

Comparison of thoracic auscultation, clinical score, and ultrasonography as indicators of bovine respiratory disease in pre-weaned dairy calves

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Introduction

Various strategies have been adopted to mitigate the impact of bovine respiratory disease (BRD) in dairy replacement calves. The diagnosis of BRD is challenging because there is no gold standard for its diagnosis on-farm. Several subjective scoring methods, such as the Calf Respiratory Health Score (CRHS) from the University of Wisconsin, which is based on rectal temperature, and subjective assessment of cough, ocular-nasal discharge and ear drooping, are available to help dairy producers identify calves with BRD. Additionally, practitioners can use thoracic auscultation, a fundamental part of the physical examination, to aid in the diagnosis of BRD. Recently, thoracic ultrasonography (TUS) has been used to detect calves with lung consolidation secondary to bronchopneumonia. The objectives of this study were to compare the different tools available for the diagnosis of BRD in preweaned dairy calves, and to assess the association of lung consolidation on the risk of dying within 30 days after the initial examination.

Materials and Methods

Thirteen dairy herds (10 with enzootic BRD in preweaned calves and 3 without a history of enzootic BRD in preweaned calves on the basis of reports from the producer and herd veterinarian) were used for this study. A maximum of 10 preweaned calves per herd were evaluated, and a total of 106 calves were enrolled in the study. For each calf, data were obtained regarding medical history, including treatment for BRD by the producer; a subjective score was assigned by use of the CRHS; the thorax was auscultated and any abnormalities (crackles, wheezes, or absence of respiratory sounds) were noted; and TUS was performed to detect lung consolidation (16 thoracic sites evaluated/calf). The “producer diagnosis accuracy” (ie, a calf that had been previously treated for BRD or assigned a CRHS for which treatment was recommended) and the presence of abnormal auscultation findings were compared with the presence of lung consolidation by TUS. The diagnostic accuracy of the maximal depth of lung consolidation and the number of sites with lung consolidation for predicting death within 30 days after the initial examination was assessed by evaluation of the area under the receiver operating characteristics (ROC) curve by means of the DeLong comparison test.

Results

Lung consolidation was detected with TUS in 56 of 106 (53%) calves. The median number of sites with lung consolidation per affected calf was 1 (range, 0 to 12). Interestingly, for 2 of the herds without a history of enzootic BRD in preweaned calves, 3 of 10 and 6 of 10 calves evaluated had evidence of lung consolidation. When lung consolidation detected by TUS was used as the standard, the sensitivity of thoracic auscultation for detection of calves with BRD was 5.9%. Only 23 of 56 (41.1%) calves with lung consolidation had been previously treated for BRD by producers. When the number of calves that were assigned a CRHS for which treatment was recommended was added to the number of calves that had been previously treated for BRD by the producer, the sensitivity for those 2 methods combined was 71.4% (40/56). The area under the ROC curves were 0.809 (95% confidence interval, 0.721 to 0.879) for the number of sites with lung consolidation and 0.743 (95% confidence interval, 0.648 to 0.823) for the maximal depth of lung consolidation to predict death within 30 days after examination, but these 2 areas under the ROC curve did not differ significantly ($P=0.06$).

Significance

To our knowledge, this study was the first to assess various on-farm methods that producers and practitioners can use to detect BRD in preweaned dairy calves. Thoracic auscultation was an insensitive method for detection of lung consolidation. Although we were unable to assess the efficiency of the CRHS for detecting calves with all stages of BRD because the standard we used (TUS) was an indicator of advanced lung damage, TUS could be used as an efficient tool to monitor the diagnostic sensitivity of the producer because each calf with evidence of lung consolidation should have been clinically ill and treated for BRD before the TUS examination was performed. The effect of BRD in preweaned dairy calves may be higher than previously reported, because calves with lung consolidation were identified in 2 of 3 herds that did not have a history of enzootic BRD in calves.