

Visual-only evaluation of lung lesions as an alternative to palpation at necropsy

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Introduction

Evaluation of lungs at necropsy will often reveal the presence of lesions, whether or not clinical signs were observed.¹ Detection of these lesions is useful not only when monitoring herds for subclinical disease but also for data collection in field trials.

Palpating lungs by hand at necropsy has several advantages and is known to be a consistent tool for detecting lung lesions.² It allows the observer to evaluate the three-dimensional qualities of the lung and detect abnormalities not only on the surface but also within the lobes. Additionally, it can aid in differentiating ante mortem lesions from post mortem artifact. However, palpating lungs requires the observer to be present at necropsy. As swine practitioners become increasingly involved in on-farm research trials, increase their practice geographic areas, and work around stringent biosecurity requirements, their ability to get to farms to perform hands-on necropsies becomes more difficult.

We evaluated a potential alternative to hands-on evaluation of lung lesions in order to address these challenges. The objective of this study was to evaluate the inter-observer and inter-method reliability of visually scoring lungs for *Mycoplasma hyopneumoniae* lesions from digital images and from visual scoring of actual lungs with the benefit of palpation at necropsy.

Materials and methods

This study used lungs from 344 pigs in a *Mycoplasma hyopneumoniae* challenge study.³ The lungs were from pigs in five treatment groups; treatments included three different commercially available *M hyopneumoniae* vaccines with subsequent challenge, one non-vaccinated challenged group and one non-vaccinated, non-challenged group. The pigs were euthanized and necropsied at 91 days of age or 28 days post *M hyopneumoniae* intra-tracheal challenge. Lungs were removed from the pigs and rinsed, then observed and palpated by two veterinarians who evaluated and scored each lung lobe for the area affected by *Mycoplasma hyopneumoniae* as a percent of the respective lobe (necropsy evaluation).

Mycoplasma-induced lesions were defined as dark red to purple consolidated areas.⁴ Digital images of the lungs were then recorded. Observations and recording of digital images for each lung were completed within 15 minutes of being removed from the pig. The digital images were later presented to the same observers, who visually evaluated and scored the lung lobes as described above, without the benefit of palpation (image evaluation). The individual lung lobe scores were then weighted by the approximate volume that each lobe contributes to total lung volume to derive a value for total percent of lung affected, as previously described.⁵ The effect of treatment group on inter-observer and inter-method reliability was not evaluated as the lung scores for pigs in all treatment groups were analyzed together. A linear regression model was used to determine the correlation of digital versus necropsy evaluation lung scores as well as inter-observer reliability for both methods.⁶

Results

The mean lung score across both observers for image evaluation was 8.21%, while the mean score for necropsy evaluation was 6.21%. Means for image evaluation were 10.32% and 5.89% and for necropsy evaluation were 7.64% and 4.77% for observer 1 and 2, respectively. The linear regression showed a good fit of the data for all three parameters, including image versus necropsy (adjusted $R^2 = 0.76$, $P < 0.001$), image between observers (adjusted $R^2 = 0.67$, $P < 0.001$), and necropsy between observers (adjusted $R^2 = 0.84$, $P < 0.001$). The correlation coefficients were 0.873, 0.819, and 0.921, respectively, suggesting very good correlation.

Discussion

There was a high correlation between the image and necropsy evaluation and between the observers for both methods. There appeared to be better correlation between observers when scoring at necropsy with the benefit of palpation, suggesting that palpation remains a more consistent method of evaluating lung lesions. It is important to note that evaluating lungs from images

can only detect surface lesions; therefore, those in the center of lobes are not factored into the overall percent of lung affected. However, the mean lung scores for the visual scoring from digital images were higher than those done at necropsy with the benefit of palpation. This may be attributed to the observers' impaired ability to differentiate ante mortem lesions from post mortem color change with digital images.

Viewing of digital images of lungs to evaluate the respiratory health of pigs is a potential alternative to necropsy evaluation for practitioners that are unable to necropsy pigs because of biosecurity or time restrictions. Practitioners may also utilize this tool to send images to experienced lung scorers to assist in their on-farm research trial. Overall, visual evaluation with the benefit of palpation is still the preferred method.

References

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