## Control and Eradication of *Mycoplasma Hyopneumoniae* Infection in Pig Herds

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Infection due to *Mycoplasma hyopneumoniae* is wide spread in pigs throughout the world. The common name 'enzootic pneumonia', indicates that once the agent settles in a pig herd it becomes an established pathogen that maintains an infection cycle. The epidemiological features of *Mycoplasma hyopneumoniae* infections are as follows:

- It is a fragile mycoplasma that is killed quickly by heat and drying. It can survive up to 7 days if protected in mucus.
- Transmission occurs from infected shedding pigs and can travel by aerosol for several kilometers[1].
- The incubation period from infection to shedding is 14 days and the agent is shed for up to 10 months[2]
- In continuous flow production systems, infection begins at an early age. Either the dam, or infected growing pigs infect the piglets, generally a prevalence approaching 100% is reached in finishing pigs.
- Segregated Early Weaning (SEW) offers an opportunity to remove the piglets from infected growing pigs, eliminating the dominant risk of infection. Shedding sows or gilts may occasionally infect nursing piglets leading to infection in the nursery. If the nursery is filled in an all in all out flow, *Mycoplasma hyopneumoniae* may cause sporadic epidemics as opposed to a continual endemic disease.
- In multisite finishing systems the prevalence may be batch or cohort specific. With animals entering a barn at one time, and only one age group present, an infection can build more slowly reaching the peak of the epidemic near market weight[3]. This has been termed the '18 week wall'.

The economic impact of *Mycoplasma hyopneumoniae* needs to be considered whenever control measures are considered. Disease is a major determinant of profitability of pig farms. 65% of income differences between farms are due to feed conversion, growth rate, and mortality rate differences[4]. Caution is needed when extrapolating the impact of disease from research to a farm situation. Tremendous variation exists in management style, virulence of pathogen and coinfections so that losses reported in the literature may not match a given farm.

[1] Hurnik D.1997. Proc. 28th Annual Meeting Amer Assoc Swine Pract. Quebec.
[2] Hurnik D.1997. Proc. 28th Annual Meeting Amer Assoc Swine Pract. Quebec.
[3] Bahnson PB, Marsh WE, Dial GD.. 14th IPVS congress. Bologna. 1996 p401
[4] Dijkhuizen AA. (1989) Vet Quarterly 11:116-124

But the following observations should be considered:

- Pigs grow 5% slower for every 10% lung involvement at slaughter[5]
- *Mycoplasma hyopneumoniae* negative pigs grew 24 gm/day faster than comparable infected ones.[6]
- Losses increase when mixed infections occur. Viral disease such as PRRS, and Swine Influenza appear to make mycoplasma infections more difficult to control. Pigs with lesions of *Mycoplasma hyopneumoniae* and Atrophic rhinitis grew 17% slower[7], indicating disease effects may accumulate.

Because so many pigs are affected world wide, *Mycoplasma Hyopneumoniae* is one of the most economically important production diseases.

**Control Options**

There are several options to control the damage caused by *Mycoplasma hyopneumoniae*. They depend on what products are licensed for swine use in various countries, and what production systems are utilized. As the epidemiology indicates, the disease expression varies with barn type and pig flow. A control program needs to be tailored to the production system. The following are the options available:

- The disease can be managed quite successfully simply through management. The severity of most diseases are dose dependent[3], thus if the initial dose exposure to the agent is low, the pigs may not be severely affected. Herds with batch flow production methods and disciplined pig flow, can have good production parameters without any mycoplasma specific control measures. The management practices that minimize risk of mycoplasma problems include: group production with all-in all-out flow of pigs, control of secondary bacterial or viral infections, finishing pigs raised away from the sow herd, and stable sow age structure and immunity.

