

Prevalence of multi drug antimicrobial resistance in *Mannheimia haemolytica* isolated from high-risk stocker cattle at arrival and two weeks after processing

E. Snyder,¹ DVM, MFAM; **B. Credille**,¹ DVM, PhD, DACVIM (Large Animal);

R. Berghaus,¹ DVM, MS, PhD, Dip ACVPM (Epidemiology); **S. Giguère**,² DVM, PhD, Dip ACVIM

¹Food Animal Health and Management Program, Department of Population Health, University of Georgia College of Veterinary Medicine, Athens, GA 30602

²Department of Large Animal Medicine, University of Georgia College of Veterinary Medicine, Athens, GA 30602

Introduction

Bovine respiratory disease (BRD) is the leading cause of morbidity and mortality in North American beef cattle. *Mannheimia haemolytica* (*Mh*) is the bacterial pathogen most frequently isolated from cattle with BRD and the prevalence of antimicrobial resistance in this pathogen has been increasing. Administration of antimicrobials to prevent BRD is commonplace in stocker cattle. Our objectives were to determine the prevalence of *Mh* isolated from the nasopharynx of high-risk stocker cattle at arrival and at resampling 10 to 14 days later, and second, to determine the prevalence of antimicrobial resistant *Mh* at these same time points.

Materials and Methods

High risk, sale barn origin bull and steer calves (n = 169) were transported to a stocker facility in central Georgia. On each sampling day, 10 calves were selected from each cohort and sampled via deep nasopharyngeal swab (NPS) at arrival processing. All calves at the facility were vaccinated with a commercially available trivalent modified live intranasal vaccine (BHV-1, PI3, BRSV) and were treated for internal and external parasites with topical moxidectin. All calves also received a metaphylactic dose of the macrolide antimicrobial tulathromycin (1.13 mg/lb or 2.5 mg/kg subcutaneously). Bulls were castrated using the California banding method and received a dose of tetanus antitoxin. All calves were ear notched to check for persistent infection with BVD. A second NPS was collected from each calf 10 to 14 days after arrival. The calves were also revaccinated with a 5-way, multivalent modified live viral vaccine at that time. Any calf diagnosed and treated for BRD prior to resampling was swabbed before treatment. All swabs were submitted for culture and antimicrobial susceptibility testing using the Kirby-Bauer disk diffusion method. An exact McNemar's test was used to compare the proportions of calves with *Mh* isolated from deep nasopharyngeal swabs at arrival and second sampling. For each antimicrobial agent, exact logistic regression was used to compare the proportions of isolates that were classified

as susceptible at arrival versus the second sampling. Exact logistic regression models were conditioned on calf ID to account for the correlation of isolates obtained from the same calves. All tests assumed a two-sided alternative hypothesis, and $P < 0.05$ was considered statistically significant.

Results

Of the 169 cattle enrolled, 27 (16.0%) were culture positive for *Mh* at arrival processing and of these, a multi-drug resistant (MDR) strain of *Mh* was detected in 1 calf (3.7%). In contrast, 123 (72.8%) cattle were culture positive for *Mh* at second sampling and of these, a MDR strain of *Mh* was detected in 122 (99.2%). The proportions of cattle culture positive for *Mh* and positive for MDR *Mh* at arrival processing and at second sampling were significantly different ($P < 0.001$). At the level of the individual bacterial isolate, 366 individual *Mh* isolates were collected from the calves at the time of the second sampling. Of these isolates, 361 (98.6%) were intermediate or resistant to all macrolides tested (tilmicosin, gamithromycin, tulathromycin) and the fluoroquinolone enrofloxacin. In addition, 254 isolates (69.4%) were intermediate or resistant to florfenicol and 4 (1.1%) were intermediate or resistant to ceftiofur. There was a significant difference in the proportion of isolates resistant to all of the drug classes except cephalosporins at arrival processing versus second sampling ($P < 0.001$).

Significance

In conclusion, this study shows that the prevalence of antimicrobial resistance in *Mh* isolated from this population of stocker cattle is high. An association between metaphylactic antimicrobial administration and antimicrobial resistance could not be demonstrated due to the design of this study and lack of an untreated control group. More research is needed to understand the role of metaphylaxis on MDR in *Mh* and the impact of MDR on morbidity and mortality in stocker cattle.