Porcine Reproductive and Respiratory Syndrome Surveillance in Breeding Herds and Nurseries Using Tongue Tips from Dead Animals

(Summarized by the MSHMP Team)

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Key Points:

- Because PRRSV can remain in a herd at a low prevalence (<10%), improved and cost-effective surveillance methods are needed.
- Utilizing tongue exudate from dead pigs is an effective method of identifying low prevalence PRRS in breeding and nursery herds.
- Sampling tongue exudate is cost effective and practical while also targets a subpopulation likely to harbor PRRS

Porcine reproductive and respiratory syndrome (PRRS) is the most prominent endemic pig viral disease that continues to generate economic losses to producers. PRRS can sustain a low-prevalence (<10%) in sub-clinically infected breeding herds. Improved surveillance methods and monitoring protocols are needed to identify these low prevalence infections. One of the ever-present difficulties with surveillance and monitoring of large populations of animals is how to sample them in a cost-effective way. Oral fluid (OF) testing has recently emerged as a cost-effective alternative for monitoring several pig diseases and can be collected in a 'welfare-friendly' way. Recently the use of processing fluids (PF) recovered at the time of castration and tail docking in US breeding herds has been proven to be a sensitive tool for sampling large populations. Castration is no longer allowed in the European Union due to animal welfare and tail docking is controversial, making the use of PF largely unavailable.

A promising alternative to OF and PF is to sample dead animals. Sampling carcasses does not require special training and can be carried out without compromising animal welfare standards. The main objective of this pilot study was to evaluate the detection capacity of the aggregation of removed tissues (e.g. tongues) from dead animals as an indicator of PRRS in swine farms, particularly breeding herds and nursery farms, to provide additional surveillance options for producers.

Methods

Samples were selected from ones submitted to the Grup of Sanejament Porci between July 2018 and December 2020. Tongue samples were taken using a protocol sent to all producers. The criteria for sample selection were: 1) Several positive PRRS RT-PCR results of serum and tongues exudate from the same farm, 2) pairs of samples (e.g. serum and tongue) collected from the same batch, 3) at least 30 serum samples were collected for each batch in order to detect a 10% prevalence with 95% confidence. Two PRRS naive farms were also included to have negative samples either in serum or tongue exudate. The time between sampling and diagnosis of PRRS outbreak was available for each farm, and none of the included farms used modified live-vaccine to piglets or in the last third of gestation. Serum and tongue exudate were analyzed by PRRSV RT-PCR. All positive RT-PCR serum samples and some exudate samples were sequenced for this study.

Results

A total of 32 submissions (25 breeding and 7 nursery), corresponding to 14 farms had PRRS diagnostic information for serum and tongue exudate that fit the selection criteria. The timing from outbreak diagnosis to sampling ranged from 15 to 464 days in breeding herds and from 64 to 464 days in nursery farms. The overall agreement of batch classification as positive or negative, based on RT-PCR results between serum and tongues exudate of the 32 pairs was 76.92% (95% CI: 60.73-93.12%) and the Cohen's Kappa was 0.55 (95% CI: 0.23-0.87). The sequences obtained from each farm clustered together independently if they were obtained from serum or tongue exudate, meaning that the nucleotide similarity was between 98.8 and 99.8% within a farm across the study period.

Discussion

The agreement between tongue exudate and serum was 76.9% and a concordance between both samples was moderate (0.55 kappa value). Clearly, differences exist in the results from the two sample types. However, the main discrepancy came from positive samples in tongue exudate and not in serum, with only one case being positive in serum and negative in tongue exudate. These results imply that tongue exudate seems to be more sensitive for detecting PRRS at the farm level. One of the reasons for this difference may be that by sampling carcasses (stillborn or dead piglets) the likelihood of detecting the virus is higher as it is a subpopulation that harbors PRRS. This reason would be especially important in low-prevalence herds where it could be cost prohibitive and impractical to test the sample size necessary to detect a low prevalence (<10%). It is probable that the prevalence of PRRS could be below 10% in most of the farms included in the study, due to the long period of time (>240 days) between PRRS diagnosis and sampling in most cases. Sampling animals with a higher likelihood of harboring virus could help to determine the true status of virus circulation in the herd. An additional benefit for using tongue exudate for surveillance is that they contain blood, saliva, and in the case of stillborn piglets, traces of amniotic fluid, while having a lower probability of being contaminated by feces than PF do.

Results from this study show that the use of carcass parts to monitor the presence of PRRSV is a suitable method, even in low prevalence scenarios for breeding herds and nurseries. Moreover, the sequences obtained from these samples allow for molecular epidemiological studies.

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