

A Review on the Impact of *Mycoplasma hyopneumoniae* Vaccination on Average Daily Gain in Swine

A.S. Leaflet R2672

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Summary and Implications

Mycoplasma hyopneumoniae is an enzootic pneumonia affecting swine. Globally it has been estimated that 93% of swine herds have *Mycoplasma hyopneumoniae* which may result in performance losses (Ross, 1992). Losses may incur from a decrease in performance, lower weight gains, decreased feed efficiency, antibiotic treatments, and an increased risk of other respiratory diseases. The objective of this study was to complete a systematic review to compare the studies and determine the effectiveness of the vaccine in relation to average daily gain (ADG). A total of 1,074 articles were considered and eight articles were used in the final report. The results of combining these final articles concluded that when vaccinated against *Mycoplasma hyopneumoniae* swine had an ADG of 17.91 grams per day more than non-vaccinated swine. The weighted average for all the studies that reported statistically significant differences was 29.63 grams per day more than non-vaccinated swine. Therefore, it may be beneficial for a producer, depending on their situation, to vaccinate against *Mycoplasma hyopneumoniae*.

Introduction

Mycoplasma hyopneumoniae is an enzootic pneumonia affecting swine. Globally it has been estimated that 93% of swine herds have *Mycoplasma hyopneumoniae* which may result in performance losses (Ross, 1992). Losses may incur from a decrease in performance, lower weight gains, decreased feed efficiency, antibiotic treatments, and an increased risk of other respiratory diseases. It may be a challenging decision for practitioners to decide on which commercially available vaccine to implement due to the various outcomes presented through the current scientific literature. Therefore, the objective of this study was to complete a systematic review to compare the studies and determine the effectiveness of the vaccine in relation to average daily gain (ADG).

Materials and Methods

A systematic review methodology was adopted rather than a traditional narrative review. Systematic reviews address a focused question, using repeatable, transparent methods to identify, evaluate, and summarize scientific evidence related to disease diagnosis, intervention or prevention (Sargeant et al., 2006). The goal of the systematic review methodology is to reduce bias during selection of research studies through use of a systematic process. The transparency of the process allows the reader to judge the conclusion and the strength of evidence used to reach the conclusion. These characteristics set systematic reviews apart from narrative reviews. The question posed to be answered by this review process was:

“What is the effect on average daily gain of growing pigs when vaccinated with a commercially available *Mycoplasma hyopneumoniae* vaccine?”

PICO: the four components of the question for a systematic review for an intervention consist of the Population of interest, Intervention, Comparator, and Outcome of interest (**PICO**).

Intervention: defined as vaccination with a commercial *M. hyopneumoniae*.

Comparator: defined as non vaccinated contemporaries.

Outcome of interest: defined as the average daily gain (ADG).

Review process

After identification of the review question, the review process consisted of four steps: 1) **identification** of a comprehensive list of all potentially relevant primary research studies; 2) **screening** of the identified studies for relevance using a team of reviewers and standardized criterion; 3) **assessment** of relative articles for quality using a team of reviewers and standardized criterion; and 4) **extraction** of data that passed both relevance and quality criterion.

Identification: The literature search used seven online search engines (AGRICOLA 1970 to 2006; Agris 1975 to 2006; Biological and Agriculture Index 7/1983 to 2006; Biosis Previews 1980 to 2006; CAB Abstracts 1910-2006; Medline 1950 to 2006; PubMed 1965 to 2006) and the 2006 Swine Information CD.

Based on these definitions a search string consisting of the components: “population of interest” AND “disease” AND “intervention.”

- **Population of interest:** boar, boars, finisher, finishers, gilt, gilts, hog, hogs, market-weight, pig, pigs, porcine, porcines, sow, sows, swine, swines.
- **Disease:** enzootic pneumonia, *M. hyopneumoniae*, *Mycoplasma hyopneumoniae*, mycoplasma, porcine enzootic pneumonia, swine mycoplasmosis.
- **Intervention:** immunization, immunizations, immunize, immunized, immunoprophylaxis, intervention, interventions, management practice, management practices, vaccine, vaccines, vaccination, vaccinations.

A total of 1,074 references were found from these sources. The resources were compiled into reference software and duplicates were eliminated.

Screening: Two independent reviewers used a relevance screening form to evaluate the usefulness of the abstracts. The **relevance screening** form included the following questions:

- Does the abstract describe primary research as opposed to a review?
- Is a commercially available *Mycoplasma hyopneumoniae* vaccine used in the protocol (not autogenous)?
- Is the average daily gain (ADG) reported?
- Is the study conducted on growing pigs not less than 5 weeks of age and not breeding stock?

An article had to pass all of the aforementioned questions to proceed. If an article was not written in English or if a full text article could not be found the document was excluded from the search.

Assessment: For abstracts passing the relevance screening the full manuscript was obtained. Articles not written in English were excluded. When the full text of the articles could not be found the article was excluded. Full reports of abstracts were read, and if still considered relevant, were assessed for the presence of standard design features by two independent reviewers. The standard design features were: 1) randomization to intervention group, 2) use of a control group and, 3) blinding of observers from the identity of the intervention groups. These study features were evaluated as they represent an important role in reducing study bias.

Only articles describing these three criteria were passed for data extraction and evidence summation.

Extraction: Data extraction was completed by one reviewer and when unclear this reviewer consulted with the other reviewers as needed. For articles remaining in the review after relevance and quality screening, data were summarized and reported. Data extracted including author, year of publication, age of pig, population size, treatment and group, study results, and statistical significance was collected. Conclusions were based on the summary of the data.

Calculations for ADG

Two values were calculated from the data extracted from these articles. The first was the weighted average for all the studies and the second was the weighted average of all the articles that reported significant values between their control and vaccinated groups. They were calculated based on the following formula:

$$\text{ADG difference} \times \# \text{ pigs in study} = \frac{\text{Total weight change per study}}{\text{study}}$$
$$\frac{\text{Sum of each total weight change}}{\text{Total \# of pigs in all studies}} = \text{weighted average}$$

Results and Discussion

Eight articles had randomized controlled trials, no antibiotics were given for respiratory diseases, the pigs were vaccinated according to product directions, and pigs had made it to market weight. The calculated results from these eight studies are shown in Figure 1. The weighted average for all survived the systematic review process was 17.91 grams. This means that swine vaccinated against *Mycoplasma hyopneumoniae* had an average daily gain of 17.91 grams more per day than swine who were not vaccinated. The weighted average for all the studies that reported statistically significant differences was 29.63 grams per day more than non-vaccinated swine. Therefore, it may be beneficial for a producer, depending on their situation, to vaccinate against *Mycoplasma hyponeumoniae*.

Figure 1. Plotted values and averages of the eight papers from a systematic review of *Mycoplasma hyopneumoniae* vaccination effects in average daily gain in grow-finish pigs.