- Mycoplasmas are generally sensitive to macrolide antibiotics, tetracyclines, and tiamulin. Some of these products are licensed to control *Mycoplasma hyopneumoniae*, and if used as directed has helped to control disease loss. Also, secondary infections with *Pasteurella multocida* or *Streptococcus suis*, may respond the medication and thus antibiotics may have an effect on more than just the mycoplasmas. Bacteria develop resistance to antibiotics, so antibiotic use for long term pneumonia control may fail. Routine antibiotic use in livestock is viewed negatively due to the potential to pass antibiotic resistance to human pathogens.

- Vaccines for *Mycoplasma hyopneumoniae* have been available since the early 1990's. The consensus appears that vaccination can limit the financial losses due to the infection. Transmission of the pathogen still occurs, but clinical signs and lesions are reduced, and production parameters can improve[8]. Feeder pigs need to be vaccinated, and generally, two doses are needed for adequate immunization. The extra handling increases labour costs significantly and creates the risk of broken needles remaining in meat products. Broken needles are becoming a significant concern for the pork industry[9]. It is essential for a

[5] Straw BE, Tuovinen VK, Bigras-Poulin M.(1989) JAVMA 195:1702-1706
[6] Tuovinen VK, Grohn YT, Straw BE. 1994 Prev Vet Med. (20) 11-22
[7] Bernardo TM, Dohoo IR, Donald A. (1990) Can J. Vet Res. 54:278-284
[8] Dohoo IR, Montgomery ME, Can Vet J. 37(5):299-302
[9] PEI Hog Commodity Marketing Board Newsletter Volume 7, Issue 5, May 1999.

vaccination program to be effective that *Mycoplasma hyopneumonaie* is the major cause of the production loss. In cases where other infectious agents are involved, immunization for mycoplasma only may not be of help.

- Eradication of *Mycoplasma hyopneumoniae* is the ultimate disease control strategy, for without the pathogen, the clinical signs, lesion and production loss disappears [3]. A full farm depopulation and replacement with mycoplasma negative gilts can occur and offers a significant improvement in productivity. The added benefits of such a procedure is a complete upgrade of genotype is possible, meaning the producer can see significant genetic improvement as well. If high health replacement animals are purchased, many of the secondary diseases may also be removed. This makes whole farm depopulation and repopulation very attractive to units that have a significant disease burden and unimproved genetics. Generally, the procedure is expensive because cash flow is interrupted. An accelerated program where clean gilts are bred on one site and contaminated pigs are moved to another site while cleaning the home barn, can significantly limit the time with no production.

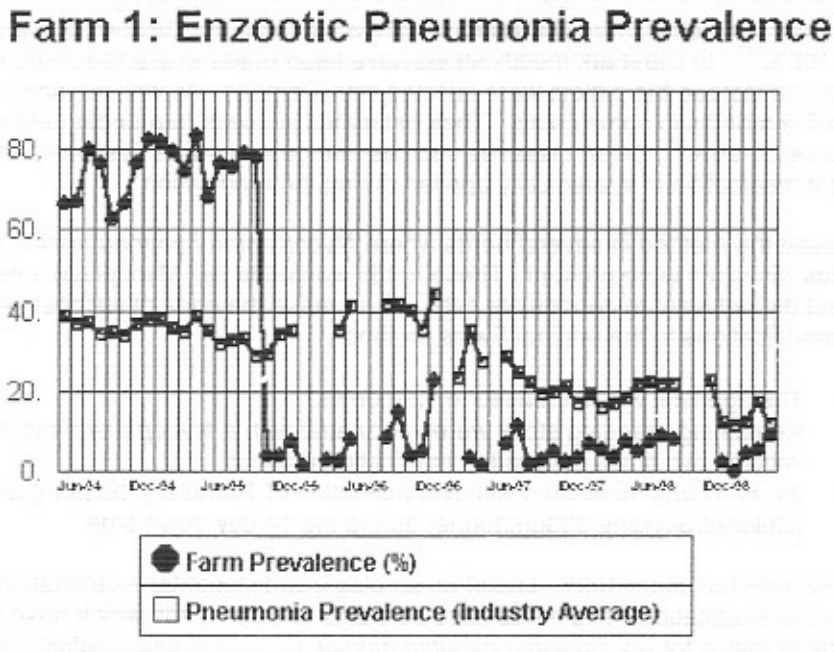


Figure 1 Many producers have chosen to eradicate *Mycoplasma hyopneumoniae* as it provides a permanent control strategy. This graph of lesions at slaughter shows that a farm can eliminate lesions and losses if the pathogen in removed. The data is available through the Animal Productivity and Health Information Network (APHIN).

