Mycoplasma hyopneumoniae elimination

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Introduction

Mycoplasma hyopneumoniae (*M. hyopneumoniae*) continues to be one of the most prevalent and economically significant respiratory pathogens in the swine industry.[1,2] *M. hyopneumoniae* is the etiologic agent of enzootic pneumonia, a chronic respiratory disease in swine characterized by a chronic, non-productive cough.[3,4] Economic losses related to *M. hyopneumoniae* are associated with decreased feed efficiency, reduced average daily gain, and increased medication costs.[1] (Table 1) Details the differences in performance average daily gain, feed efficiency, percent mortality, percent marketed, feed grade medication and other medication costs in Mycoplasma negative pigs vs positive pigs (all pigs are similar genetics and nutrition).

One of the industries challenges is to enter mycoplasma negative gilts into positive herds. Today almost all genetic suppliers are *Mycoplasma hyopneumoniae* negative production. This has affected the stability of many positive farms resulting in an increase in colonization and more problems in the finishing phase. The difficulty of exposing *M. hyopneumoniae* negative gilts early enough to develop good immunity and not be shedding high numbers by the time they get to farrowing continues to be a part of the problem. Figure 1 shows the time required to get gilts exposed and immune and reduced shedding before farrowing. Recent research work has shown that to infect gilts need to have at least 60% of the gilts shedding to effectively get the negative gilts exposed.[5] This has been a factor in frustration of being able to get this done on a consistent basis has pushed some farms to elimination just to not have to do this and not have the down stream problems.

The economics of this disease had been the primary driver for producers to look at elimination. Many herds have been able to stay negative for an extended period of time. This has also encouraged more herds to move forward with elimination when looking at the return on investments and the amount of time that herds have been able to stay negative. (Table 2) Outlines the success of elimination programs and the amount of time that they have been able to stay negative.

M. hyopneumoniae elimination protocols

If elimination of *M. hyopneumoniae* from a herd or flow is desired, *M. hyopneumoniae* elimination protocols can be implemented. The following protocols for *M. hyopneumoniae* elimination have been described: 1.) Depopulation and repopulation, 2.) Herd closure and medication, 3.) Whole herd medication without herd closure and 4.) Change of flow in a parity segregated flow.

Depopulation and repopulation is the most direct approach for *M. hyopneumoniae* elimination, as it involves removal of the entire breeding herd and restocking with *M. hyopneumoniae* negative replacements.[6] Advantages of depopulation and repopulation include the ability to eliminate more than one disease at once and the opportunity to improve genetics;[6] however, there is a complete loss of production from the time the breeding herd is liquidated until replacement females begin farrowing. The duration of lost production can be reduced with an offsite breeding project, but is associated with additional costs. Furthermore, total depopulation of the breeding herd may be undesirable on farms with animals that have a high genetic potential (i.e., genetic nucleus or multiplier farms). If herds have had problems with parity structure this also offers an opportunity to get the herd started back over.

Herd closure and medication approach has been adapted from the Swiss model for *M. hyopneumoniae* and from herd closures done for PRRS control and many times in combination with

Table 1: Performance differences between *M. hyopneumoniae* positive and negative groups from 2008-2014.

Per 1000 sows	Myco (+)	Myco (-)	Difference
Finishing mortality	3.8%	3.0%	-0.8%
Finishing culls (underweight MKT)	1.9%	1.6%	-0.3%
Total pigs sold	27081	27406	325
Cost of treatments	$ 3.60	$ 2.39	$ (1.21)
Finish ADG	1.72	1.80	$ 0.08
F/G	2.75	2.73	$ (0.02)
Total cost per pig marketed			**$ 4.44**
Total cost per sow			**$ 121.79**

Figure 1: Time line for negative gilt exposure prior to farrowing in a positive herd to remain stable.

