VACCINATION AND OTHER STRATEGIES TO CONTROL PORCINE REPRODUCTIVE RESPIRATORY SYNDROME (PRRS)

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ABSTRACT

Porcine Reproductive Respiratory Syndrome (PRRS) is an economically significant disease that affects the pig industry globally. This presentation will elucidate and cover the most recent strain that has hit the Philippine swine industry locally and other two major countries in Asia: China and Vietnam. It was in 2006, when the swine industry suffered a disease problem that was so damaging, challenging and annoyingly enigmatic that had created a huge vacuum in the supply chain of pork for a persistent long period of time. With this development, swine veterinarian practitioners and stakeholders became vigilant and critical in understanding as we embark in one of the most challenging control programs against Porcine Reproductive Respiratory Syndrome (PRRS).

Case definition was established to differentiate “Typical PRRS virus infection from “Atypical PRRS virus variant strain infection.” Field observations indicate a confirmed case of High Pathogenic – PRRS (HP-PRRS) with mortality observed in all stages but it was more lethal in piglets. High fever of 41*C ++, reddening of the skin, gummy eyelid in sows, 30% mortality in growers if complicated with other secondary bacterial pathogens. Most of the lesions, (spleen, kidneys, and lungs are similar to that observed in hog cholera cases. Farms affected, may suffer from other co – infection like PED, PCVAD, Ileitis and HC which were known to have affected farms with previous PRRS vaccination.

With 85% of cases affecting pregnant sows and spread to other production building in a single site farm, we formulated diagnostic protocol to confirm the profile of farms affected.

INTRODUCTION

The attacks of swine diseases have always been a constant threat especially with the intensification of swine production. A change in disease patterns was also observed and new diseases, unheard of in the early days of animal production are now being reported. As always, these disease outbreaks have seriously affected farm viability. The outbreak was considered one of the most devastating disease problems that affected the swine industry. The severity of PRRS and the economic repercussions it has in the swine industry have influenced producers and veterinarians to progress towards a better understanding of and a means to control this disease. This has moved the disease to the forefront of swine disease research, as explained by the seeming uncontrolled spread of the disease spanning through countries and continents, mindless of territorial boundaries. PRRS has become one of the most important disease entities affecting pigs worldwide. It’s an RNA virus and has the characteristic of mutation even in the same herd. North American and the European genotypes were recognized and documented to be both stable and most likely to change genetically and equally capable of changing.

The 2007 Asian episode of the high fever Atypical PRRS in Asia (China, Vietnam and Philippines) may have evolved PRRS in a mix of pathogens. It was a genetically different isolates of PRRS that differ
in virulence – in terms of their ability to cause the disease. Clinical signs, lesions and severity are also different from the typical PRRS. In the past ten years, the disease brought plenty of research with good results, but the puzzle is not solved for still we have the frustration that we cannot effectively and properly control the disease. We are still confronted with what happened to the pigs in terms of immune response when the pigs are infected. Gaps in keeping a virus free farm status and maintaining it is very difficult because risk of re-infection is always a challenge. There is the persistence of the virus especially in an on-farm situation, that we are dealing with heterologous strains of both genotypes of PRRS virus.

**BACKGROUNDER**

**Porcine reproductive respiratory syndrome unraveled**

Most swine farm owners and practicing veterinarians recognized the presence of Porcine Reproductive Respiratory Syndrome (PRRS). Started in the third quarter of 1993 up to the second quarter of 1994, there were undisclosed outbreak of the disease affecting swine breeding herd causing reproductive failures and chronic losses due to viral associated pneumonia. Typical Porcine Reproductive Respiratory Syndrome virus was confirmed by the virology section of the National Animal Disease Diagnostic Laboratory of the Bureau of Animal Industry (NADDL-BAI). It was disclosed that 32% of tissue samples submitted were found to be positive in Fluorescent antibody (FA) test. The PRRS disease outbreak was considered one of the most devastating disease problems that affected the swine industry.

**Typical Porcine Reproductive Respiratory Syndrome (PRRS)**, was confirmed in 1994 through a seroprevalence study conducted by vaccine companies selling PRRS vaccine. They collected serum samples in all swine producing areas except Bacolod and Iloilo to establish the prevalence of PRRS antibody in Philippine swine farms. On the account of most swine practitioners, symptoms observed are of “rolling” inappetence in gestating and lactating sows, developing high temperature and often being lethargic. If this clinical signs are observed in late gestation, these sows will show late abortion. Pre-mature farrowing is a common sign that increases stillbirths and mummified fetuses to 2–3 % and 5–6 % respectively. Two to 3% of the total live born piglets suffer Splayleg and the review of literature suggests that this clinical signs are related infection due to Porcine Reproductive Respiratory Syndrome. Palpebral edema is also commonly observed in newly born piglets born from sows affected with PRRS. Documented pre-weaning mortality is as high as 60–80 % in the initial outbreak. Older piglets 10 days or older suffer from abdominal breathing pattern and same abdominal breathing is observed in the nursery section. They tend to be affected with secondary bacterial infection and do not respond to individual treatment using antibiotics. Morbidity and mortality in the nursery affected pigs is as high as 30%. Grower and fattener pigs affected with respiratory signs have lung lesions of interstitial pneumonia.

