Controlling mycoplasmal pneumonia in swine: a continuous learning process

Mycoplasmal pneumonia of swine (MPS), or enzootic pneumonia, is caused by *Mycoplasma hyopneumoniae* (*M. hyo*), one of the most important causes of disease-associated loss in swine production. Economic loss associated with MPS is often the result of a complex interaction between *Mycoplasma* and coinfections with other bacteria, poor health management and poor environmental conditions. Studies show that more than 90% of swine herds worldwide are infected with mycoplasmal pneumonia, making it one of the most prevalent and costly swine diseases.1 Even at low levels of infection, this chronic respiratory disease presents significant added costs to pig operations through reduced feed efficiency, decreased overall daily weight gains, variability in pig size, decreased carcass prices and repeated antibiotic treatments. In addition, *M. hyo* infections can add from 6 to 25 days to the time it takes to bring a pig to the market.2

MPS is maintained in many herds by sow-to-piglet transmission of *M. hyo*. Once infection is established in a few pigs, transmission among penmates occurs, especially after animals are pooled together at weaning time. In continuous-production systems, *M. hyo* and a number of other important respiratory pathogens may be transmitted in large numbers from older to younger pigs. Overt signs of MPS usually are not seen until piglets are six weeks of age or older. Although *M. hyo* infections are commonly thought to begin in the nursing pig, microbiologic evidence of the organism’s presence in lung lesions has not been presented. Factors that may contribute to the peak prevalence of MPS in growing and finishing swine are likely to include: the long *M. hyo* incubation period, the slow spread of the organism in litters, increased animal density downstream of the nursery, spread of other infectious agents and environmental factors that develop following weaning.

Animals may also become coinfected with the PRRS virus following infection with *M. hyo*., swine influenza virus and other porcine respiratory disease agents, resulting in severe reproductive problems. Also, economic losses can be considerable if secondary bacterial infections occur. These losses can include reproductive problems such as abortion and stillbirths in breeding stock.

**Treatment/eradication:** Control of *M. hyo* is managed primarily through vaccination, serologic monitoring and husbandry. The best prevention against *M. hyo* is to prevent susceptible animals from contacting infected animals. The close proximity of infected and susceptible animals facilitates the spread of *M. hyo* and MPS in nursery and weaning facilities.

**Part A: Dealing with Presumed Mycoplasma-Negative Populations**

The first step for controlling any of the respiratory complex agents in swine operations is to define the role of the potential agents that can be involved in the porcine respiratory syndrome. In particular, identify viruses and/or bacteria with low- or high-virulence effect in the upper respiratory tract that can open the door for other secondary pathogens to create a potentially devastating disease over the complete herd.

If we consider a swine operation or region as an *M. hyo*-free zone, a continuous program of screening both newly introduced and resident...
M. hyo

With the Tween-20 or IDEXX removed from the test cutoff to provide an sample/OD buffer control ration) were sufficiently where the mean sample values (either S/P or OD 1, 2 and 3 depict the results for the population Ab Test and a blocking-format ELISA. Figures compared using the Tween-20, IDEXX results from three different ELISA methods were produced false-negative results. In previous data, can give high confidence that the test will not be screened with a very sensitive test that infections and indicate the need to proceed to more involved investigations with a more specific testing tool.

Unfortunately, there is no gold-standard method for confirmation of positive serological results. In some regions, a competitive ELISA has been considered as a gold standard, but its format has been reported to be less sensitive than that of the IDEXX ELISA and may allow for false-negative results. This may make it a less sensitive test for use in suspected Mycoplasma-free swine populations. Recently, IDEXX performed a comparison study on a presumed M. hyo-negative population. The results from three different ELISA methods were compared using the Tween-20, IDEXX M. hyo. Ab Test and a blocking-format ELISA. Figures 1, 2 and 3 depict the results for the population distribution offered by these ELISAs. All three tests demonstrated similar population distributions, where the mean sample values (either S/P or OD sample/OD buffer control ration) were sufficiently removed from the test cutoff to provide an extremely low false-positive rate.