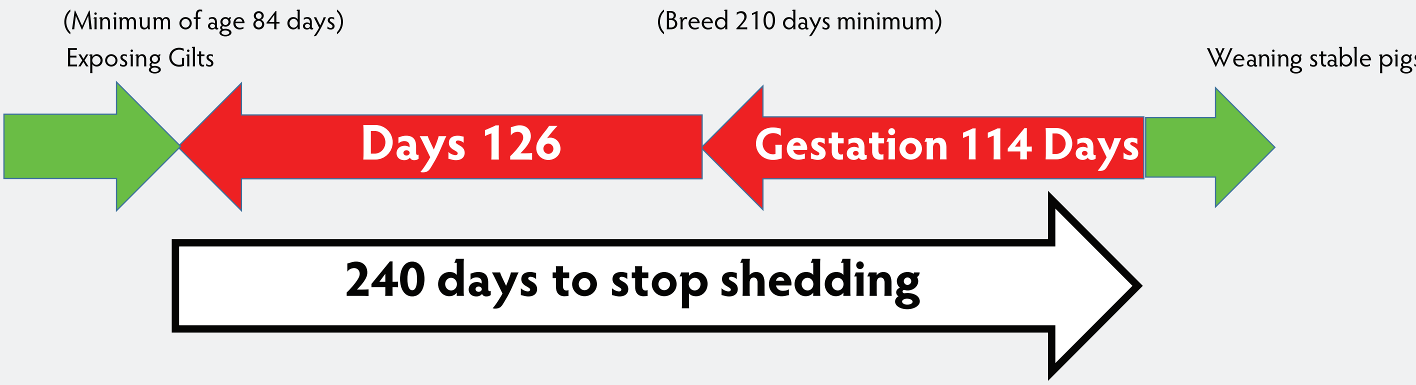


Table 2: Success of *Mycoplasma hyopneumoniae* eliminations.

	Herd Closure	Medication	Total
Number of sows	130088	47450	177638
Number of herds	46	20	66
Percent negative at 1 year	98%	58%	86%
Percent negative to date	89%	53%	80%
Herds negative	40	10	51
Average months negative	44	32	40
Average herd size	2828	2373	2691
Years negative	3.6	2.7	3.4

