Predicting bovine respiratory disease risk in feedlot cattle in the first 45 days post arrival

H. Rojas, BS; D. Amrine, DVM, PhD; R. Larson, DVM, PhD; B. White, DVM, MS
Beef Cattle Institute, Kansas State University, Manhattan, KS, 66506

Introduction

Bovine respiratory disease (BRD) is the leading cause of morbidity and mortality in feedlot cattle. Improved predictions of BRD magnitude facilitates appropriate and judicious intervention application. Our goal was to build classification models to accurately predict cattle cohorts at high risk for BRD morbidity within the first 45 days of arrival.

Materials and methods

Data from 10 U.S. High Plains region feedlots containing 1,733 cohorts representing 188,188 cattle were classified into high (≥ 15% BRD morbidity) or low (< 15%) disease risk in the first 45 days on feed. Classification models including logistic regression, decision tree, random forest, discriminant linear, and naïve Bayes were trained to identify risk status. Each model's performance was evaluated using receiver operating characteristic (ROC) curves and the area under the curve (AUC).

Results

Accuracy in discriminating BRD risk between models ranged from 10.9% to 79.4%. Sensitivity and specificity ranged from 44.7% to 100%, and 0% to 83.7% respectively. Random forest was most accurate and correctly identified 42 of 47 high risk cohorts (sensitivity: 89.4%). Specificity was 60.6% (233 of 386 lots that were identified as low risk were truly low risk). Random forest's positive and negative predictive values were 21.3% and 97.9%, respectively.

Significance

The objective was to measure several classification models' ability to identify high risk cohorts entering a feedlot. Random forest was accurate when classifying cohorts as low risk. Further research is needed to decrease the number of cohorts falsely classified as high risk.

