

Emerging Risk Notice

November 2019

Streptococcus equi subspecies *zooepidemicus*

Key Points

- Starting on September 28, 2019 a high mortality event occurred in a cull sow slaughter plant in Tennessee. A chiller malfunction caused the hold of 22 loads of cull sows. On September 30, 2019, Food Safety and Inspection Service (FSIS) reported over 40 percent of the 2,222 sows in holding pens, dead or euthanized when condemned on antemortem inspection. Samples from the affected sows in Tennessee showed *Streptococcus equi* subspecies *zooepidemicus* (*S. zooepidemicus*).
- Preliminary information suggests that similar events may have occurred at other locations in the United States. This includes a continuous-flow swine aggregating and buying station in Ohio epidemiologically linked to the event in Tennessee. Reports from knowledgeable individuals describe both feeder swine and cull sows as being affected.
- The finding of high mortality rates in cull swine at holding facilities is unusual. The cause of this and similar recent events identified in the United States are under investigation to understand if *S. zooepidemicus* is the single cause or if the deaths are due to multiple factors.
- The Canada West Swine Health Intelligence Network (CWSHIN) [2019 Second Quarter Swine Disease Report](#) described detections of *S. zooepidemicus* in sows and gilts that occurred in Manitoba in the beginning of May 2019. In April 2019 and May 2019, Canada noted other similar swine die-offs. Although the Canadian Network watched for additional high mortality events linked to *S. zooepidemicus*, they had not noted any previous trends in swine.
- China has reported significant detections of *S. zooepidemicus* in swine. The reports emphasize large economic losses to the swine industry affecting sows and replacement gilts and has become a threat to human health.¹⁻⁴

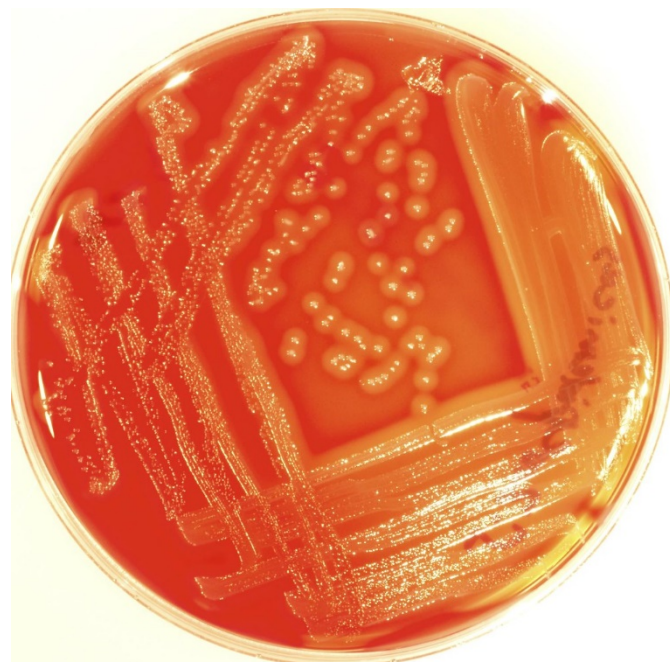


Figure 1: *S. zooepidemicus* colonies on a blood agar plate

- *S. zooepidemicus* is a zoonotic organism. Although rare, it can cause severe illness in humans exposed to infected horses or other infected species. This includes exposure through consumption of associated unpasteurized milk products.

Concerns for U.S. Animal Health

- There is a need to investigate and understand the exposure and the epidemiology of *S. zooepidemicus* in swine to avoid potential negative economic impacts to the swine industry.
- Identification of effective measures are needed to prevent negative impacts due to *S. zooepidemicus* infection in swine. Further investigation of this pathogen is required to determine the role, if any, of *S. zooepidemicus* in high mortality events in swine.
- Current recommended controls to decrease the impact of *S. zooepidemicus* infection in swine include reducing transportation-related stressors. These include trauma, extreme temperatures, inclement weather, malnutrition, and extended holding times prior to slaughter.