With the Tween-20 or IDEXX M. hyo. ELISAs, the veterinarian may want to verify any unexpected positive results with a more specific test. You could use a competitive ELISA, as suggested by Dr. Torremorell during a recent Allen D. Lehman Conference. This strategy will ensure that the farm’s Mycoplasma control program is monitoring with tests that can provide an early warning of infection for appropriate management of the index cases.

**Figure 1:** M. hyo. negative population on IDEXX M. hyo. Ab Test

![Figure 1](image1.png)

**Figure 2:** M. hyo. negative population on Tween-20 Test

![Figure 2](image2.png)

**Figure 3:** M. hyo. negative population on blocking-format ELISA

![Figure 3](image3.png)

**Table 1:** Results comparing the IDEXX M. hyo. Ab Test and antigen detection from lung tissues

<table>
<thead>
<tr>
<th>Age of animal (weeks)</th>
<th>Number of samples tested</th>
<th>Antigen detected</th>
<th>Percent antigen positive</th>
<th>Antibody detected</th>
<th>Percent antibody detected</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>37</td>
<td>7</td>
<td>19%</td>
<td>7</td>
<td>19%</td>
</tr>
<tr>
<td>4</td>
<td>43</td>
<td>1</td>
<td>2%</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>8</td>
<td>45</td>
<td>7</td>
<td>16%</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>12</td>
<td>44</td>
<td>11</td>
<td>25%</td>
<td>4</td>
<td>9%</td>
</tr>
<tr>
<td>16</td>
<td>32</td>
<td>10</td>
<td>31%</td>
<td>9</td>
<td>26%</td>
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<tr>
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<td>10</td>
<td>33%</td>
</tr>
<tr>
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<td>10</td>
<td>100%</td>
</tr>
<tr>
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<td>12</td>
<td>9</td>
<td>75%</td>
<td>7</td>
<td>58%</td>
</tr>
</tbody>
</table>

The results shown in Table 1 demonstrate that a good correlation was observed between the percentage of swine detected as positive on the ELISA as the percentage of infected swine increased.

**Part B: Dealing with Mycoplasma-Positive Populations**

A more sensitive test is the best starting point for monitoring and establishing baselines for each farm/complex in a swine operation. The use of the ELISA as a tool for monitoring populations requires the testing of swine at various ages using a statistically valid number of samples. We recommend that producers follow certain scientific criteria as described by authors such as Dr. Polson. Choosing the correct sampling plan allows the veterinarian to rely on the results obtained, to analyze and arrive at accurate conclusions relating to the health management of the herd, and to define strategies related to vaccine applications (e.g., age of application, routes of application, type of vaccine used, etc.).

A study presented by Rapp-Gabrielson, et al, at the American Swine Practitioners meeting offered a comparison between two different M. hyo. ELISAs. Their conclusion was that the sensitivity of the IDEXX ELISA was higher, and more reliable in terms of seroprevalence two months post-vaccination (24% vs. 14%), and at four months post-vaccination (33% vs. 19%), as well as in observing dynamics of the seroconversion after field challenge as performed in a control situation (95% vs. 90%).

Maternal antibody interference is a mechanism that affects all swine Mycoplasma vaccines. This phenomenon needs to be considered when a lack of post-vaccine seroconversion is observed. However, establishing baseline profiles for the herd will allow the veterinarian to establish the rate of maternal antibody decay and allow for confidence in selecting the age for first vaccination of the weaned piglets. We recommend that the veterinarian establish reference baselines for each of the different conditions facing the swine in the operation, such as nursery and weaned piglets, finisher pigs, gilts, and sows at all stages of the production pyramid. These baselines will also be of value in assessing the efficacy of any modifications in a vaccine strategy, such as age of application, type of vaccine used, or any other factors that you may consider as affecting the dynamics of the serology curve. The use of baselines may also allow for the detection of a Mycoplasma infection in playing a role in the respiratory health of the herd. Having these types of baselines well-documented and correlated with other performance parameters, as well as with clinical conditions, can lead veterinarians to better preventive medicine programs in their companies.

Table 1 shows the correlation between IDEXX M. hyo. Ab Test and PCR.
References


