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How boar studs are adapting to the recent PRRS breaks

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Introduction

Since the early 1990s, the use of artificial insemination has increased dramatically. This has led to the development of boar studs that supply semen to numerous sow herds. Any health challenges that occur in a given stud have the potential to affect several sow herds downstream. The swine disease of most concern is porcine reproductive and respiratory syndrome (PRRS). This is due to the health and economic devastation it can cause as well as its potential transmittability via boar semen.

During the winter of 2001-2002, nearly a dozen boar studs in multiple states representing several different genetic sources experienced clinical PRRS disease. Other breaks around the county have occurred since then. The events have left many wondering about the causes of these breaks and what can be done to minimize this disease risk.

This paper will describe one boar stud's experiences with a PRRS break and discuss what we've learned from the case.

Background

The stud we will look at was established in the upper Midwest in the mid 1990s and consists of approximately 300 boars in the main building, which is connected to two 30-head isolation buildings. The initial stocking was with PRRS-positive boars in 1993. PRRS-negative boars of the desired genetics were not available at that time.

Boars arrived PRRS-seropositive and were boostered with a commercial live PRRS vaccine approximately one week after arrival. Other vaccinations also were given shortly after arrival and boostered 30 days later. All boars were bled approximately one week post-arrival, and 33% were re-bled 30-40 days post arrival. The isolation period lasted approximately 90 days. When semen PCR testing became readily available, each boar was tested in isolation prior to entry into the main stud barn.

The main stud was tested monthly serologically. The stud went along for several years without incident other than being shut down for one week in the fall of 1998 when the H3N2 strain of swine influenza (SIV) first came through the US midwest. Although clinical signs were suggestive of SIV, the stud was closed until we were certain that PRRS was not involved.

Transition to a PRRS-naïve herd

In the summer of 2000, the stud owners decided to do a full depopulation/repopulation, since large quantities of PRRS negative boars were now available. Over the winter of 2000-2001, 355 boars were isolated in another state, vaccinated, and trained to mount a dummy for semen collection. Around 1 March all old herd boars were removed from the facility. The facility was thoroughly cleaned, disinfected, and fumigated. Twenty-five days later, the new herd was brought in, and routine collections began once again with the new PRRS-naïve herd.

All boars were tested semen PCR-negative in isolation prior to being collected and processed for shipping out doses. In isolation a random serological sampling of boars was done three times, approximately 3-4 weeks apart, using the PRRS Elisa test prior to movement to the newly cleaned facility.

New monitoring protocols implemented

The same vaccination protocols and 90 day isolation time was used in the new herd, except no PRRS vaccine was used. In the stud, random semen samples of 3-5 boars per pool were submitted for semen PCR. In total, approximately 30 ejaculates from the main herd were tested per month, in addition to the monthly serological monitoring being done. No health issues were occurring in the new herd other than a half-dozen boars that had mild clinical signs of ileitis shortly after arrival.

In the late fall of 2001, it was decided to increase the frequency of semen PCR testing from around 30 ejaculates per month to around 25 per week in response to other studs starting to report clinical PRRS breaks. Samples were mailed to the University of Minnesota Diagnostic Lab usually the same day they were collected. See **Table 1** for semen PCR results.

The PRRS break

On Tuesday, 8 January I received notice from Dr. Kurt Rossow of the University of Minnesota that some of the

Table 1: Semen PCR testing.

Sampling date	No. of samples pooled or individuals	Test Results
12-18-01	11 Pools	11 Negative
12-28-01	5 Pools	5 Negative
12-30-01	5 Pools	1 Negative, 2 Positive, 2 Suspect
1-02-02	8 Pools	6 Positive, 2 Suspect
1-07-02	5 Pools	5 Negative
1-15-02	5 Pools	3 Positive, 2 Negative
1-16-02	5 Pools	4 Positive, 1 Negative
1-21-02	5 Pools	4 Negative, 1 Positive
1-28-02	8 Pools	7 Negative, 1 Suspect
2-05-02	8 Pools	6 Negative, 2 Positive
2-07-02	12 Pools	8 Negative, 1 Suspect, 3 Positive
2-11-02	13 Pools	11 Negative, 1 Suspect, 1 Positive
2-15-02	16 Individual Boars	14 Negative, 1 Positive, 1 Suspect
2-18-02	40 Individual Boars	35 Negative, 5 Positive
2-27-02	10 Pools	10 Positive
2-28-02	9 Positive	9 Negative
3-04-02	18 Individual Boars	16 Negative, 2 Positive
3-05-02	14 Individual Boars	13 Negative, 1 Positive
3-07-02	10 Pools	10 Negative
3-10-02	8 Pools	8 Negative
3-13-02	12 Pools	12 Negative

semen samples submitted the previous week had tested PCR-positive for PRRS. The stud was immediately shut down and all farms receiving semen were immediately notified.

The stud contingency plan was immediately implemented with its allied studs so that no sow farms would have to go without semen for very long.

On Wednesday, 9 January, 35 boars in the main barn and five in each isolation barn were bled and the samples were hand delivered directly to the University of Minnesota Diagnostic Lab. The lab, fully understanding the urgency of the situation, ran the samples immediately for PRRS Elisa and pooled them for serum PCR. All 30 main housing boars were Elisa-positive, and all isolation boar samples were still Elisa-negative. Just 16 days prior to this serology, Elisa results from the main barn came back 100% negative. PRRS serum PCR samples from the main barn indicated 5 of 7 pools were positive.