**Eradication without depopulation**

In the 1990, Zimmerman reported the eradication is possible without depopulating the whole herd[10]. This has become known as the Swiss method of mycoplasma eradication. The program has been used in Europe extensively to control Mycoplasma hyopneumoniae infection in both commercial and breeding herds[11] The basis of the program is as follows:

- All young animals (weaners, growers, finishers) are removed from the infected herd
- Only Breeding animals **older than 10 months** remain in the herd
- There is no farrowing allowed for 14 days
- During the 14 days the whole herd is medicated with Tiamulin (120ppm)
- During the 14 days, the whole barn is cleaned and disinfected

This program is believed to work because older breeding stock do not shed the pathogen, and piglets born in the herd after the 14 day window will remain free of the pathogen. If the program is successful, the piglets, when they grow up, will not carry *Mycoplasma hyopneumoniae* nor will they be seropositive for the agent.

Using this method in small herds in Norway and Switzerland, the success rate appears to approach 100% [12]. In Denmark modifications have been made where farrowing has not been interrupted and instead the piglets were injected with Tiamulin. As well the age limit was lowered to 8-9 months in some cases. Their estimated success rate under field conditions appears to be 80-90%[12]. Other diseases such as mange and swine dysentery can also be eliminated if medication is strategically applied during the eradication.

We have used the method in several herds where *Mycoplasma hyopneumoniae* appeared and no other diseases were present. These herds wanted to sell Mycoplasma negative animals and did not want to depopulate fully. To increase the odds of success we made the following modifications to the original Swiss method.

- The age limit was increased to 12 months
- Remaining breeding stock were vaccinated with a *Mycoplasma hyopneumoniae* vaccine two times prior to the eradication process
- the herd was medicated with a combination of Tiamulin (100 ppm) and (Chlortetracycline 330gm/tonne) during the 14 day down time.

The success rate has been 100%, based on serologic and slaughter examination, up to 3 years after the eradication. The herds have sold pigs to other herds which have remained consistently negative for *Mycoplasma hyopneumoniae* by clinical examination, slaughter examination and serologic testing.

The reasoning for the modifications were to reduce the risk of failure. The increase of the age limit is ensure that full immunity was present and risk of shedding was reduced. If purchased gilts are used enough time needs to elapse so that full immunity develops. Vaccination may or may not help in the procedure, but the vaccines are safe and will stimulate greater immunity towards *Mycoplasma hyopneumoniae*. In larger herds the risk of failure may be greater as the likelihood of at least one carrier animal remaining in the herd increases with herd size. In multisite production where pigs are weaned early and to an offsite location, a condition close to a Swiss eradication may occur[3]. This leaves an intriguing possibility to remove *Mycoplasma hyopneumoniae* from Multisite production systems.

[10] Zimmermann W. (1990) Tierartzl Umschau 556-562.

[11] Baekbo P. 1999 Proc. 30th Annual Meeting Amer Assoc Swine Pract. St Louis

The herd criteria that we used to select herds for a mycoplasma eradication program are as follows and increase the odds of success:

- A clean *Mycoplasma hyopneumoniae* negative source of gilts needs to be available after the eradication.
- The farm people needs to be motivated to follow through on all the details of the eradication program.
- An off-site facility to growout the contaminated feeder pigs needs to be available at a sufficient distance to avoid re-infection.
- the biosecurity commitment of the herd needs to be great enough to prevent re-infection once the herd is clean.

The major benefit of an eradication program is that it is cheaper than a full depopulation and offers a high probability of success. In our hands, it has been a valuable tool for farms where long-term control of *Mycoplasma hyopneumoniae* has been needed.