Epidemiology

- *S. zooepidemicus* is an emerging zoonosis. It is a ubiquitous opportunistic commensal organism in the respiratory and reproductive tracts of horses. Although rare, there are reports of infection in other species, including: humans, cattle, sheep, pigs, camels, alpacas, foxes, birds, rabbits, guinea pigs, dogs, cats, and monkeys, often with severe disease. Many of these infections are associated with exposure to infected horses.^{5,6}
- In the recent swine mortality events in the United States, the clinical picture observed in swine included: lethargy, weakness, high fever, swift spread among pigs from highly varied sources within the affected premises, and rapidly escalating mortality levels approaching 30 to 50 percent. There were also reports of: bacterial septicemia, inflammation, and necrosis of submandibular lymph nodes. Noted pathology included: fibrinosuppurative peritonitis, hepatitis and vasculitis, fibrinous pleuritis and polyserositis in thoracic and abdominal cavities, and suppurative lymphadenitis and cutaneous hyperemia. Aerobic cultures from liver and lung samples were positive for *S. zooepidemicus*.
- Studies from China suggest severity of disease in swine is possibly related to a particular strain of *S. zooepidemicus*.^{7,8} Studies using genetic analysis suggest it is an invasive and virulent strain.^{3,4}
- An intracellular phase may be one way *S. zooepidemicus* survives in the host, and could in part explain recurrent/persistent infections.⁹
- Human infection with *S. zooepidemicus* is rare but is often related to contact with infected horses. Human infection is also linked to contact with other infected animals including: dogs, monkeys, domestic ruminants, pigs, and with ingestion of unpasteurized dairy products.
- Human infection is of particular concern for immunocompromised individuals, such as those undergoing chemotherapy, treatment with steroids, or who have an immunosuppressive condition, such as diabetes.
- In reported human cases, the organism causes severe and potentially fatal disease, including: bacteremia, endocarditis, arthritis, glomerulonephritis, necrotizing myositis, and meningitis.¹⁰⁻¹⁶

Transmission

- Transmission routes to humans, pigs and other animals include direct exposure to infective respiratory droplets, uterine exudates, and consumption of unpasteurized milk and cheese from animals with mastitis due to infection with *S. zooepidemicus*.^{5-6,10-16,19-20}

Diagnostic Testing in Swine

- The USDA-APHIS National Veterinary Services Laboratories performs testing with Matrix-Assisted Laser Desorption/Ionization-Time of Flight Mass Spectrometer (MALDI-TOF), which produces a spectrum that is matched to a database to identify the organism. Results are supplemented by biochemical tests.
- Whole genome sequencing is used to compare strains and assist with identifying the possible source of the infection. The organism identified from the Tennessee mortality event shared the same genotype and is remarkably similar to the published strain causing mortality events in China and the detection in Manitoba in May 2019. Samples to collect include: fixed and fresh tissues, including lymph node, lung, liver, kidney, spleen, and fresh tonsil.
- *S. zooepidemicus* was isolated from multiple organs collected from the affected swine in Tennessee with high growth from kidney and spleen and lower growth from the lung.

Treatment

- *S. zooepidemicus* bacteria are largely susceptible to β -lactam antibiotics, like penicillins, amoxicillin, ampicillin, and cephalosporins. Susceptibility to tetracyclines, macrolides, clindamycin, and fluoroquinolones is variable.¹⁸⁻²⁰
- Common cleaning and disinfecting procedures can inactivate this bacterium. Quaternary ammonium compounds, phenol-based agents, or oxidizing agents are all effective against *S. zooepidemicus*.²⁰ Because this bacterium has the potential to form biofilms, appropriate mechanical cleaning with disinfection should be incorporated into any cleaning procedure.²¹

Prevention in Swine

- Decrease stress related to transport. Stress is a common factor noted in the recent investigations related to the swine deaths at holding facilities in Ohio, Tennessee, and Canada. Additionally, stress was also observed in a recent report of *S. zooepidemicus* in dogs in Georgia.
- Avoid holding animals in pens overnight to several days.²⁰ Proper cleaning and disinfection of pens and equipment before introducing new animals decreases the risk of pathogen transmission.¹⁹
- Avoid commingling groups of transported swine, as direct contact occurs along with other stress factors.
- Minimize or mitigate conditions for swine that present risks for trauma, including exposure to extreme temperatures, overcrowding, inclement weather, malnutrition, inadequate water supply, or loud noises.
- Early identification of *S. zooepidemicus* can facilitate appropriate medical intervention and timely epidemiologic surveillance, preventing the spread of a potentially life-threatening pathogen.¹¹
- There is currently no commercial vaccine available for *S. zooepidemicus* for any species, though autogenous vaccines may have limited use.²²

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