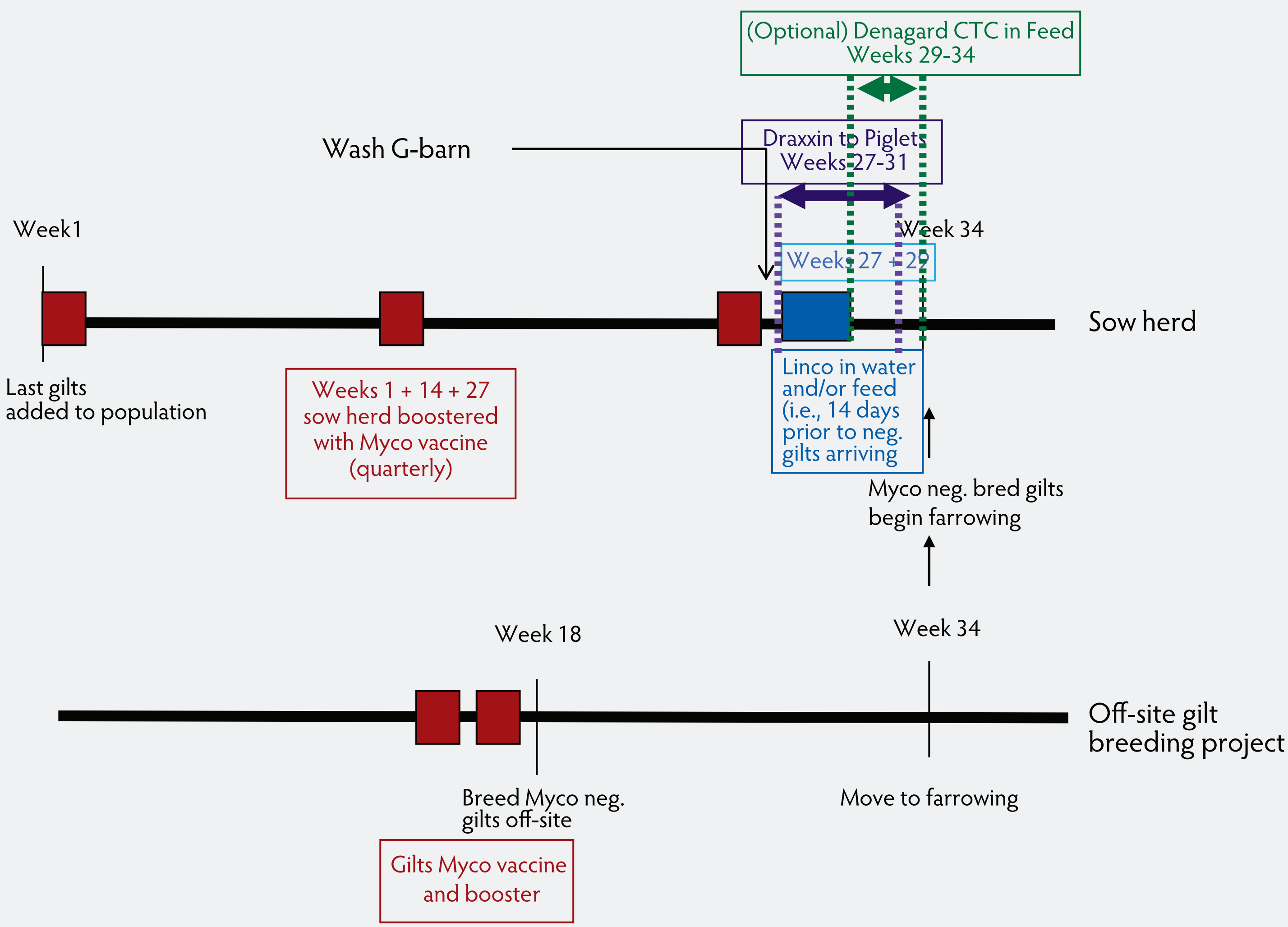
PRRS elimination from the herd as well.[2] The basis of this procedure is to close the herd once all replacement animals have been exposed to *M. hyopneumoniae* and not make any additions for 240 days.[2] Work done by Pijoan and Peters demonstrated that this was the time that it took for animals to no longer be shedding following natural infection.[7] Using this information gilts are accumulated for the closure into the herd when possible or with an offsite breeding project. For gilts that will be added to the herd in this time they must be infected with *M hyopneumoniae* to start the clock ticking. This can take 1-2 months and is a critical step in the process to ensure success. Once this is completed then herd immunity is boostered every 90 days with whole herd vaccination. At 7 weeks before the negative replacements are scheduled to arrive the whole herd is medicated (sows and piglets). Although different combinations have been done the most common method had been to use Lincomycin in the water for the sows and injection of Draxxin® to the piglets at birth and at 14 days to piglets. (Figure 2)[2] A detailed time line of herd activates including the offsite breeding project. (Table 3) Details a check list that can be used to make sure that all activities are being completed in the process and following the timeline. Herds have had extended closures over 13-14 months and been able to achieve negative status with no medication just longer closures.

Whole herd medication is another method that allows for much faster elimination from the herd but has a lower rate of success. This procedure does not involve a specific herd closure but is generally done when gilts have just entered the farm. Treating all animals on site and then coming back 2 weeks later to treat all sows again. Treating piglets that are born for 4 weeks at birth and 14 days of age with Draxxin® starting at time of first medication. Waiting until all treated piglets are weaned off site and then bringing negative replacements back into the herd.

Combinations of herd closure and whole herd medication have been done in cases where closure for a full 240 days is not possible. Having a closure period before starting the whole herd medication program appears to have increased the odds for success of the medication program. This has varied in closure time frames but it is best to be as long as possible to push towards greater success.

Parity segregated flow offers a unique opportunity to eliminate *M. hyopneumoniae* in taking advantage of the flow to allow for immune sows. Since the older parity sows should not be shedding and not have exposure to younger sows that are shedding, these sows should be negative and allow for flowing the negative replacement animals into these herds, and then flow the system

Figure 2: Time of events in a herd closure for *Mycoplasma hyopneumoniae* including an offsite breeding project.



backwards (following older immune sows to parity 1 site) until 240 days have passed on the last positive gilts introduced into the parity 1 herd. Once this is completed the flow can go back to normal. Some herds using this approach have used medication along with the change of flow to drive the odds to higher success.

