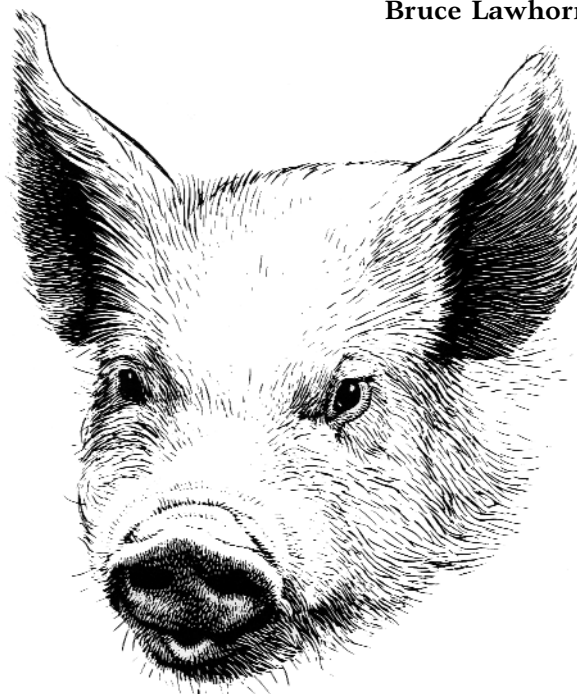


Diarrheal Disease in Show Swine

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Diarrhea is one of the most important problems in show pigs. It can occur at any time, from first obtaining a show pig through the last day of exhibition. It can become a chronic condition that persists for weeks. Diarrhea can be caused by nutrition, infectious diseases, internal parasites or a combination of these.

Dietary Causes

Nutritional causes are relatively easy to detect and correct. Show pigs are typically fed high protein rations to develop maximum muscling. Overfeeding protein can, in itself, cause loose stools or diarrhea. If a pig is growing well but has a chronically loose stool, reduce the protein and/or increase fiber in the diet. If the stool does not firm up, there are probably other causes of diarrhea.

Parasitic Causes

Whipworms are a major cause of diarrheal disease in show pigs. Infection occurs after pigs ingest microscopic whipworm eggs while rooting or eating in a contaminated environment. Whipworm eggs remain viable for as long as 6 years so contaminated premises are an important source of infection.

Whipworms cause inflammation of the cecum and spiral colon, resulting in loose stools or diarrhea between 3 to 7 weeks after ingestion of eggs. Dark stools containing blood can occur. Untreated whipworm infection causes a chronic wasting disease that lasts for several weeks to months. Infected pigs have a loose or diarrheic stool, and "rail out" or become extremely emaciated. Death can occur or pigs can become chronic poor performers. Swine whipworms are not important as a human disease.

Cryptosporidium spp protozoa can rarely cause inapparent infection or mild diarrhea in swine. Swine are not an important source for cryptosporidiosis in humans.

Giardia spp protozoal infection in swine is rare, but it does cause disease in humans. Contaminated water is the main source of *Giardia spp*.

Bacterial Causes

Swine dysentery or "bloody dysentery" from infection with *Brachyspira (Serpulina) hyodysenteriae* is a major cause of diarrheal disease in show pigs. Pigs can be exposed to the organism from the feces of recovered carrier pigs or from contaminated premises, trailers or scales. Pigs affected with this disease usually become very sick. This organism infects the cells lining the cecum and spiral colon (the same area as whipworms) and prevents reabsorption of fluids. Affected pigs severely dehydrate and up to 30 percent can die. Most affected pigs will drink but will not eat. Pigs that recover are intermittent shedders of *B. hyodysenteriae* and are a source of infection for clean pigs. Swine dysentery bacteria are not known to cause disease in humans.

Salmonella typhimurium infection is another important cause of diarrheal disease in show pigs. They become infected by exposure to contaminated swine manure on premises, trailers or scales. Chronic diarrhea persists until effective treatment is administered. Death can occur in untreated animals.

Salmonella choleraesuis infection also is very important in swine. It causes only a transient or short-term diarrhea followed by systemic or blood stream infection.

