

Less Invasive Sampling Methods for PRRSV Detection in Swine: Dry Blood Spots, Oral Swabs, and Tonsil Oral Scrubbing in Intentionally Exposed Gilts

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Introduction

Effective disease surveillance in the swine industry is vital for controlling endemic pathogens and preventing foreign animal disease outbreaks, yet current efforts often focus on piglets rather than adult breeding herds. While jugular venipuncture is the gold standard for sampling adult sows, its high labor demands, technical requirements, and associated safety risks often make representative sampling logistically challenging. To address these gaps, less invasive alternative methods have been proposed to facilitate sampling of adult populations. However, some of them remain cost-prohibitive for large-scale production. This study aims to evaluate the diagnostic sensitivity of different less invasive methods in detecting viremic PRRS-infected gilts under field conditions and describe their cost per sample.

Methods

Two field studies were conducted to evaluate the diagnostic sensitivity of various sampling methods in 50 randomly selected gilts recently inoculated with PRRS virus. Study 1 compared jugular venipuncture blood collection against oral swabs, tail blood swabs (Figure 1), and Whatman 903 filter paper (i.e., dried blood spots - DBS) collected via tail pricking. Study 2 expanded this comparison at a second farm, assessing ear blood swabs, oral swabs (OS), tonsil-oral scrubbing (TOSc), and Grade 50 filter paper (DBS) collected via ear pricking. All samples were tested for PRRSV via RT-PCR, with serum serving as the reference standard to calculate sensitivity. Cycle threshold (Ct) values and cost per sampling were described (calculated based on the unit price paid at the time of procurement in the United States, excluding PPE but accounting for needles or lancets when applicable). Additionally, we evaluated the stability of DBS samples over one and six months at room temperature.

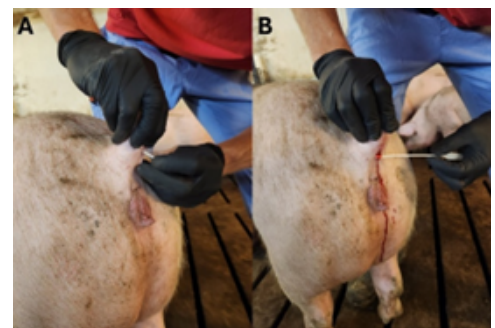


Figure 1. Tail pricking with animal lancet (A) and blood swab collection (B).

Results

In Study 1, tail blood collection was considered mostly unsuccessful due to the configuration of the filter paper cards and the short length of the gilts' tails and this specimen was not further assessed. A low sensitivity (<64%) for both oral and tail swabs compared to serum was found. In Study 2, with TOSc and ear-pricking dried blood spots (DBS) showing 100% sensitivity, and oral and ear blood swabs ~90% sensitivity. While Ct values were generally higher in alternative specimens than in serum, TOSc performed most similarly to the gold standard (Figure 2). ORF5 sequencing from DBS was successful and DBS samples also demonstrated high diagnostic stability at room temperature, maintaining a 96% positivity rate at one month and 86% at six months, despite moderate increases in Ct values. Sampling costs varied widely, with Grade 50 filter paper DBS as the most economical at \$0.44/sample, followed by oral/blood swabs (\$1.20 to \$2.87), TOSc (\$1.32), Whatman 903 filter paper (\$2.04), and jugular venipuncture as one of the most expensive sampling methods at \$2.10/sample.

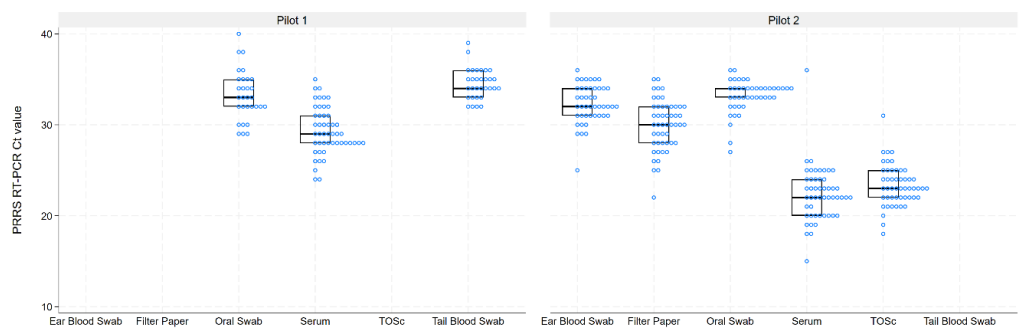


Figure 2. PRRS RT-PCR Ct values categorized by specimen and sampling point. The box plot illustrates the median and quartiles.

Conclusion

Overall, oral swabs were the easiest and fastest to collect, followed by TOSc. Tail-based sampling (swabs and DBS) was deemed impractical while ear-based sampling was straightforward but required targeting larger veins to ensure adequate volume. Both TOSc and ear prick DBS demonstrated to have the highest sensitivity and agreement with serum, whereas OS and ear blood swabs may require careful interpretation depending on specific conditions. However, further assessment of all specimens is still needed to better understand false positives yielded and differences in sensitivity according to days post infection. Overall, the high sensitivity, affordability, and stability at room temperature highlight DBS as a potential practical tool for ongoing surveillance.

The full paper can be accessed here: <https://doi.org/10.1155/tbed/5578300>