

Tool can provide swine producers with early diagnosis of often-fatal 'strep zoo'

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Pigs look through a fence at the Penn State Pig Farm. Credit: Ann Taylor-Schmidt

A team led by researchers in Penn State's College of Agricultural Sciences has developed a diagnostic test that can identify virulent forms

of the swine bacterial pathogen *Streptococcus equi* subspecies *zooepidemicus*—often referred to as "Strep zoo"—which can cause severe illness and death in pigs, other animals and rarely people.

Outbreaks of *S. zooepidemicus* causing high mortality in swine first were reported in Asia in 1977, and until recently, the pathogen was not thought to be a major concern in North America. However, high-mortality Strep zoo outbreaks occurred in swine herds in Canada, Tennessee, Ohio and Pennsylvania in 2019. Different versions of the pathogen also can cause a range of disease symptoms in horses, ruminants, guinea pigs, monkeys, cats, dogs, poultry and humans.

Pigs infected with Strep zoo may suffer a sudden onset of lethargy, weakness, high fever and rapidly escalating mortality that can approach 30% to 50% of infected [animals](#). However, the bacterium that causes these symptoms presents a diagnostic challenge because [virulent strains](#) are largely indistinguishable from benign strains, according to lead researcher Suresh Kuchipudi, clinical professor of veterinary and biomedical sciences.

"Rapid and accurate diagnosis is absolutely critical for controlling and limiting the spread of this emerging disease of swine," said Kuchipudi, who also is the associate director of Penn State's Animal Diagnostic Laboratory. "But the version of the bacterium that is deadly is very similar—with only minor genetic differences—to bacteria that are commonly found in healthy pigs and in other animals. As a result, conventional methods can't selectively identify this virulent version."

To address this issue, the team set out to identify genetic factors that are unique to virulent Strep zoo bacteria. Using cutting edge tools including next-generation sequencing, the researchers looked at bacterial isolates from a lethal Pennsylvania Strep zoo outbreak. Their analysis zeroed in on the SzM gene, which had been identified in previous research as a

key virulence factor of *S. zooepidemicus* for swine but was not found in avirulent strains of the pathogen.

Targeting the SzM gene, researchers developed a probe-based, real-time polymerase chain reaction, or PCR, diagnostic assay for the detection of virulent Strep zoo isolates. They evaluated the assay's specificity and sensitivity by using it to test a panel of reference bacterial isolates and viral pathogens commonly associated with swine respiratory disease. In addition, they applied the newly developed assay to test avirulent strains of *S. zooepidemicus*.

The team's study, reported recently in *Frontiers in Veterinary Science*, found that the new PCR test reliably identified virulent Strep zoo strains, while producing negative results when testing other pathogens that can cause porcine respiratory diseases, as well as avirulent *S. zooepidemicus*.

Kuchipudi noted that emerging and reemerging animal infectious diseases have the potential to negatively impact animal health, food safety and trade.

"Several animal infectious diseases also have zoonotic potential, meaning they can have a significant impact on public health," he said. "For these reasons, accurate and rapid diagnosis is of utmost importance. This novel assay—which can return results in less than four hours and is the first test that can detect virulent *S. zooepidemicus* selectively in pigs—provides a practical solution to the previously unsolved problem of diagnosing Strep zoo in [swine](#) herds."

Kuchipudi added that a key question yet to be answered is whether susceptible animals of other species serve as reservoirs for *S. zooepidemicus*. "This PCR assay also can be used to answer this question and further investigate the host range of *S. zooepidemicus*," he said.

More information: Suresh V. Kuchipudi et al. A Novel Real-Time PCR Assay for the Rapid Detection of Virulent *Streptococcus equi* Subspecies *zooepidemicus*—An Emerging Pathogen of Swine, *Frontiers in Veterinary Science* (2021). [DOI: 10.3389/fvets.2021.604675](https://doi.org/10.3389/fvets.2021.604675)

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