Intentional *Mycoplasma hyopneumoniae* Exposure

P. Yeske

Swine Vet Center, St. Peter, Minnesota

Introduction

Mycoplasma hyopneumoniae is the causative agent of enzootic pneumonia,[1,2] a highly prevalent clinical condition that influences the production outcome of swine operations.[3] *Mycoplasma hyopneumoniae* is a pathogen that has been in the swine industry for a long time and continues to be a significant problem for the swine industry. The major effects are in the grow-finish phase of production with effects of decreased average daily gain, increased mortality and lower percent marketed pigs to the primary market, poorer feed conversion, and increased medication cost of treatment in feed, water, and injectables.

These costs are significant when using actual production numbers from records accumulated from 2007 to 2015. Plugged into an economic model, the resulting cost was $4.99 per pig;[4] data reported from other farm systems place costs per pig at $2.85.[5]

Research data suggest that disease status in the sow farm has an important effect on downstream flows.[6] One of the biggest challenges is proper acclimatization of the gilts going into the sow herd to control the level of shedding to piglets in litter and subsequent disease problems. Reducing the amount of shedding is important to reduce the amount of downstream disease in the pigs.[7] Historically, this was not a problem because most of the replacement gilts were born in positive herds or raised internally in the herd and were infected early in life with plenty of time to reduce shedding by the time of farrowing. Today most all of the replacement gilts are *Mycoplasma hyopneumoniae*-negative, requiring that they get acclimatized once they get to the sow farm. One of the challenges is getting the gilts infected. Work has been done with seeder gilts to expose negative gilts, which took (6 infected) per (4 negative) gilts to get this done in 30 days.[8] These gilts then must be allowed the necessary time following infection so as to reduce shedding at farrowing.[9] This is critical whether you want to stabilize a positive sow farm to reduce the impact of clinical disease in the finishing phase or whether you want to do a herd closure for elimination protocol.

Objectives

- Reducing the level of *Mycoplasma hyopneumoniae* shed to piglets and subsequently reducing disease problems in the finishing phase.
  - This is accomplished by getting the gilts to be colonized and to stop shedding by the time they farrow their first litter.
- Establishing the day zero for elimination of *Mycoplasma hyopneumoniae* program.

Methods of Exposure

The first step is to identify gilts that are *Mycoplasma hyopneumoniae* positive. These gilts will then be used to infect the negative incoming gilts at an age early enough to allow them to shed well before farrowing time. Ideally, these negative gilts would be infected by 84 days of age. Figure 1 demonstrates the time needed to reduce shedding in farrowing gilts and their piglets.

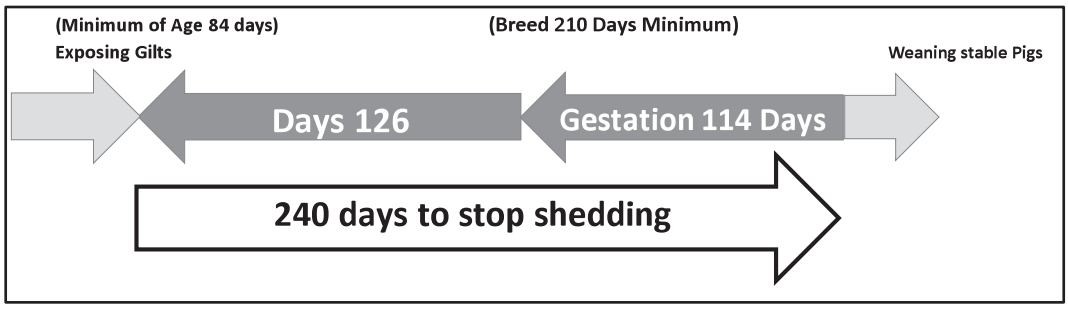

Figure 1. Gilt exposure timeline.

There are several methods of exposing these negative gilts.

