

Prevalence and antimicrobial susceptibility of bovine respiratory disease pathogen isolates submitted to the Wisconsin Veterinary Diagnostic Laboratory: 2008-2017

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Introduction

Respiratory disease negatively impacts growth, reproductive performance, milk production, and longevity of adult cattle. Most calves diagnosed with clinical respiratory disease on dairy farms are treated with antibiotics. Treatment failure is not uncommon and although management factors likely contribute to these treatment failures, the role of antimicrobial resistance cannot be ruled out. Therefore, the objective of this study was to describe pathogen prevalence and antimicrobial resistance patterns for pathogens associated with respiratory disease isolated from samples submitted to the Wisconsin Veterinary Diagnostic Laboratory between 2008-2017.

Materials and Methods

Data were retrospectively collected on all bovine respiratory isolates of *Pasteurella multocida*, *Mannheimia hemolytica*, *Bibersteinia trehalosi*, and *Histophilus somni* identified at the Wisconsin Veterinary Diagnostic Laboratory 2008 - 2017, using the Laboratory Information Management System. Antimicrobial susceptibility testing data were queried from antimicrobial resistance databases at the WVDL Madison and Barron locations.

During that ten-year period, MIC data was routinely collected on the following antibiotics: ampicillin, ceftiofur, chlortetracycline, clindamycin, danofloxacin, enrofloxacin, florfenicol, gentamicin, neomycin, oxytetracycline, penicillin, sulfadimethoxine, spectinomycin, tiamulin, tilmicosin, trimethoprim-sulfa (TMS), tulathromycin, and tylosin. MIC data was also obtained on gamithromycin and tildipirosin during the latter five years (2013 - 2017). Inclusion of the antibiotics in this study reflects laboratory standards and should not be perceived as an endorsement of their use in cattle. The prevalence of *P. multocida*, *M. hemolytica*, and *B. trehalosi* isolates will be described. For *P. multocida* isolates, the overall risk of resistance, and resistance patterns during 2008 - 2012 will be compared to 2013 - 2017. Commercially available software was used to build contingency tables and calculate relative risk (95% CI). Where cell values < 5, fisher's exact test was used to compare proportions. Significance was set at $\alpha \leq 0.05$.

Results

Prevalence of *P. multocida*, *M. hemolytica*, and *B. trehalosi* was 68%, 26%, and 7%, respectively from 3109 isolates. A total of 2106 *P. multocida* isolates with susceptibility result were further evaluated. For *P. multocida*, 10% (IQR 5, 26) of isolates were classified as resistant and at least one resistant isolate was detected for 22 of the 24 antibiotics routinely tested for susceptibility over the past 10 years. Five percent or less of the isolates were resistant to ceftiofur (< 1%), enrofloxacin (2%), chlortetracycline (2%), ampicillin (2%), danofloxacin (4%), florfenicol (5%), penicillin (5%), gentamicin (5%), TMS (5%). Resistance ranged from 8 - 36% for tulathromycin (8%), tiamulin (12%), gamithromycin (13%), tildipirosin (19%), spectinomycin (21%), tilmicosin (23%), oxytetracycline (36%), and sulfa (52%). Resistance was most common against clindamycin (98%), tylosin (88%), neomycin (55%), and sulfadimethoxine (52%).

When comparing time periods, there were relatively fewer recent isolates resistant to ampicillin (RR: 0.22, 95% CI: 0.11, 0.44), ceftiofur (P = 0.05), florfenicol (RR: 0.61, 95% CI: 0.41, 0.88), gentamicin (RR: 0.45, 95% CI: 0.30, 0.66), sulfadimethoxine (RR: 0.81, 95% CI: 0.74, 0.87), tiamulin (RR: 0.25, 95% CI: 0.15, 0.41), and TMS (RR: 0.33, 95% CI: 0.22, 0.49). With the exception of danofloxacin (RR: 2.45, 95% CI: 1.50, 4.06), resistance to the other antibiotics was unchanged.

Significance

In conclusion, *P. multocida* is commonly isolated from bovine respiratory samples. For many of the drugs labeled for use in dairy cattle, resistance is relatively low and has either improved or at least remained constant. Veterinarians and producers should be aware of the pathogen challenges and work towards early detection, proper administration, and monitoring lung lesions to ensure that their treatment protocols improve lung health.