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Evaluating the efficacy of exposing feeder pigs to *Mycoplasma hyopneumoniae* via fogging using pooled intra-tracheal samples

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Introduction

Mycoplasma hyopneumoniae (Mhp) has a huge economic impact due to the reduction in feed efficiency, average daily gain, and increased medication costs.[1] Producers will see an average reduction of $5.53 due to an Mhp infection.[2] Many are researching and experimentally inoculating pigs to measure and find better ways to control Mhp. Herd closure techniques also incorporate mass Mhp exposure as a method of elimination. Today, the gold standard for inoculating pigs with Mhp involves the use of Mhp positive lung homogenate as the inoculum source. While proven by many to be an effective inoculum, animal welfare concerns are present and associated with the process of obtaining the inoculum source. Utilizing antemortem samples as an inoculum source would also reduce production loss. The objective of this study is to evaluate the efficacy in using Mhp positive pooled tracheal samples to expose feeder pigs using a fogger.

Methods and materials

The study was performed in an 800 head feeder-to-finish site in north central Iowa with pigs from a maternal line flow. The site is divided into two 400 head rooms separated by a center office/load out area. Site was filled with maternal line gilts and barrows prior to the start of the study.

Prior to fogging, tracheal samples were collected from a Mhp positive sow farm. The tracheal samples were pooled by 5 and 0.5 mL from each pool was collected for testing. Samples were submitted to ISU VDL for Mhp PCR and PRRSV PCR. Only samples negative for PRRSV were used in this study. The pools of tracheal samples were diluted 1:1 with Friis Media (Teknova, Hollister, CA) and then stored in a - 80°C ultra-low freezer.

The goal of this study was to expose pigs to Mhp with Hurricane Ultra II (110V) foggers using pooled tracheal samples collected at the sow farm mentioned previously. The study was conducted twice, with each trial occurring in the one of the 400-head rooms. A similar protocol was used for each trial and all of our Mhp testing occurred at ISU VDL.

First trial

For the first fogging event, the average Mhp Ct value of the pooled tracheal samples collected was 21.1 with a final total volume of 27 mL. After combining the pooled tracheal samples with 4,600 mL of Friis Media, the Mhp Ct value was 27.5. The inoculum was mixed together the afternoon before the planned exposure and incubated at 37°C overnight.

The day of fogging, 4,600 mL of Mhp inoculum was divided into two Hurricane Ultra II (110V) foggers with 40 mL reserved and used to inoculate positive control pigs.

Prior to fogging, 65 pigs were randomly selected, tagged and tracheal samples were collected for Mhp testing by PCR. These samples were pooled by 5 and tested negative.

Five of the selected and tagged pigs were intra-tracheally inoculated using PCAI catheters. 8 mL of the inoculum was used and collected from the inoculum used in the fogger. The foggers were set to a medium-high flow rate and ventilation was shut off during the fogging event. The foggers were carried throughout the pens and were held at the height of the pigs during fogging. Ventilation was shut off for a half an hour after fogging. Tracheal samples were collected from the tagged pigs at 7- and 21-days post-exposure and the tracheal samples were tested for Mhp by PCR. All Mhp PCR's in this study were performed by Iowa State University Veterinary Diagnostic Laboratory (ISU VDL).

Second trial

To save time the day of fogging, 45 pigs were randomly selected, tagged and tracheal samples were collected for Mhp testing by PCR 1 week prior to the second replicate. These samples were pooled by 5 and tested negative.

The average Mhp Ct value of the pooled tracheal samples collected for the second trial was 24.1 and the final volume of the tracheal samples was 30 mL. After combining the pooled tracheal samples with 4,600 mL of treated Friis Media, the Mhp Ct value was 30.3. The inoculum was mixed together the afternoon before the planned exposure and incubated at 37°C overnight. The 4,600 mL inoculum was divided into three Hurricane Ultra II (110V) foggers and 40 mL of the solution was saved and used for the positive control pigs.

Five of the pigs served as positive controls and were intra-tracheally inoculated with 8 mL the inoculum used in the fogger.

The foggers were set to a medium flow rate and ventilation was shut off during the fogging event. The three Hurricane Foggers were distributed throughout the room and placed on top of trash cans. Throughout the exposure period, pigs were circulated around the foggers. Three people walked pens to achieve this circulation wearing proper PPE (protective eye gear, N95 face masks, coveralls, gloves, and plastic boot covers). Ventilation was turned back on immediately following exposure. Tracheal samples were collected from the tagged pigs 21 days post-exposure, and the tracheal samples were tested for Mhp by PCR. All Mhp PCR's in this study were performed by ISU VDL.

Results

For the first fogging event day 7 and 21 results show that none of the pigs fogged tested positive for Mhp. Three of the five

intra-tracheally inoculated pigs tested positive for Mhp. For the second trial, 21 days after exposure to Mhp with a fogger, 95% of the tagged pigs exposed to Mhp via fogging were positive for Mhp by PCR. 3 of the 5 intra-tracheally inoculated pigs tested positive as well. This suggests that pooled tracheal samples can be a viable inoculum source when exposing pigs to Mhp using a fogger.

Discussion

When exposing groups of pigs via fogging, it is important to evaluate technique and ensuring there is an adequate distribution of fogging fluid. Placing these foggers on an elevated surface may also be beneficial in maintaining the aerosolized inoculum in the environment for a time period long enough to allow for adequate exposure to Mhp.

Utilizing tracheal samples as an inoculum source could be revolutionary when going about herd Mhp exposure. The industry could avoid euthanizing future breeding stock and reduce production and economic losses associated with the collection of lung homogenate. Tracheal samples are a cleaner Mhp inoculum source, therefore reducing the immune response associated with the foreign lung tissue found in lung homogenate. Armed with knowledge on the effectiveness of this inoculum source, this method offers a safer, cleaner, and more economic friendly alternative when the industry thinks about herd Mhp exposure. More research identifying the ideal concentration of Mhp positive intra-tracheal samples would be a beneficial when implementing this exposure technique in a commercial setting.

References

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