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Affected pigs are very sick and can die or become chronic poor performers if not promptly diagnosed and treated. Both *S. typhimurium* and *S. choleraesuis* are the main causes of salmonella sickness in swine. Fecal contamination from other livestock, wild animals (including rodents, reptiles and amphibians), pets and birds also can contain many species of salmonella. There are more than 2,400 known species that can cause infection in swine but not obvious disease. Swine that become infected with salmonella shed these bacteria in the feces at higher levels within the first 2 weeks after exposure and shed intermittently thereafter. Regardless of the source, if humans ingest salmonella from their own contaminated skin, clothing, equipment or food, sickness can occur.

Ileitis is an important postweaning disease of swine, especially in commercial operations that supply pork (nonshow pig operations). This disease causes a range of problems from sudden death to chronic diarrhea that reduces the rate of gain. *Lawsonia intracellularis* is the causative bacterium. Though it is rarely the cause of diarrheal disease in show swine, veterinarians consider this organism as a potential cause when making a differential diagnosis. *L. intracellularis* does not cause human disease.

Viral Causes

Transmissible gastroenteritis (TGE) virus causes vomiting and profuse watery diarrhea after exposure to contaminated swine manure. Fecal exposure to TGE virus can be directly from sick pigs with diarrhea or indirectly from contaminated footwear or bird migration from one swine farm to another. The seasonal peak for TGE infection of swine is winter, when bird migrations occur. The incubation period for TGE is only 18 to 36 hours. This means that pigs taken to prospect shows on a weekend can be affected with TGE disease signs by the following Monday. TGE causes extreme loss of condition in show pigs weighing from 25 to 280 pounds. Two weeks or more are necessary for full recovery. As many as 100 percent of unweaned pigs can die from the disease, but death becomes increasingly rare in animals above 25 pounds or older than about 5 weeks of age. Pigs that have recovered from TGE are carriers of the virus and can spread TGE to uninfected swine for many weeks. TGE does not cause human disease.

Clinical Diagnosis

The stool of the normal pig should be firm and well-formed. When a normal show pig is on free-choice feed and water, the stool tends to loosen to the consistency of a cow patty as feed consumption increases. Feed restriction reduces the amount of stool and tends to be constipating, particularly if water also is restricted.

When feces are totally liquid with no solid form, diarrhea is occurring. A pig with diarrhea caused by infectious agents and/or parasites usually has a reduced appetite or is anorexic, but is still drinking. Vomiting can occur at the start or during diarrheal disease. Weight loss accompanies diarrheal disease and is usually obvious

because show pigs are weighed frequently to monitor weight gain. It is common for sick show pigs to be affected with more than one diarrheal disease condition and have dramatic weight loss.

As soon as the pig develops diarrhea, the cause or causes need to be determined. Loose stool or diarrhea caused by diet usually does not result in weight loss. Restricting feed intake, reducing the protein content of a feed by about 4 percent and/or substituting rolled or crimped oats or oatmeal as 25 to 50 percent of the ration usually cures dietary induced diarrhea.

Consult a veterinarian to diagnose infectious and/or parasite-caused diarrheal disease because death is often a result of undiagnosed, chronic diarrheal disease in show pigs.

TGE is the least important of the diarrheal diseases because it is self-limiting and almost never causes death loss in older pigs. Electron microscopic examination of feces at a diagnostic laboratory is the most rapid way to diagnose TGE. For other diseases, a veterinarian typically does the following:

- cultures the feces for salmonella infection,
- starts the pig on a water medication of lincomycin (Lincomix®) or tiamulin (Denagard®) plus electrolytes as a treatment for swine dysentery, and
- performs a fecal flotation to check for microscopic whipworm eggs.

If *Escherichia coli* is isolated during fecal culture for salmonella, it is probably not important as a cause of diarrhea in show pigs weighing above 40 pounds. If sensitivity testing of the *E. coli* isolate demonstrates that most antibiotics tested in the laboratory will kill it, then the veterinarian has evidence that this *E. coli* is not a pathogen.

