Management and intradermal vaccination as a tool to control M. hyo

Respiratory disease in pigs is considered a significant disease condition in intensive pig production worldwide and Mycoplasma Hyopneumoniae (M. hyo) is a major contributor in this.

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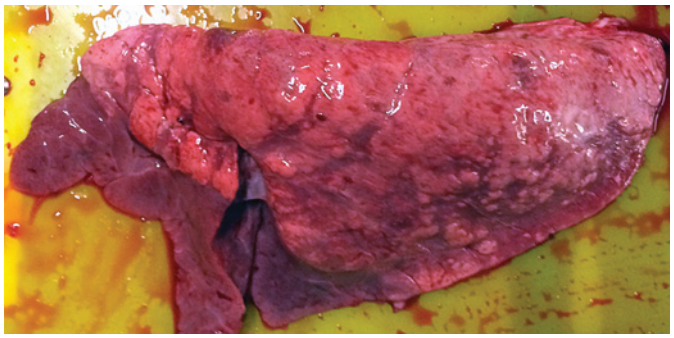


Lung infected by Mycoplasma hyopneumoniae showing red to purplish consolidated areas (with meaty consistency) on the cranial-ventral parts of the apical, cardiac and diaphragmatic lobes.

M. hyo is the primary agent of enzootic pneumonia, a chronic respiratory disease caused by mixed respiratory infections with M. hyo and one or more secondary bacterial pathogens. Nowadays, these bacteria also play a central role in Porcine Respiratory Disease Complex (PRDC). The multifactorial aetiology of PRDC includes both viral and bacterial pathogens, and is also influenced by management and environmental conditions.

Both enzootic pneumonia and PRDC result in major economic losses due to reduced growth, increased mortality and feed conversion, costs for antimicrobials and immunoprophylaxis and increased time to market. Non-productive (dry) coughing is the most obvious clinical sign. Macroscopic lesions are characterised by catarrhal bronchopneumonia with red to purplish consolidated areas (meaty consistency) on the cranial-cranioventral parts of the apical, cardiac, accessory and diaphragmatic lobes, also known as mycoplasma-like lesions.

Control of M. hyo

Since eradication of M. hyo from infected commercial herds is complicated, and difficult to achieve as well as to maintain, control of the infections is still considered the best strategy. Control measures include vaccination, optimisation of housing and management practices and antimicrobial treatment.

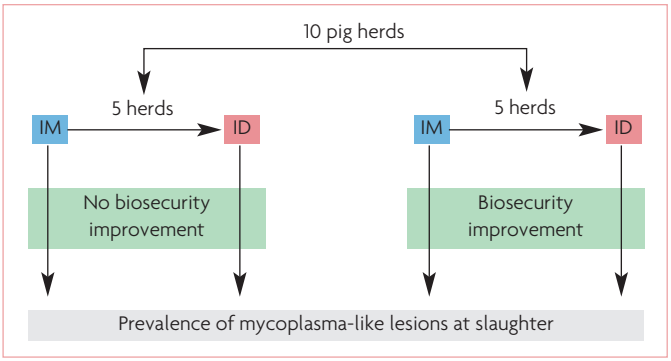
In the actual context of reduction of antimicrobial use, prevention leads the race against pathogens, and is by far better than cure in this case. Vaccination against M. hyo is very effective, is practiced in most of the swine producing countries and is done in more than 80% of the Belgian swine farms.

The severity of the respiratory disease may be exacerbated when adverse environmental and management conditions are present and depends largely on many non-infectious factors.

Identifying and reducing those risk factors may lead to a reduction of the introduction/transmission of pathogens, less stress provoked to the animal by hostile environments (physical, climate and air quality factors) and less direct impairment of the respiratory tract.

Therefore optimisation of management and housing conditions is crucial in the control of M. hyo.

Fig. 1. Comparison of intramuscular (IM) to intradermal vaccination (ID) (Porcilis M Hyo ID Once, MSD AH) against M. hyo in 10 Belgian pig herds. Advice for optimisation of management and improvement of biosecurity was given in five herds (group BS+), whereas no advice was given in the other five herds (group BS-).



Intradermal vaccination

Recently, an intradermal needle-free M. hyo vaccine was introduced in Belgium. Intradermal needle-free vaccination has been demonstrated to be as effective as, or better than, intramuscular vaccination and also provides a fast and efficient immune response.

As discussed by Jolie (2016) in a previous article, this technique also presents other advantages such as improved animal welfare, animal health, safety and friendly use, carcase quality, as well as it may reduce the risk of spread of viraemic diseases via the needle.

Following the maxim of 'prevention is better than cure', MSD Animal Health Belgium has developed 'Full Service on Target'.

This service aims to improve respiratory health on pig farms by giving support to Belgian pig farmers that opt for intradermal needle-free vaccination. It is based on a monitoring system for mycoplasma-like lesions at slaughter and biosecurity level in Belgian pig herds.

Field study

A field study compared intramuscular vs intradermal needle-free M. hyo vaccination in farms with different biosecurity level.

A total of 10 Belgian pig herds were included. The traditional M. hyo vaccination scheme in each farm (intramuscular; IM) served as a historical control and was compared to intradermal vaccination (ID) (Porcilis M Hyo ID Once, MSD AH). Intradermal vaccination was performed following label recommendations. The main parameter of comparison was the prevalence of Mycoplasma-like lesions (catarrhal bronchopneumonia) scored at slaughter.

