Development of a novel clinical scoring system for bovine respiratory disease (BRD) in weaned dairy calves

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Introduction

Bovine respiratory disease (BRD) continues to impact the welfare of dairy calves and the economics of dairy production. As a common cause of morbidity and mortality among dairy calves, BRD was responsible for 46.5% of deaths after weaning and was observed in 11.2% of weaned animals on heifer-raising operations. Costs involved with the disease reach beyond the treatment of clinically ill animals and include reduced growth, reduced milk production, impaired fertility, and premature culling in the first lactation. The prompt and correct diagnosis of BRD is challenging on farms, especially in weaned dairy calves. Weaned dairy calves are typically housed in larger group pens where there is often a lack of restraint and where it is more difficult to monitor them closely. As a result of challenges in correctly diagnosing BRD, cases often become neglected until they are more severe. Several clinical scoring systems to detect BRD in calves have been published. However, available BRD scoring systems for weaned dairy calves are mostly based on data from calves experimentally infected with specific pathogens. The objective of the present study was to develop and validate a scoring system for weaned dairy calves housed in group pens in an on-farm setting that minimizes calf handling.

Materials and Methods

In a prevalent case-control study, a BRD clinical scoring system for weaned calves was developed using field data from 689 dairy calves in group pens on 5 dairies in California (CA). Of the 689 calves in the study, 89 were selected because they appeared sick based on display of lethargy, depression or separation from the group, while the remaining 600 were randomly selected from the study pens on enrollment days of both spring and fall seasons. Clinical signs were recorded for all calves and BRD case status was determined by thoracic auscultation and ultrasound examinations, using parallel testing strategy. Of the 689 calves, 238 were BRD cases. Four survey-adjusted generalized linear mixed models with a logit link function were developed, including the CA scoring system for preweaned calves. All 4 models specified the calf as the unit of analysis and dairy as a random intercept. Model performance was assessed using 3-fold cross validation for screening sensitivity, diagnostic sensitivity and specificity.

Results

The best model chosen based on performance parameters and parsimony contained the variables cough (2 points), abnormal respiration (1 point), low body condition (5 points), sunken eyes (4 points) with a 1-point cutoff for a suspect score. The best model was validated on 138 observations not used for model training and resulted in 83.8% screening sensitivity, 100.0% diagnostic sensitivity, and 45.5% specificity. Adding rectal temperature > 102.6°F (39.2°C) as a second-tier test for score suspect calves improved specificity to 62.7% and decreased screening sensitivity to 70.2% and diagnostic sensitivity to 76.9%.

Significance

Use of a 2-tier CA BRD scoring system for weaned calves may provide a new tool to monitor BRD in group housed dairy calves. The current scoring system simplifies to the presence of 1 of the clinical signs in the model. Under the CA BRD scoring system for weaned calves, a user may identify a calf as suspect for BRD if any of the clinical signs cough, abnormal respiration, low body condition or sunken eyes are observed. Subsequently, calves are determined to be BRD score positive with an elevated rectal temperature. The novel CA postweaning scoring system may improve judicious medical intervention for BRD cases and reduce unnecessary treatments of animals with antimicrobials.