During microscopic examination for whipworms, *Coccidia* oocysts (eggs) and/or *Balantidium coli* protozoan ciliates might be observed. Coccidiosis usually is considered to be a self-limiting and co-occurring infection that needs no treatment to improve. The *B. coli* are commensals, benefitting from their relationship with another infectious agent. Neither of these two organisms are the primary cause of diarrhea.

Postmortem Diagnosis

If a show pig with signs of diarrheal disease dies, a necropsy can be performed by a veterinarian to determine the cause or causes. Rapid decomposition of organs and tissues, especially in hot weather, can make the animal unsuitable for testing. Place the deceased pig in a plastic bag and pack in generous amounts of ice in an insulated container to prolong preservation until veterinary examination. Do not freeze the carcass because thawing destroys cellular structure and makes microscopic disease diagnosis impossible. If the animal is well preserved, the veterinarian can either send the entire animal carcass to a diagnostic laboratory or perform a necropsy and submit tissues to a diagnostic lab for fur-

ther tests to confirm a presumptive diagnosis. Other show pigs on the same premises could benefit by early disease recognition and treatment if a diagnosis is confirmed on the deceased animal.

Treatment and Control

Veterinarians use no specific treatment for TGE but prescribe electrolytes to minimize dehydration and possibly antibiotics to control secondary bacterial infection.

If salmonella diarrhea is diagnosed via culture, a veterinarian will choose the antibiotic that is the most effective and has the shortest withdrawal time. Typically, salmonella that cause diarrhea in show pigs are resistant to the majority of antibiotics; this is why laboratory culture and sensitivity testing are so important.

If pigs, treated for possible swine dysentery with lincomycin (Lincomix®) or tiamulin (Denagard®) plus electrolytes in the water, pass a firmer stool in several days, this indicates to the veterinarian that swine dysentery is at least one cause of diarrhea. Medicated water treatment is continued for 5 days after improvement with lincomycin or for a total of 5 days of therapy with tiamulin. At the end of the water treatment, recovering animals should be continuously fed medicated feed containing lincomycin (40 grams per ton, no withdrawal time) or tiamulin (35 grams per ton, 2-day withdrawal time) to prevent swine dysentery from recurring.

Fenbendazole (Safe-Guard®) given orally for 3 days is an excellent parasiticide for whipworm adults and most developing larval stages; deworming should be repeated in a month. Dichlorvos (Atgard® C) is another commonly used dewormer for whipworms. Ivermectin (Ivomec®) and doramectin (Dectomax®) are excellent injectable dewormers and also kill lice and mange, but are not highly effective against whipworms.

Prevention

Prevention of diarrheal diseases, and diseases in general, starts with preparation before producing or purchasing one or more show pigs. Show pigs that are farrowed at one location, never exposed to other swine and fed at that location until exhibition should be very healthy. When purchasing, it is **best** to buy show pigs directly from the farm of origin and from only one producer with a history and track record of excellent herd health. It is acceptable to house these pigs together in one pen (unless they are fighting too much or need to be fed different rations). If show pigs are purchased directly from several farms, it is **advisable** to keep pigs from each farm in separate pens and not in fence-line contact for 60 days. Consider these separate isolation pens as totally different locations and wash and disinfect boots, equipment, etc., before going from one pen to another. In fact, it could be practical to keep these pigs isolated for the entire feeding period prior to exhibition.

If pigs are shown multiple times during a season, after each return to the farm isolate them in their own pen. Do not expose other swine (such as breeding stock) on the

farm to the many disease-causing organisms that these exhibited swine may have encountered. If show pigs are purchased at a sale that is not at the farm of origin or pigs are bought directly from multiple farms, mixed on a trailer and transported to a location for distribution to buyers, they potentially are exposed to many disease-causing organisms. The greater the exposure, the greater the likelihood of disease problems. Treating pigs with an antibiotic to compensate for poor health management is usually ineffective. Also, highly effective vaccines are not available for many diseases. As a general rule, it is much easier to prevent swine diseases using good management practices than to successfully treat or vaccinate against disease.