- Use of seeder animals has been done for a long time by the industry and works well if the right animals are used and there is plenty of time. However, the age of replacement gilts may make this method difficult. To achieve a shorter time, such as 30 days, studies show that a large number of seeders (6 to 4) is needed to be 100% successful.[8] One challenge with this system is that the infection may die out in the seeders, making it difficult to maintain the timeline. This results in (1) problems in the finishing population, (2) a prolonged time to reestablish the herd stability, and (3) costs from reduced performance during the process.
- Intratracheal inoculation has been done in research work and challenge models. This can be done using a lung homogenate inoculum from positive animals from the farm to avoid cross contamination of other mycoplasmas or disease.[10] The method, although effective, is labor intensive and more dangerous to staff due to restraint methods that must be used.
- Aerosol inoculation has been done for other diseases and with other species for vaccination, so it is a possibility. This can be done using the same lung homogenate inoculum from positive animals from the farm. Advantages of this method include reducing labor and eliminating the need to restrain animals. There are some technical steps required including having a smaller air space to work with animals, shutting down ventilation for 30 minutes, and monitoring barn temperatures to increase post-exposure time as long as possible.[11]

For the intratracheal and aerosol inoculations, a source of inoculum will be needed. The best source is from the herd itself since there is no possibility of introducing a different pathogen to the farm. This can be done by identifying animals with clinical signs and testing with either tracheal swabs or laryngeal swabs to identify animals that are positive for *M. hyopneumoniae* by PCR. Once positive animals are identified, they can be humanely euthanized to harvest the lungs, and the tissue can be put into a (Ninja) blender with 60% lung tissue to 40% Friis media to make a lung homogenate. Once this is completed, filter (pantyhose has worked the best) the homogenate, dilute with additional Friis media, and use for exposure by either method.

One of the keys to this process is having a good diagnostic protocol to confirm that gilts have been properly exposed. Testing every group to be sure that this has been accomplished is key to the success of these programs whether for herd stabilization or for elimination protocols.

Discussion

The goal of intentional *Mycoplasma hyopneumoniae* exposure is to establish exposure, infection, and clearance of the organism before the gilts farrow. This can be useful in (1) a herd stabilization plan that is being used to produce pigs with a relatively low load of *Mycoplasma hyopneumoniae* at weaning time or (2) to establish time zero for a *Mycoplasma hyopneumoniae* elimination program. It will depend on the herd and the long-term control strategy. Certainly not all herds will follow the same plan to reduce the economic impact of *Mycoplasma hyopneumoniae*. However, regardless of the plan for stability, they will need to (1) stabilize the herd and (2) control exposure (intratracheal or aerosol) in order to get this done. No matter what the protocol for

acclimatization, a good diagnostic plan must be followed for every group of gilts that enters the herd in order to accomplish the goal. One challenge is to develop a plan that will work repeatedly. With nearly all replacement gilts now coming from negative herds, this is a greater challenge than it was historically and has resulted in *Mycoplasma hyopneumoniae* surfacing as a clinical problem again.

References

1. Mare CJ, Switzer WP. 1965. New Species: *Mycoplasma hyopneumoniae*: a causative agent of virus pig pneumonia. *Vet Med Small Anim Clin* 60:841– 846.

2. Goodwin RFW, Pomeroy AP, Whittlestone P. 1965. Production of enzootic pneumonia in pigs with a mycoplasma. *Vet Rec* 77:1247–1249.

3. Thacker EL, Minion FC. 2012. Mycoplasmosis. *In:* Zimmerman JJ, Karriker LA, Ramirez A, Schwartz KJ, Stevenson GW (eds.), *Diseases of Swine*. Iowa State University, pp. 779–797.

4. Linhares D. 2017. A field study on economics of *Mycoplasma hyopneumoniae* elimination. *Allen D Leman Conference Proceedings*. St. Paul, Minnesota.

5. Schwartz M. 2015. Cost of *M. hyopneumoniae* in growing pigs. *Allen D Leman Swine Conference Proceedings*. St. Paul, Minnesota.

6. Yeske P. 2016. *Mycoplasma hyopneumoniae* Elimination. *AASV Proceedings*. 376–381.

7. Fano E, Pijoan C, Dee S, Deen J. 2007. Effect of *Mycoplasma hyopneumoniae* colonization at weaning on disease severity in growing pigs. *Can J Vet Res* 71:195–200.

8. Roos L, Fano E, Homwong N, Payne B, Pieters M. 2016. A model to investigate the optimal seeder-to-naïve ratio for successful natural *Mycoplasma hyopneumoniae* gilt exposure prior to entering the breeding herd. *Vet Microbiol* 194:51–58.

9. Pieters M. 2016. Current efforts on *Mycoplasma hyopneumoniae* disease control. *Allen D Leman Swine Conference Proceedings*. St. Paul, Minnesota.

10. Sponheim A. 2017. A Diagnostic Approach to Confirm Day Zero. *Allen D Leman Swine Conference Proceedings*. St. Paul, Minnesota.

11. Toohill E. 2017. Achieving Day Zero in Large Swine Operations. *Allen D Leman Swine Conference Proceedings*. St. Paul, Minnesota.