**Disease Information**

The term *Swine Enteric Coronavirus Diseases* (SECD) describes a group of "novel" (new) or "emerging" (previously unknown) viruses from the Coronavirus family which affect only pigs and which include porcine epidemic diarrhea virus (PEDV) and porcine delta coronavirus (PDCoV).

PEDV has an acute onset, spreads rapidly, and can cause vomiting and diarrhea in all ages of pigs. The virus affects the lining cells of the gut so that liquids and nutrients can’t be absorbed, which is especially harmful to newborn pigs. More is understood about PEDV than PDCoV. For example, at least two strains of PEDV exist but similar evidence about PDCoV strains is unknown. PDCoV appears to cause similar but less severe disease signs than PEDV.

SECD does not cause any concerns for food safety or public health.

**History of Disease Spread**

Signs in the first sick US animals were similar to those seen in transmissible gastroenteritis virus (TGE). When tests for TGE were negative, Iowa State University researchers determined the agent to be a Coronavirus and then identified it as being very closely related to PEDV which was reported in China in 2012. As of August, 2014, 30 states, including South Carolina, have reported at least one PEDV case. Mexico and Canada had their first PEDV cases in late 2013 and early 2014, respectively. Outbreaks have been widespread in Europe and Southeast Asia and are suspected in some Central and South American countries. China has had an increasing amount of PEDV outbreaks since 2010.

While numbers of affected farms, sows, and piglets are estimates, it is possible that as many as 7000 piglets have died from PEDV infection. Positive lab tests have come both from animals (biological samples) or the environment (manure). Overall appraisals of PEDV’s effects in the US have included a reduction of the pig population by 10 - 13 %, 2014 production losses of 7 %, and escalating pork costs. Case numbers in the US peaked in February, 2014, but declining numbers have led some hopeful experts to anticipate the outbreak may subside by the end of 2014.

It had been hoped that immunity to PEDV from natural infection would last two to three years as it does with TGE, even though the viruses aren’t closely related. Therefore it was a huge disappointment when 30% of herds initially infected became re-infected in 2014. That the re-breaks on farms were from the same viral strain suggests that the virus remained present on the farms, but it has not been ruled out that virus was re-introduced. Although these “secondary outbreaks” may demonstrate incomplete immunity, affected farms experienced reduced death rates in the 2014 outbreaks (from 100 to 30-40 %).

PDCoV was reported in China in 2012. Canada reported cases in early 2014. The first US cases of PDCoV were detected in April, 2014. As of August, 2014, 16 states have reported at least one case. South Carolina has not had any reports of PDCoV. No other countries have reported PDCoV cases.

Some US farms have had both PEDV and PDCoV infections.

**Disease Transmission**

PEDV is transmitted when a pig ingests feces infected with virus. Transmission can occur from pig to pig and also occurs when people or inanimate objects (“fomites”) such as boots, clothing and equipment have been in contact with infected manure. PEDV can survive in manure up to 8 weeks. PEDV is not spread through the respiratory tract. It is possible that virus can be spread in dust particles in the air. The incubation period for PEDV may be as short as 12 hours or up to 5 days. Feces contain large doses of virus and shedding lasts up to 4 weeks. The infectious dose of PEDV is small. This type of transmission information is not yet known for PDCoV.

The method by which these viruses entered the US is still being studied and has not yet been determined. Feed as a vehicle for introduction has been and continues to be under scrutiny. Pig blood products used as feed ingredients have been highly suspect, although a theory that PEDV could survive production processes for spray-dried porcine plasma was believed to be disproved. Recent research using livestock feed residues found on farms demonstrated that feed can carry and transmit PEDV to pigs, causing illness. In this study’s findings it has not been determined whether PEDV entered the feed in a contaminated ingredient or after processing such as during transportation. None of the samples tested contained any pig blood products.

It was expected that PEDV could be spread by equipment and vehicles used for transportation of live pigs since this method of transmission had been a major cause of spread of TGE in the 1970’s. The use of shared transport vehicles between sites in the 1970’s increased the risk of disease spread. A study undertaken in June, 2013, of 575 livestock trailers at 6 swine harvest facilities demonstrated that 5% of the trailers that were uncontaminated with PEDV at arrival became contaminated while at the site. Contamination of these previously uncontaminated trailers was shown to be more likely under these two conditions: when facility staff entered the trailer; or when staff unloaded the trailer immediately.
after unloading a vehicle that was contaminated with PEDV upon arrival. In addition, it was noted that all drivers of arriving vehicles stepped into the facilities which increased the chance of contact between people and equipment. A conclusion of this study was that swine collection points can pay a major role in spreading PEDV and that improved disease control/biosecurity measures should be implemented at these sites.

