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Porcine Epidemic Diarrhea Virus (PEDv)

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Introduction

Porcine Epidemic Diarrhea virus (PEDv) made a surprise appearance in the United States in the spring of 2013. Caused by a distant (viral) cousin of Transmissible Gastroenteritis (TGE), the disease is similar, with rapid dehydration resulting in a high percentage of deaths in young piglets. Vaccination against TGE does not confer any cross-protection against PEDv, and no natural immunity existed in U.S. herds. The virus is transmitted by the fecal-oral route and spreads easily in manure and by manure-contaminated objects (fomites) such as trailers, equipment, boots and clothing. Natural immunity develops over 2 to 4 weeks such that infected sows produce protective antibodies in their colostrum.

PEDv is a production-related disease. PEDv may appear clinically to be the same as transmissible gastroenteritis (TGE) with acute diarrhea. There is no treatment for PEDv. Therefore, emphasis should be made on prevention and control. Producers will need to work with their herd veterinarian if any TGE-like symptoms appear. As well, strict biosecurity protocols must be in place and practiced. Laboratory testing is the only conclusive method of diagnosis.

Arkansas' swine industry includes integrated commercial facilities, independent producers of purebred and show animals and a large number of 4-H and FFA projects that are most often transported into the state for a show season. Swine are very mobile in the state; therefore, all available biosecurity measures and federal/state regulations should be strictly followed.

PEDv

Porcine Epidemic Diarrhea virus (PEDv) is a coronavirus that affects swine, causing diarrhea and vomiting, and death of 50-100 percent of infected piglets. Adult swine can become infected but generally survive. The incubation period of PEDv is 3 to 4 days. The clinical presentation of PEDv is not distinguishable from TGE. Clinical signs of PEDv may vary widely and are dependent on previous exposure and the immunological and endemic status of the farm, region or area affected. The primary clinical finding is watery feces that may be flocculent and fetid. Vomiting may occur. Dehydration and metabolic acidosis may be secondary signs. PEDv may spread more slowly than TGE. If swine recover, it is usually within 7 to 10 days.

Modes of Transmission

Direct Transmission – Fecal-oral transmission is the most common route of infection. Clinical signs of PEDv can occur within 4 to 5 days following the introduction of infected swine to farms with susceptible animals. Following an outbreak, PEDv may subside but could become endemic if sufficient litters are produced to overcome lactogenic immunity.

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Indirect Transmission – Contaminated personnel, equipment or other fomites may introduce PEDv into a susceptible herd.

Although clinically similar to transmissible gastroenteritis (TGE), this coronavirus is unrelated to TGE. Prior vaccination for TGE (or, presumably, prior exposure to TGE or respiratory coronavirus) does not infer protection against PEDv. Introduction of PED virus into a naive herd typically results in acute outbreaks of severe diarrhea, vomiting, high morbidity (often 100 percent) and variable mortality (as high as 100 percent in young pigs).

Diagnosis is made based on clinical signs, history, ELISA or electron microscopic examination of fecal material, PCR and post-mortem examination of dead pigs. Differentiation from TGE requires laboratory diagnosis. Treatment is supportive to maintain hydration. The virus is susceptible to a number of common disinfectants including Virkon S, Clorox, 1 Stroke Environ and Tek-Trol (Pospischil, A., et al; 2002). Sanitizing and drying pig trailers is effective against PEDv. Preliminary results suggest that it may be possible to inactivate PEDv in the presence of feces by heating trailers to 160ºF for 10 minutes or by maintaining them at room temperature (68ºF) for at least 7 days (Holtkamp; unpublished 2013).

Infection with PEDv can create tremendous financial losses to a pork producer. PEDv transfers via feces and survives in manure for extended periods of time. During an outbreak, affected animals shed a large amount of the virus into the environment. Contamination of trucks, equipment, clothing and footwear with feces can spread the virus.

