Keeping the damage to a minimum

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Introduction

PRRSv naïve is the widely accepted industry standard for boar studs; however, PRRSv seems to have an affinity for naïve boar studs. With the recent increase in the number of studs with air filtration, the risk of lateral introductions will be reduced, but infection with PRRSv will continue to be a risk. When studs are exposed to PRRSv, the subsequent cost can be minimal to extraordinary. There is no doubt rapid detection of PRRSv infection is the most important aspect to minimize the cost of a PRRSv introduction but is followed closely by responding quickly to an infection. To properly respond to a PRRSv introduction, a fundamental understanding of PRRSv viremia, shedding in semen, and test sensitivity is critical and warrants a review.

Detection of PRRSv antigen using nPCR and real-time PCR is a very sensitive indicator of viremia in all ages of swine, including adult boars. Viremia in adult boars after IN challenge can be detected as soon as 24 hours post-infection.[1,2] Peak viremia has been found to occur between 5 and 10 days post-infection.[3] While time to viremia is similar for all ages of swine, the duration of viremia differs between them. In mature swine including boars, viremia following infection does not appear to last beyond 31 days where as immature pigs remain viremic to 251 days post-infection.[4,5]

Recent investigations have explored the effect of sample pooling, a method to increase animals tested without increasing the number of PCR runs, on diagnostic sensitivity. Rovira, et al. (2007) reported that pooling serum samples by 3 or 5 reduced the real-time PCR assay's sensitivity to 95% and 94%, respectively. Rovira and colleagues (2007) also evaluated the sensitivity of PRRSv PCR on pooled blood swabs; individual blood swabs had 98% sensitivity which declined to 93% and 92% when swabs were pooled by 3 or 5, respectively. The detrimental effect of pooling is most obvious when trying to detect the index case. When the first positive sample obtained from a boar (to simulate the index animal) was pooled by 5, the PRRSv PCR test sensitivity declined to 86% for both serum and blood swabs.[6]

Time to shedding of viral RNA in semen lags behind time to viremia; but PRRS virus has been detected in semen as early as 2 days post infection.[1] Boars tested once per week have plenty of time for their semen to become positive and spread PRRSv to several boars before you ever test the index animal.

Routine testing strategies

Many boar studs are unique in design, size, relative risk, and lab availability. All these factors must be analyzed to develop an adequate routine testing strategy. The ideal testing strategy is to collect and test serum individually by PRRSv PCR all boars just before or during semen collection since PRRSv is detected in serum before it is detected in semen. This strategy provides the most security to the downstream farm. Testing the same serum samples in a pooled manner will decrease sensitivity incrementally, but is a risk we are willing to take to reduce diagnostic cost. In addition to surveillance, any boars showing any clinical signs consistent with PRRSv infection must be sampled immediately, even if they are not being used for semen collection. Protocols for quarantine of suspect animals in a sub-population and testing procedures must be part of the daily routine. Sub-populations of animals showing clinical signs such as lethargy, anorexia, or nasal discharge are bled and tested for PRRSv by PCR.

Case Example #1

November 2002: 168 head boar stud with 2 barns of 4 rooms (21 boars each). 10% of boars are tested weekly by serum PCR and ELISA for PRRSv. One boar did not eat all his feed. Blood was collected from the off-feed boar and his closest 2 neighbors, the room was quarantined.

Boar was PRRSv PCR positive on serum PCR. Room was depopulated immediately and 100% of remaining boars were tested negative the following week by PCR and Elisa. No sow units became clinical with the boar stud virus.

Case Example #2

March 2007: 252 head boar stud with 3 barns of 4 rooms each (21 boars per room).

Farm crew identified a boar off feed with a sore foot. Suspect boar and adjacent animals were bled and submitted

for PRRSv PCR. Boar was treated with antibiotics and an anti-inflammatory for the lameness concern. Farm manager evaluated the boar the next morning and decided he was much better and the anorexia was probably a result of the sore foot. The boar was collected and semen was distributed the same day.

Results came back PRRSv positive by PCR. Sows bred on a negative sow unit were culled within 48 hours of insemination with the suspect semen pool. Sow unit became clinical 1 month after the event. Sow unit PRRSv sequence matched the boar stud 100%.

One additional room adjacent to the positive room became infected at the stud, partial depopulation was successful.