Table 2 details the success of these methods and the period of time that these herds have been able to stay negative on average. The longest herd in this data base has stayed negative for 12 years following elimination. These procedures have been done in farrow to wean farms of various sizes with the largest herd being 8000 sows. A spreadsheet has been developed to document the cost of *M hyopneumoniae* in a herd as well as the various procedures to eliminate it and how to calculate return on investment.[8,9] This tool has been very useful in detailing multiple scenarios for owners as they look at the possibilities.

Discussion

Mycoplasma hyopneumoniae continues to be a problem for the industry. With essentially all negative replacement stock it is more and more difficult to keep positive herds stable, resulting in more problems in the grow finish population and more cost of disease. There are many different ways to eliminate *M hyopneumoniae* from herds; every herd will be different with the goals for the elimination plan and the risk levels that the owner is willing to take. Hopefully with this presentation one can see some of the values for elimination and different methods to do it. The successes of herds that have followed these procedures is outlined below. Every herd owner will need to decide if there is enough return for doing one of these projects but hopefully with this information they along with the herd veterinarians can make a more informed decision on how to move forward for their specific herd.

Table 3: Checklist of activities for *Mycoplasma hyopneumoniae*.

Mycoplasma Eradication Herd Closure Protocol

Farm		
Date		

Date	WK	Activity	Product	Dosage	Withdrawal	Completion date	INT
5/12/2015	20	Herd closure	N/A	N/A	N/A		
5/12/2015	20	Myco exposure complete (confirmed)	N/A	N/A	N/A		
5/13/2015	20	Whole herd vaccination (sow unit & GDU)	Respisure 1	2 cc	21 days		
8/10/2015	33	Whole herd vaccination (sow unit & GDU)	Respisure 1	2 cc	21 days		
9/4/2015	36	Vaccinate gilts at off-site breeding project	Respisure 1	2 cc	21 days		
9/18/2015	38	Vaccinate gilts at off-site breeding project	Respisure 1	2 cc	21 days		
10/2/2015	40	Begin off-site breeding project	N/A	N/A	N/A		
11/5/2015	45	Wash the gestation	N/A	N/A	N/A		
11/8/2015	46	Whole herd vaccination(sow unit & GDU)	Respisure 1	2 cc	21 days		
5/24/2015	22	Rope test gilts in GDU test all pens and keep track of pens so that they can be retested	N/A	N/A	N/A		
11/19/2015	47	Whole sow herd medication Draxxin	Draxxin	1cc per 88 ibs	33 days		
11/19/2015	47	Piglet treatment all piglets on site (larger pigs will need to adjust dose by weight)	Draxxin	1cc per pig Diluted to 1cc 4.4.lbs	33 days		
11/20/2015	47	Piglet treatment at birth	Draxxin	1cc per pig Diluted to 1cc 4.4.lbs	33 days		
12/3/2015	49	Whole sow herd medication Draxxin	Draxxin	1cc per 88 ibs	33 days		
12/3/2015	49	Begin Denagard CTC in feed lactation and gestation	Denagard CTC	1600 gms ton CTC 35 gms ton Denagard	14 days		
12/3/2015	49	Begin piglet treatment at 14 days of age (treat all piglets that are 14 days and older)	Draxxin	2cc per pig Diluted to 1cc 4.4.lbs	33 days		
12/17/2015	51	Last piglets treated at birth	N/A	N/A	N/A		
12/31/2015	53	Last Piglet treatment at 14 days of age	N/A	N/A	N/A		
1/7/2016	2	Elimination completed	N/A	N/A	N/A		
1/8/2016	2	Negative gilts enter breeding herd	N/A	N/A	N/A		
1/8/2016	2	Date pigs are expected negative	N/A	N/A	N/A		
240		Days since the herd was confirmed (+)					
241		Days since closure					
268		Last gilts birth date	4/15/2015				
304		Gilts 10 months of age	2/13/2016				

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