**Atypical Porcine Reproductive Respiratory Syndrome (PRRS)**, as recorded on June 2007, backyard farms in Bulacan province reported a highly contagious viral disease that spread Northward up to Isabela and Southward up to Batangas. The episode of the outbreak started in sows and affected all stages of production. There is no parity predisposition, losses observed in all stages but the disease is more lethal in piglets. Upon further studies and documentation, cases of this outbreak only occurred in Luzon and confirmed to be of HP-PRRS. This presentation will elucidate and cover the most recent strain that has hit our swine industry locally and other two major countries in Asia: China and Vietnam. It was in 2006, when the swine industry suffered a disease problem that was so damaging, challenging and annoyingly enigmatic that had created a huge vacuum in the supply chain of pork for a persistent long period of time. With this development, swine veterinarian practitioners and stakeholders became vigilant and critical in understanding as we embark in one of the most challenging control programs against Porcine Reproductive Respiratory Syndrome (PRRS).
Field observations indicate a confirmed case of High Pathogenic – PRRS (HP-PRRS) with mortality observed in all stages but it was more lethal in piglets. High fever of 41°C, reddening of the skin, gummy eyelids in sows, 30% mortality in growers if complicated with other secondary bacterial pathogens. Most of the lesions, (spleen, kidneys, and lungs are similar to that observed in hog cholera cases. Farms affected, may suffer from other co-infection like PED, PCVAD, Ileitis and HC. Known to have affected farms with previous PRRS vaccination.

With 85% of cases affecting pregnant sows and spread to other production building in a single site farm, we formulated diagnostic protocol to confirm the profile of farms affected. The diagnostic flow for PRRS include:

1. Clinical Signs
2. Post – mortem findings:
   a. Gross pathology
   b. Microscopic pathology

Virologic test/Serology:

Conventional Methods:
   a. Enzymes Linked Immunosorbent Assay (ELISA)
   b. Virus Isolation – PRRS virus.
   c. Immunohistochemistry.

Molecular Diagnostic Methods:
   a. Virus Amplification (PCR)
   b. Gene sequencing

GUIDELINES ON PRRS CONTROL AND PREVENTION

Control of PRRS

The fundamental principle of PRRS control understands the pattern of virus transmission within an infected population. Studies confirmed that the PRRS virus may limit itself to an individual population within the herd (i.e. nursery). It is therefore imperative to understand the pattern of PRRS virus transmission with an individual farm, and on an area wide basis to determine which methods of control have the greatest chance of success. It must be pointed out that in addition to herd area-wide profiling, submission of tissues or whole animals to the laboratory is needed. This ensures that the components of the disease process are identified such as the pathology involved and the concurrent infection (bacterial, viral). Of course, it may also be necessary to characterize the virus through molecular diagnostic methods. Finally, clinical observations and their effects on production cannot be over emphasized.

Serological profiling and sample size consideration

To date, serological profiling is most helpful in monitoring and determining the levels of serum antibodies and therefore the disease pattern. However, it is extremely necessary to decide how many samples to take and why sampling has to be done. For PRRS, we assume that there are reasons why we need to take a sample.

a. To determine whether or not a population is infected (detection sampling)

b. To estimate the percent of the population that has been infected (prevalence estimation) and is a helpful tool in assessing whether to proceed with the intervention already made.
The exact sample sizes can be obtained from epidemiology references or by using computer software. As a general rule, sampling should include a minimum of 30 breeding age animals, and 10 animals at 4-weeks of age intervals in the nursery, grower and finisher population.

Moreover, when sampling, population can be tested using either cross-sectional or prospective testing. Cross-sectional testing is done by randomly selecting a number of pigs from each population and sampling at one point and time, while prospective testing consists of identifying specific animals and testing the same periodically over time.

Farm classification

Farm Classification – is based on a system proposed by Scott Dee (1998). Through this classification it is easier to determine which control strategies could work best in the herd or in the area.