Thoughts on pooling of sera for testing

Thought should be used before you decide how to pool your serum samples. Instead of simply deciding to pool by a standard number (3 or 5), we pool serum by semen pool. Simply put, we expect the serum pool tested by PRRSv PCR to reflect the PRRSv status of a semen pool delivered to a farm. Thus if a PRRSv PCR positive result is reported, retrieval of the infected pool of semen is easier (and faster). Alternatively, if boars are housed in different barns and you routinely hold semen before shipment, it may be wise to pool your sera by boar location. If positive results come back you can immediately cull, quarantine, or remove the infected population of animals before it spreads to other unexposed sub-populations within the stud. In addition, realizing no diagnostic test is 100% sensitive, semen pools delivered to a farm should be kept to a minimum to reduce the risk of a single infected semen pool being distributed to more farms than necessary. Pool serum PCR tests to allow a targeted response to an outbreak when it happens.

In addition, daily routines of farm personnel must be performed with the "precautionary principle" in mind. Therefore, every procedure must be performed with the thought of not spreading PRRSv even if the virus is not present on the farm. For example, needles used to perform vaccinations must be changed between boars and clothes must be changed when moving between subpopulations of boars (rooms or barns). Ensuring farm personnel adhere uniformly to detailed daily routines will result in limited losses when a when a lateral introduction of PRRSv happens.

Who is responsible for result interpretation?

First and foremost, someone has to be accountable to review the diagnostic test results as soon as they are reported. This must be tasked to more than 1 person, and it is easy to make an argument for 3 individuals to be responsible in light of the extreme consequences of an overlooked positive result. Therefore, a good working relationship must be established and a lot of trust must be in place with the diagnostic lab before a positive result can be interpreted. Although specificity with PRRSv PCR is reported to be very high, false positives do happen. Standard re-test and re-sample procedures should be defined with the diagnostic lab to expedite an accurate and confident result.

Case Example 3

June 2008: 252 head boar stud with 3 barns of 4 rooms each (21 boars per room).

Boar stud had experienced a PRRSv infection 1 week ago, completed a partial depopulation, and returned to normal production. Routine testing was by serum on 90% of boars during semen collection. One boar on the opposite side of the farm tested positive by PCR on a routine monitoring sample. The affected semen pool was discarded before being used for breeding.

The room with the positive boar was quarantined. Lab personnel were contacted about the unexpected result. The lab reported the rate of positives for that PCR run was higher than expected and they suggested a retest, but the quantity of serum at the lab was insufficient for a retest. The suspect boar and all his roommates tested negative by PCR and ELISA the next day. The result was confirmed as a false positive.

Results are positive!

When the lab determines the test results no longer contain an element of reasonable doubt, it is time for action. Sources of semen known to be free of PRRSv must be available. Many producers or genetic companies with excess semen production capacity are willing to help out during times of distress. Unfortunately, positive results generally show up on Friday evening and finding replacement semen for weekend breeds can be a challenge! Therefore, develop a contingency plan prior to a PRRSv break that outlines where negative semen can be obtained and how the semen from the positive

farm should be used. We do not ship semen to PRRSv naïve or PRRSv negative farms from studs if there is a known positive animal on the site or before a 100% negative test has been completed after a partial depopulation. We do send semen to PRRSv positive sow farms from an infected stud if the infected boars are in a defined area and under quarantine. This is a high risk procedure, but sick pigs are better than no pigs when semen supply is tight.

Many facilities with defined sub-populations, such as rooms or barns, may have the ability to complete a partial depopulation before the infection spreads into areas housing unexposed animals. Rapid action and attention to details can be the difference between success and failure. Internal biosecurity between groups of animals must be maintained as part of the daily routine. When a partial depopulation is performed, retesting of the entire population a minimum of 48 hours later is required to detect any spread that occurred before or during the depopulation. Remember that PRRSv virus is stable in the environment for short periods of time and re-infection from contaminated walkways, boots, etc can occur. All areas that were in contact with the positive animals must be treated as highly contaminated until a complete wash, disinfection, and drying can be completed.

Farms with a single large barn can attempt to remove positive boars and in-contact animals that share a fence line or a common trough. The partial depopulation in large barns will likely be less successful due to the lack of physical barriers to control spread by employees, aerosol, and fomites, but is worth consideration.

Summary

Studs must be prepared to handle a PRRSv introduction before it takes place. Testing strategies do not prevent infection and are not a replacement for sound daily internal biosecurity. Diagnostic tests are limited in sensitivity early after infection and there is ample opportunity for PRRSv to spread before detection, even when testing every boar during collection. Diligent routine testing and rapid reaction time along with a little luck can result in a minimal impact from a PRRSv infection.

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