Diet-induced diarrheal disease can be prevented by not overfeeding protein and other ingredients such as fat. Gradually switch the pig from one type ration to another. Make sure the pig finds the water source because water intake is important for adequate feed consumption. A lack of water for a couple of days followed by overconsumption of water can be fatal; this condition is called salt toxicity or water deprivation. Pigs that are "held back" or limit fed to prevent excessive weight gain should always have access to plenty of water.

Whipworms can be prevented by routinely deworming healthy pigs with an effective product (Safe-Guard® or Atgard® C) at least once during the feeding period and by housing them on clean dirt, sand or pasture or uncontaminated concrete floors. Routine deworming in show pigs is commonly performed during the first week after purchase at about 8 to 10 weeks of age or 50 pounds, and then about a month later. Another option is to take a fresh stool sample to a veterinarian for fecal flotation and microscopic examination for whipworm eggs. It takes a minimum of 42 days from the time a pig is infected until adults are present and eggs are passed in feces. This means fecal examination for whipworm eggs before 6 weeks of age is not necessary. Also, whipworm adults are intermittent egg layers so one negative fecal flotation does not completely rule out whipworm infection.

Swine dysentery is preventable by obtaining pigs directly from a farm that is free of swine dysentery and minimizing exposure to other swine or feces-contaminated premises, trailers and equipment such as scales. Absence of diarrhea containing blood and mucus, excellent growth performance and no significant death loss in pigs from weaning through market weight are evidence of freedom from swine dysentery in a herd. In reality, the credibility of swine dysentery-free status is based on each breeder's reputation.

The following medications are included in show swine rations by feed manufacturers to prevent swine dysentery:

- Lincomix®—100 or 200 grams per ton for 30 days, then 40 grams per ton continuously (0 withdrawal days before slaughter at 40 grams per ton; 6-day withdrawal before slaughter at 100 or 200 grams per ton), or

- Denagard®—200 grams per ton for 30 days, then 35 grams per ton continuously (2-day withdrawal before slaughter at 35 grams per ton; 7-day withdrawal at 200 grams per ton).

An alternative and less expensive strategy is to use the continuous lower levels of Lincomix® (40 grams per ton) or Denagard® (35 grams per ton) in feed to minimize sickness if pigs are infected.

Mecadox is another alternative feed medication to prevent swine dysentery, but it has an extremely long withdrawal time.

- Mecadox® (carbodox)—50 grams per ton continuously until not less than 42 days before slaughter (42-day withdrawal before slaughter).

It is best to take show pigs off of all medication (even 0-withdrawal medication) at least 24 hours before exhibition.

The best prevention for **salmonellosis** is to obtain the healthiest pigs possible and to manage pigs to reduce stress and maintain good sanitation practices. It is generally not a good practice to put antibiotics in the feed to prevent salmonellosis because antibiotic resistance is very common with salmonella species. (However, Mecadox®—50 grams per ton fed continuously, 42-day withdrawal before slaughter—is approved for the control of salmonellosis caused by *S. choleraesuis*.) Vaccines are available for *S. typhimurium* and *S. choleraesuis*, but these have not been widely used in show swine. There are numerous sources of salmonella, and any of these can

cause human disease if the organisms are ingested. Animal and human exposure to salmonella can be minimized by proper sanitary measures, such as handwashing with antiseptic soap, proper livestock and pen management, bedding changes, premise cleaning and disinfection, pasture rotation, rodent control, and proper food preparation and cooking.

TGE can be prevented by not exposing swine to sources of the virus. Vaccines are available that control the effects of disease; they do not prevent infection with TGE.

Summary

Diarrheal disease is one of the most important disease problems in show swine from 5 weeks of age (about 25 pounds) through the last day of exhibition. Prompt diagnosis and treatment are important because chronic, undiagnosed diarrhea frequently results in death.

A veterinarian should be consulted to assist in the prompt diagnosis, treatment and prevention of this and other conditions.

For more information

Selected articles in Proceedings of the American Association of Swine Veterinarians. 2000-2006.

Selected articles in Proceedings of Allen D. Leman Swine Conference, 2000-2006.

Feed Additive Compendium, The Miller Publishing Company, Minnetonka, Minnesota, 2007.

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