Clinical Signs
Affected animals have a rapid onset of vomiting and watery diarrhea. Severity of the disease depends on age and immune status. Loss of appetite and dehydration usually follow in suckling pigs. In a naïve herd, often 100% of pigs (suckling, feeder and grower) become sick; death losses in piglets under 10 days of age are often 50 - 80% (range of 30 - 100%). Signs in feeder and grower pigs range from none to diarrhea, loss of appetite, and depression; death rates in growing and adult pigs from PEDV are about 1 - 3%.

Signs of SECD can look similar to those from infections from other viruses and bacterial species as well as from some enteric parasites. Therefore, laboratory diagnosis is essential.

Diagnosis
As is true for all emerging diseases, laboratory tests were not initially available for diagnosis of PEDV. Veterinary diagnostic laboratories from affected states developed the initial diagnostics. Several member states from the National Animal Health Laboratory Network (NAHLN) are conducting diagnostic testing for SECD.

Veterinarians can consult with state or federal animal officials prior to submitting samples. Sample from live animals include feces or oral fluids collected within 24 hours of the onset of diarrhea. Serum may be analyzed for antibodies. Necropsy samples should be collected immediately after an animal dies and include intestinal contents, intestines, and colon. SECD laboratory detection tools include PCR, immunohistochemistry and virus isolation.

Treatment
Affected animals can be treated with supportive measures including electrolyte solutions to assist them in maintaining hydration.

Prevention
Some techniques to eliminate TGE in the 70’s may be effective. Recent studies of herds that utilized feedback have shown some immunity to PEDV in sows that may last as long as four months. Sentinel animals can be used before deciding to move replacement gilts into the herd.

Piglets infected with PEDV cannot absorb sows’ milk and have worsening diarrhea if left to nurse. Early weaning (6 – 10 days) or very early (6 days) weaning off-site has reduced piglet deaths in some cases.

PEDV can be inactivated by heat and time combinations as well as some disinfectants. Strict biosecurity protocols such as eliminating crossover traffic with use of a physical or imaginary boundary (“line of separation”) and sanitation practices such as cleaning, disinfection and drying of contaminated surfaces are effective measures to prevent the spread of SECD. These measures should be employed at any site or processing step where animals could be exposed to SECD. See link* for numerous guidance documents.

Conditional licenses have recently been granted for two PEDV vaccines and other vaccines are being developed and tested.

Control or Elimination of SECD
Veterinarians treating PEDV-positive herds have reported elimination has been possible on some but not all farms. See Positive Diagnosis of PEDV….What Next? and Elimination of PEDV from a... Site and other guidance at the link* below.

Because of the devastating effects of SECD on US swine, USDA APHIS instituted a program of SECD mandatory reporting on June 5, 2014, to determine the scope of the disease and assist in disease management while maintaining business continuity. This Federal Order states that producers, veterinarians and diagnostic laboratories must report positive occurrences of SECD to state or federal animal health authorities. Producers with positive SECD cases will be assisted with herd management plans to address and prevent the spread of these viruses. This is part of USDA’s collaboration with the swine industry and state animal health officials, along with a $26 million commitment toward research and prevention, response and control strategies for SECD.

Guidance for Fair Season
When animals are co-mingled from different farms there is always an increased disease risk. All of these are recommendations:

- If pigs on your farm have diarrhea, do not take pigs to the fair.
- Fair managers can consider asking exhibitors to sign affidavits stating their swine have shown no signs of SECD in the past 30 days.
- Clean and disinfect all equipment and vehicles when leaving your farm and again when leaving the fair.
- Do not share equipment or feed with other exhibitors and minimize any unnecessary contact with other swine. Ensure pens are cleaned and disinfected between pigs.
- When leaving the fair, dispose of shavings and feed and separate your clothing worn at the fair to be cleaned before contact with your herd.
- Place animals brought home in an isolation area for a minimum of 21 days before they re-join the herd.

Keep in mind that there are requirements for interstate movement of swine that involve having current Certificates of Veterinary Inspection (CVIs) and Official Identification on each animal. Contact your veterinarian or the SC State Veterinarian's office at 803-788-2260 for more information about these requirements.

*Useful Resources:
http://www.pork.org/Research/4316/PEDVResources.aspx

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