the implant with the ear tag.

Use disinfectant-soaked sponge and plastic paint tray with implant guns. Wipe both sides of the needle on the top of the sponge. Be sure to drag the bevel of the needle across the sponge to clean out the opening of the needle.

Insert the implant needle at a point that will allow you to deposit the implant in the middle 1/3 of ear. Avoid existing implants, ear tags and tag holes.

After implanting, feel the implant to make sure that you did not fire a blank.

#### Miscellaneous:

Cattle should be held off feed 12 hours before treatment with any of the white

drench dewormers (Safeguard, Synanthic, Valbazen). The presence of feed in the rumen will reduce the effectiveness of these products.

#### All Products:

Use Beef Quality Assurance (BQA) techniques and guidelines.

Inject all products in neck – DO NOT inject products into top butt or leg.

Use subcutaneous (SC) route of administration unless intramuscular (IM) route is specifically required for the product to work properly.

Select a clean area to place the injection, or clean the area prior to injection.

Use the proper needle diameter. For water-consistency products, use an 18 or 16 gauge needle. Make sure you have adequate restraint to prevent needle breakage if you plan to use 18 gauge needles. For thicker products use a 16 gauge needle. Never use a 14-gauge needle except for intravenous (IV) injections.

## Continuing Education

**April 6, 2008**

25th Annual Frank W. Jordan Seminar on Fielding a Winning Team

**April 18-19, 2008**

Bovine Conference on Health and Production

**April 27, 2008**

Small Animal Medicine Conference on a Few of Our Favorite Things

**May 28, 29, and 30, 2008**

International Symposium on Beef Cattle Welfare

**June 1-4, 2008**

70th Annual Conference for Veterinarians and KVMA Veterinary Trade Show

**September 13, 2008**

16th Emergency Medicine Conference

**November 1 and 2, 2008**

15th Mid-Western Exotic Animal Medicine Conference

For the most complete, up-to-date conference information visit our Web site at: [www.vet.ksu.edu](http://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](mailto:johnson@vet.ksu.edu)

## Upcoming Events

**April 5, 2008**

High Plains Horseman's Day, Oakley, Kan.

**April 9, 2008**

Kansas Wildlife Habitat Evaluation Contest, Maxwell Wildlife Refuge, Canton, Kan.

**April 9, 2008**

Effective Livestock Programs, Hutchinson, Kan.

**April 17, 2008**

Hays Roundup, Hays, Kan.

**May 28-29, 2008**

Symposium on Beef Cattle Welfare, Manhattan, Kan.



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