Biosecurity Measures

Because of the extreme ease of PEDv to spread, it's very important that everyone do their part to prevent the spread of this disease. Some prudent steps to help achieve this goal include the following:

Drivers – Truck and Trailer

1. For each load of pigs, wear/use clean boots, coveralls, gloves, knee pads, etc. After each load, place dirty boots and coveralls in a separate container for disposal or laundering. Do not contaminate the cab with dirty outerwear.
2. Between loads, clean and disinfect the cab of the truck, including floor-boards, pedals, steering wheel, etc. Anywhere outside the cab of the truck should be seen as potentially contaminated, so in an effort to keep the cab as clean as possible:
    - Use disposable footwear and coveralls while outside of the cab on the dock, in the yards and inside of the facility. Dirty footwear should not enter the cab of the truck.
    - Limit foot traffic on the dock or in the yards.
    - Unnecessary foot traffic into other areas of the market should be avoided.
    - Do not enter another truck's trailer or cab.
    - Keep cab as clean as possible. Use disinfectant solution and wipes where possible.
3. Between loads, wash and disinfect the trailer and all equipment and allow to dry completely.
    - Always use your own equipment and do not share equipment with other truckers.
    - Before cleaning and disinfection takes place, assume that trailer and equipment are contaminated.
4. Always ask the market about their biosecurity practices and then abide by them.

Disinfection Tips

Several disinfectants have been demonstrated to effectively inactivate PEDv. The list includes:

1. Oxidizing agents [e.g., potassium peroxymonosulfate (Virkon S1) or sodium hypochlorite (bleach)]
2. Sodium carbonates (e.g., soda ash)
3. Lipid solvents (e.g., ethyl alcohol)
4. Strong iodophors in phosphoric acid (e.g., iodine)
5. Phenolic compounds (e.g., 1 Stroke Environ2 or Tek-Trol3)
6. Aldehydes (e.g., Synergize4)

Always clean before disinfecting as the disinfectants are less effective when organic material (i.e., feces) is present. Cleaning with hot water and detergents will assist with organic material removal. To avoid dilution of the disinfectant, remember to drain off standing water prior to applying the disinfectant. After cleaning and applying disinfectant, allow for a drying period to further inactivate any viruses present.

For the best efficacy, disinfect with an appropriate disinfectant, at the correct rate, for the proper contact time, and apply so that all surfaces are covered. Always mix disinfectants according to label directions. Misuse of a product is a violation of EPA regulations.

Implications for 4-H and Youth Projects

General Swine Health Biosecurity

1. **Isolation**

   Isolation means keeping a new pig or a pig returning from a fair or show separate from animals already on the farm for a set amount of time. Isolation provides a period of time for you to watch your pig for signs of disease before bringing it back into your herd.

   - House new or returning pigs in a separate facility.
   - Work with pigs in isolation at the end of the day.
   - Wear separate boots/footwear for isolation chores, OR wash boots after finishing chores and allow them to dry before use the next day.

2. **Cleaning and Disinfection**

   Cleaning and disinfection of your facilities, trailers and equipment should be a top priority in your biosecurity plan. Proper cleaning can greatly reduce the risk of disease spread by removing the dirt and manure that pathogens can live in. Disinfection and drying can further reduce the number of pathogens on equipment surfaces.

3. **Cleaning**

   - Cleaning equipment and trailers should occur away from the pigs that have not been to a show.
   - Remove all bedding, dirt and manure.
   - Wash your equipment/rooms with the hottest water possible. Detergents, similar to those used for dish washing, may make cleaning much easier.
   - Make sure to clean all equipment that has gone to a show including feeders/waterers, hoses and show box items (show equipment, sort panels, brushes, etc.).

4. **Disinfection**

   - Use disinfectants only after cleaning.
   - Apply disinfectants according to label directions. Directions may include how long a disinfectant needs to be on a surface and also rinsing procedure.

5. **Drying**

   - Allowing equipment to fully dry is an important step to kill pathogens.
   - Drying can be done by direct sunlight, by time or by adding a heat source.

6. **Minimize exposure to people and other traffic.** People can transfer pathogens on their body and/or clothing to your pigs. Vehicles also can carry unwanted pathogens to your farm.

   - Limit visitors to only those who have a reason to be there and only allow visitors when you are present.
   - Visitors need to wear clean boots or plastic boot covers and clean clothing.
   - Limit off-farm vehicle access to your pig project area.