Lungs were scored according to the score system described by Bollo et al. (2008) which ranges between 0-5, namely score 0 (absence of lesions or ≤5% of the pulmonary surface affected), score 1 (>5% to ≤15%), score 2 (>15% to ≤25%), score 3 (>25% to ≤35%), score 4 (>35% to ≤45%) and score 5 (>45% to ≤55%).

The management and biosecurity of each herd was scored by means of an audit that has a total of 24 multiple choice questions subdivided in two subcategories for External (location; purchasing policy/quarantine) and four subcategories for Internal (all-in/all-out procedures; hygiene; management of diseased animals; housing/climate) biosecurity.

Each question results in a score between one (lowest risk of disease) when this measure is implemented and four (highest risk of disease)

Continued on page 21

Continued from page 19
when the measure is not implemented.

The average score for external and internal biosecurity represents the total biosecurity score. A lower score is indicative of a better biosecurity and, hence, lower disease risk.

This biosecurity audit was performed twice a year in all herds: before and after implementation of intradermal vaccination.

Immediately after the first audit, an extra herd visit was completed in half of the herds (5/10) in order to give advice on improvement of management and biosecurity (group BS+). The remaining five herds did not receive any advice and did not implement any biosecurity improvement, and therefore were allocated in the group BS- (Fig. 1).

Pneumonia

On average, the prevalence of pneumonia was significantly higher in the IM group ([A]16.3%) when compared with the ID group ([B]4.5%) ($P<0.05$). Therefore, on average, a 72% reduction of pneumonia was observed after ID vaccination (Table 1). The average prevalence of pneumonia was significantly higher in groups vaccinated intramuscularly [[A]18.9% (IM/BS-), [A]13.7% (IM/BS+)], when compared with the groups vaccinated intradermally [[B]6.8% (ID/BS-), [B]2.2% (ID/BS+)] ($P<0.05$).

In other words, herds that switched from IM to ID vaccination (IM/BS- vs ID/BS-) experienced a 64% reduction of pneumonia, whereas those herds that switched from IM to ID vaccination and also improved the management and biosecurity (IM/BS+ vs ID/BS+) had a 84% reduction of pneumonia (Table 1).

The individual prevalences of pneumonia at herd level in herds with intramuscular or intradermal vaccination followed by no biosecurity improvement (BS-) or after biosecurity improvement (BS+) are plotted in Fig. 2.

	Intramuscular (%)	Intradermal (%)	Improvement (%)
No biosecurity improvement (BS-)	18.9[a]	6.8[b]	64
With biosecurity improvement (BS+)	13.7[a]	2.2[b]	84
Average	16.3[a] [3.6%–46.4%]	4.5[b] [0.5%–13.3%]	72

A, B: values with different superscripts within a row are significantly different ($P<0.05$).
A, B: values with different superscripts within a column are significantly different ($P<0.05$).

Table 1. Percentage of mycoplasma-like lesions after intradermal needle-free vaccination against M. hyo in pig herds with biosecurity improvement (BS+) and in pig herds without biosecurity improvement (BS-) in comparison to intramuscular vaccination.

In all herds, independently of the biosecurity level, the percentage of animals affected by pneumonia was reduced.

Optimisation of biosecurity

The biosecurity score was only improved in the BS+ group, and remained similar in the BS- group throughout the study. This confirms that the advisory service provided to herds included in the BS+ group was taken into account by farmer and herd veterinarian and therefore implemented at herd level. Since no advice was given to the remaining five herds, BS- group may serve here as a control to evaluate the effect of vaccination alone (BS-) or vaccination + biosecurity improvement (BS+).

Both external and internal biosecurity scores were improved in most of the herds (group BS+).

Within the different subcategories the higher biosecurity improvement was observed for purchasing policy of gilts/quarantine and all-in/all-out procedures. Hygiene, management of diseased animals and housing/climate were also slightly improved.

However, it is crucial to emphasise that there were no golden strategies which had an overall effect on the disease. When a swine consultant gives advice about a health program, it must be understood that these recommendations are tailored to the specific requirements, pathologies, management, infrastructure and possibilities of each individual herd.

Although this increased biosecurity in BS+ group only resulted in a numerical reduction of pneumonia, it remains important to note that the final prevalence after vaccination and optimisation of management and biosecurity was very low (2.2%).

This is an excellent outcome and corroborates the importance of controlling environmental and management conditions before implementing a new vaccination program.

Conclusions

A significant reduction of mycoplasma-like lesions was demonstrated after intradermal needle-free M. hyo vaccination when compared with intramuscular vaccination.

Improvement of biosecurity contributed to a numerical reduction of pneumonia. Further research is needed to confirm this observation.

Our observations are in line with disease control programs implemented in the swine industry. An integrated approach is nowadays more than needed to improve animal health and control infectious diseases in swine farms, especially when different non-infectious factors may also be involved. ■

Fig. 2. Prevalence of mycoplasma-like lesions in herds with intramuscular or intradermal vaccination against M. hyo after biosecurity improvement (BS+) and followed by no biosecurity improvement (BS-).