The total depopulation/repopulation project from a year prior was a very expensive one, and the ownership was not eager to spend the money again so soon without knowing exactly how this disease break occurred and, more importantly, how to prevent its recurrence. The owners chose to maintain a positive status and focus on stabilizing the active infection through management and health strategies. The decision was made to expose the isolation boars to the same strain of PRRS for whole herd exposure.

During the two weeks prior to the PCR-positive results, only three individuals had been mildly off-feed. Farm staff found no elevated rectal temperatures when evaluating with a digital thermometer. Boars in isolation exposed to the virus intentionally did not show any clinical signs of illness either. If it hadn't been for the semen PCR testing, it would have been another couple of weeks before the problem would have been picked up on monthly serologic testing.

How many more sow farms downstream may have been infected if this problem had been detected much later?

Ongoing monitoring

Semen PCR testing was continued, even though the stud was closed. All boars were collected at 7-10 day intervals to maintain semen quality for when the stud reopened. PRRS shedding was monitored via pooled ejaculates tested by PCR. When almost all PRRS shedding appeared to be done, individual boar ejaculates were PCR tested to find any remaining shedders. The last three PCR-positive boars were culled and the stud re-opened for business a week later, on 15 March. Sixty-seven days had passed from the first sampling of positive semen (30 December) until the last positive sample was detected.

Since this time, all ejaculates have been tested in pools of three boars. Semen PCR samples are shipped directly to the University of Minnesota, usually the same day they are collected. All packaged doses are held in a tempera-

ture-controlled cool room at the stud itself until semen PCR results are completed. Then these doses are delivered to the sow farms with a copy of the test results.

Initially, PCR testing took about 5-6 days before results were received. We asked the University of Minnesota Diagnostics Lab for help in reducing turnaround time on semen PCR results. The diagnostic lab staff understood the urgency and growing demand for this service and quickly responded to the situation. Currently most submissions received by noon are reported out the following morning. This has allowed the delivery of semen doses with an adequate life expectancy without having to deliver semen every other day to every site.

Since the implementation of this quicker turn around time, several other boar studs have started regular semen PCR monitoring at various frequencies.

Virus sequencing

The virus isolated from the stud was immediately submitted for sequencing. The virus had an RFLP pattern of 1-3-4 with a unique mutation (three extra base pairs). This virus was compared to the almost 100 viruses already sequenced within our practice and almost 1500 sequenced by the University of Minnesota Diagnostics Lab. No matches were found in either database. It is likely this strain of PRRS came from outside the immediate area. At the time this paper was written, the exact source of the virus causing the outbreak was still undetermined.

Viral transmission

During the winter of 2001-2002, several areas of the upper Midwest endured numerous clinical PRRS outbreaks, and our area was no different. Several sow herds in our practice had mild to severe PRRS activity, and, in almost every case, the virus was sequenced. In the three months following the stud PRRS outbreak, over two dozen sow herds in our practice showed some signs of PRRS activity. Only six of these had the 1-3-4 RFLP pattern. Three of these were PRRS-negative herds and the other three were PRRS-positive herds with a history of long term PRRS stability. The number of abortions and off-feed sows was extremely low in all six of these herds. The only obvious symptom noted was a decreased average total born and pigs weaned per litter for a 3-4 month period.

One observation to note is that all herds that apparently had PRRS transmitted via the semen were either PRRS-naïve or had no significant PRRS activity or PRRS immunity stimulation for an extended period of time. These stable sow farms were not using any PRRS vaccine and had not had any clinical signs of PRRS in the last 12 months. Is this coincidence? Or were sow herds with a relatively high immunity to their herd's own PRRS strain able to withstand the infectious challenge of the PRRSV-infected semen? This may warrant further investigation.

Lessons learned

The biggest lesson learned from the recent PRRS outbreaks revolves around early detection and prevention of transmission. At the time of the outbreak, PRRS PCR turnaround time was 5-6 days and was delayed even more by laboratory closure during the holiday season. Twenty-four hour turnaround time has greatly increased the probability of identifying PRRS infections earlier. This is especially true when clinical signs are subtle or not apparent.

One hundred percent PCR testing and retention of all doses until PCR results are found negative further decreases the risk of infectious semen doses reaching the farm level and transmitting PRRS virus infection.

Each stud and farm will need to decide for themselves if the risk is great enough to warrant the extra expense of semen PCR testing.

Although semen PCR testing was not readily available during the first years this stud was up and running, this PRRS-vaccinated stud went several years with no PRRS activity or PCR-positives. Perhaps part of the reason so many different studs across the country experienced PRRS outbreaks last winter was that many of them had just become PRRS-naïve in the last couple of years. One could make a good argument either way as to whether or not it is important to have a PRRS-naïve stud if every dose of semen is PCR tested and any positive stud are well vaccinated. The answer may be different depending on whether the recipient sow herd is PRRS-positive or naïve.

Conclusion

The winter of 2001-2002 will be remembered for the numerous PRRS outbreaks in the boar studs across the country. Testing doesn't prevent infection of the stud, but it may help decrease the risk of transmitting PRRS to recipient sow herds. Many studs are re-thinking the aggressiveness of their PRRS testing protocols. Due to the quicker turnaround times available today, more studs are considering at least some semen PCR testing. Each stud, sow farm, or system must weigh the risks of infection or transmission via semen versus the extra costs associated with aggressive PCR testing protocols.

Until PRRS is eliminated or more easily controlled, many will choose the aggressive PRRS testing approach.