The implementation of a biosecurity plan does not stop at the end of a show. Taking biosecurity precautions when you return home is just as important as those you take before and during the show. Biosecurity steps to consider when you return home:

- Clean, disinfect and dry all equipment that was taken to the show including trailers, even if the show was terminal.
- Isolate any returning pigs from your home herd.
- Work with your veterinarian to determine the length of time for isolation and for any health testing requirements.
- Monitor returning pigs daily for signs of illness and alert your veterinarian if you have concerns about your herd's health.
- If your pigs do get ill, it is very important to allow those pigs to fully recover before going to another show.

If you notice any health problems in your pigs, be sure to contact your veterinarian as soon as possible. Your veterinarian will work with you to develop a treatment schedule.

National Regulations

The U.S. Department of Agriculture issued a federal order on June 5, 2014, that requires U.S. pork producers to report any new incidences of coronaviruses to either USDA or state animal health authorities. This federal order will allow federal and state animal health officials to closely monitor the location and spread of diseases caused by coronaviruses providing opportunities for better control and management of these viruses. The order also states that producers who have infected herds must provide the Animal and Plant Health Inspection Service (APHIS) with a herd management plan that addresses issues of animal movement, biosecurity of visitors and vehicles, cleaning and disinfection, etc. Although there are no food safety concerns associated with these coronaviruses, all of these measures must be taken to assure our trade partners around the world that we are making every effort to supply the most healthy and wholesome pork products available. For complete information on the federal order, visit www.aphis.usda.gov/animal-health/secd.

Arkansas Regulations

The State of Arkansas has been able to keep our swine herds free of the emerging swine disease caused by PEDv. But, because this time of the year show swine are purchased and imported into Arkansas from other states, the Arkansas Livestock and Poultry Commission and swine industry representatives are concerned. Other states' swine herds have seen significant death loss in piglets because of this disease. The commercial swine herds in Arkansas are already practicing biosecurity to keep out PEDv, but now everyone from Arkansas who goes to other states to purchase show swine has the potential to bring PEDv into Arkansas. Everyone who imports swine into Arkansas should be aware that the Arkansas State Veterinarian has enacted new regulations to prevent the incursion of PEDv.

Arkansas show swine exhibitors should be aware that it is their responsibility to obtain a valid Interstate Certificate of Veterinary Inspection (ICVI) and a permit to import swine into Arkansas. No one wants to be the person responsible for bringing this disease into Arkansas, which could cause the state great financial harm.

Effective February 18, 2014, the following regulation is in effect for transitional production swine (basically show swine – not commercial swine moved within a commercial production system or as part of a commuter herd agreement):

It is required that the following statement be on the Certificate of Veterinary Inspection (CVI):

To the best of my knowledge, swine represented on this certificate have not originated from a premises known to be affected by Porcine Epidemic Diarrhea virus (PEDv), and have not been exposed to PEDv within the last 60 days."

Transitional swine must acquire an entry permit prior to being imported into Arkansas.

References

A Champions Guide to Youth Swine Exhibition: Biosecurity and Your Pig Project. National Pork Producer Council, American Association of Swine Veterinarians.

Harris, H. D. L., 2012. Porcine Epidemic Diarrhea. The Merck Manual. Merck, Sharpe and Dohme Corp.

Porcine Epidemic Diarrhea (PED). Technical Note, United States Department of Agriculture.

Pospischil, A., A. Stuedli and M. Kiupel, 2002. Diagnostic Notes Update on Porcine Epidemic Diarrhea. J Swine Health Prod 10, 81-85.

Thomas, P., D. Holtkamp, L. Karriker, A. Ramirez, J. Ellingson and J. Zhang. Evaluation of Time and Temperature Sufficient to Inactivate PEDV in Swine Feces on Metal Surfaces. Pork Check Off Update on Porcine Epidemic Diarrhea Virus (PEDV), Volume 2, No. 1, January, 2014.

Transportation Biosecurity Recommendations for PEDV Control at Packing Plants. Swine Health Producer Guide, National Pork Producer Council, American Association of Swine Veterinarians.

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