

***Streptococcus equi* subsp. *zooepidemicus* associated with sudden death of swine in North America**

Matheus de O. Costa¹, Brad Lage²

¹University of Minnesota, University of Saskatchewan ²Maple Leaf Agri-Farms

Key Points:

- Historically described as a commensal of the swine upper-respiratory tract, *Streptococcus equi* subsp. *zooepidemicus* was only reported previously in Asia as an important swine pathogen.
- Here we report the isolation and whole genome characterization of *Streptococcus equi* subsp. *zooepidemicus* associated with a sudden death outbreak in pigs in North America.

Streptococcus equi subsp. *zooepidemicus* (*S. zooepidemicus*) is considered a commensal and opportunistic pathogen of several warm-blooded hosts, including humans, horses, different canines and swine. It can cause severe disease characterized by pneumonia, septicemia and meningitis (1, 2). *S. zooepidemicus* has been suggested as a normal inhabitant of the palatine tonsils of pigs, being detected by both culture and high-throughput sequencing in samples collected from healthy animals (3). However, strains virulent to pigs have also been reported in the literature, particularly associated with high-mortality outbreaks of sudden death and respiratory disease in China (4).

In April 2019 an outbreak of sudden death and abortions occurred in 4 loose-housed, commercial sow farms (approximately 9000 sows) in a large vertically integrated swine system within the Canadian province of Manitoba. This outbreak increased the cumulative mortality in the 3 affected sow herds by more than 1000 sows in the following 12 weeks. The abortion rate during this time period was approximately 11x the normal rate. Animals were often described as apparently healthy during morning checks. Over the course of hours, sows would become unwilling to stand, develop fever, lethargy and die with no other apparent clinical signs. Other sows would abort and then go on to develop similar symptoms. Stressing factors in these farms, such as mixing of animals and the presence of other sick animals appeared to exacerbate outbreaks within pens. Animals were fed a commercial grade, nutritionally balanced diet as per ESF (electronic sow feeding) and had access to water *ad libitum*.

Gross *post-mortem* examination of multiple animals, either euthanized or recently deceased, revealed the following common observations: rhinitis (mucopurulent discharge, mild, diffuse), pulmonary edema, gall bladder edema, hemorrhagic lymphadenopathy (tan to haemorrhagic) consisting of submandibular, cervical neck and bronchial lymph nodes, which taken together are suggestive of sepsis. All animals tested negative for PRRSV, *Mycoplasma hyopneumoniae*, SIV-A, PCV-3 and PCV-2 by real-time PCR. In parallel, Gram positive cocci were observed in imprints from heart and submandibular lymph nodes. Aerobic bacterial culture followed by Matrix-Assisted Laser Desorption/Ionization-Time Of Flight (MALDI-TOF) for identification of isolates revealed varying levels of *S. zooepidemicus* in liver, kidney, heart, brain, lung, spleen, and submandibular lymphnodes. Based on whole genome analysis, all isolates were also identified as *S. equi* subsp. *zooepidemicus*. Interestingly, these isolates were closely related to previous pig isolates only, more specifically to those previously typed as MLST (multi-locus sequence type) ST-194. These isolates were not related to other *S. equi* subsp. *zooepidemicus* infecting horses, dogs or other domestic species.

These findings suggest the emergence of *S. zooepidemicus* ST-194 as a cause of mortality in pigs in North America. This specific sequence type seems to be particularly virulent to pigs, for reasons that remain unexplained. Given the clinical presentation described here, this pathogen requires special attention and should no longer be overlooked due to its historically accepted commensal lifestyle, when conducting diagnostic investigations. Full article is available at

<https://www.biorxiv.org/content/10.1101/812636v2>

References

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