1. Gilt development/Isolation/Acclimatization:
   a. Breeder stabilization is critical
   b. Gilt developer facility is helpful to successfully prepare gilts for entry into an infected farm.
   c. Function under ALL-IN ALL-OUT (AIAO) pig flow.
   d. Gilts may be introduced as weaned piglets from 2 – 5 months of age.

2. Period of gilt development:
   a. Isolation period
   b. Serologic testing day 1 to 2
      i. Vaccination shortly upon arrival if decision is made.

3. Acclimatization period:
   a. Starts 30 days after gilts’ entry into the developer facility.

4. Recovery period:
   a. Sources of field virus are removed from the development facility (eg. nursery pigs, culled sows)
   b. Period of 30 days prior to entry into the gilt pool

5. Partial depopulation:
   a. Adjustment in pig flow to interrupt horizontal transmission of PRRS virus.
   b. This technique is primarily used in the nursery.

6. All In All Out (AIAO) Pig flow:
   a. Basis of strict control over movement of animals to reduce perpetuating and intensifying effect of the virus by avoiding mixing of older and slower growing poor performance in pigs with younger animals.
   b. Solid division of pens and individual rooms.

Vaccination

1. To reduce immune response which will alter the course of infection and protect against clinical disease.
2. Vaccination does not stop infection.

A number of controlled studies have demonstrated safety and efficacy of modified live virus (MLV) PRRS vaccines against homologous and heterologous challenge. Mass vaccination and unidirectional pig flow have been used effectively. The basis is to stop transmission of PRRS virus infected finishers by vaccinating all animals twice with an MLV over a 30-day period and simultaneously stopping the introduction of naïve pigs for a period of 60 days. Following the
emptying of rooms during routine marketing, facilities are washed, disinfected and allowed to dry for two days.

McREBEL

Management changes to reduce exposure to bacteria to eliminate losses.
1. Cross foster only during the first 24 hours of life.
2. Stop cross-fostering piglets between litters for resizing or for saving sick pigs and runts.
3. Cross foster pigs to equalize litter size only up to 24 hours after birth.
4. Only moved pigs within farrowing rooms at birth. Don’t move sows or piglets between rooms.
5. Stop using nurse sows for weak born, PRRS virus–infected pigs and runts.
6. Minimize handling of piglets, especially for routine antibiotic or extra iron injection.
7. Evaluate the effect on clinical disease levels of each non-essential processing or treatment procedure for suckling and nursery pigs.
8. Immediately euthanize pigs that get very sick and are unlikely to recover.
9. Don’t move pigs that fall behind or are lightweight into rooms of younger pigs or to nursing sows.
10. Immediately stop all feedback programs of stillborn or aborted fetuses.
11. Establish strict AIAO nursery pig flow. Provide 2 – 3 days for cleanup and disinfecting room between groups.

PREVENTION OF PRRS VIRUS INFECTION

The primary source is the infected pig. For this reason, it is critical to routinely isolate and test breeding stocks intended for PRRS virus–negative herds. Naïve farm owners should purchase replacement stocks from known negative sources which carry out a regular schedule of monitoring and communication with veterinary practitioner.

Isolation facilities should be located on another farm site and visited at the end of each working day. If diagnostic results indicate that incoming stocks are infected, all animals should be removed from the premise and marketed. The isolation facility should be cleaned using 90 – 92*C water, disinfected using formaldehyde based products and allowed to sit empty for a minimum of seven days. Biosecurity should be practiced at all times.

Vaccination*

*Consult your veterinarian for possible biosecurity and vaccination as part of your control and prevention measures (particularly for naïve clinically and serologically negative farms wherein vaccination may or may not be an option)

For Positive – Stable/Unstable farms:

- Replacement gilts and junior boards
  - 2 shots with MLV PRRS vaccine before breeding 3 – 4 weeks interval and the second dose should be at least 3 – 4 weeks before breeding (gilts should be isolated within 60 days).
- Sows
  - Initial Program – mass vaccination with MLV – PRRS vaccine 2 shots with 30 days interval.
  - Maintenance Program: - 3 Options
    - Mass vaccination every 4 months using MLV-PRRS vaccine.
- Mass vaccination every 4 months using killed inactivated PRRS vaccine
- Regular program with MLV-PRRS vaccine 14 days post farrowing.

- **Piglets**
  - Mass vaccination with MLV-PRRS 18 – 21 days old or 21 days old piglet.

- **Boars**
  - Every four months with MLV-PRRS vaccine (as a precaution boars to be vaccinated may be batch into two:
    - Vaccinate the first batch, then rest for four weeks, after which, vaccinate the second batch.

**REFERENCES**


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