for 42 days, with cows modeled to have a 63-day natural service breeding season. The breeding of heifers and cows was initiated simultaneously each model year. The initial herd populated for all models included 160 heifers and 840 cows. The age of puberty for heifers was assumed to be 365 days, the pregnancy risk per 21-day estrous cycle was assumed to be 65%, and the pregnancy risk for artificial insemination following estrous synchronization was assumed to be 60%. Pregnancy diagnosis occurred 90 days following the end of the cow breeding season, and calves were weaned 205 days after the start of cows calving. The post-partum periods examined for cows were 50, 60, 70, and 80 days, with the post-partum periods for heifers being set to 80, 90, and 100 days, resulting in 12 model herds being included in the analysis.

Results

The average percent pregnant at pregnancy diagnosis differed between model herds. Herds modeled with a 50-day cow post-partum period and 80-, 90-, and 100-day heifer post-partum periods had average pregnancy percentages of 91.82%, 90.66%, and 88.70%, respectively. Herds with a 60-day cow post-partum period had average pregnancy percentages of 90.03%, 88.69%, and 86.48% for 80-, 90-, and 100-day heifer post-partum periods, respectively. Herds with a 70-day cow post-partum period had average pregnancy percentages of 84.92%, 83.11%, and 80.28% for 80-, 90-, and 100-day heifer post-partum periods, respectively. Herds with an 80-day post-partum period and 80-, 90-, and 100-day heifer post-partum periods had average pregnancy percentages of 77.27%, 74.87%, and 71.77%, respectively. The average lb of calf weaned per cow exposed for herds with a 50-day cow post-partum period and 80-, 90-, and 100-day heifer post-partum was 347.6, 341.2, and 331.8 lb (158, 155, and 150.8 kg)/cow, respectively. Herds with a 60-day cow post-partum period had an average lb of calf weaned per cow exposed of 336.3, 328.8, and 317.9 lb (152.8, 149.4, and 144.5 kg)/cow for herds with heifer post-partum periods of 80-, 90-, and 100-days, respectively. The average lb of calf weaned per cow exposed for herds with a 70-day cow post-partum period and 80-, 90-, and 100-day heifer post-partum was 308.7, 298.9, and 285.2 lb (154.3, 135.8, and 129.6 kg)/cow, respectively. The average lb of calf weaned per cow exposed for herds with an 80-day cow post-partum period and 80-, 90-, and 100-day heifer post-partum was 274.5, 262.4, and 248.2 lb (124.7, 120, and 112.8 kg)/cow, respectively.

Significance

The 10-year model of cow-calf production we developed adequately models cow-calf production as commonly practiced in the Midwestern and Great Plains regions of the United States. The duration of post-partum anestrus has a dramatic impact on measures of herd productivity, including the percent pregnant at pregnancy diagnosis and the pounds of calf weaned per cow exposed, when holding other production factors constant. Our model indicates that increasing post-partum periods of cows and heifers leads to reductions in the percent of cows pregnant at pregnancy diagnosis and the pounds of calf weaned per cow exposed. Based on our results, veterinarians and producers should consider determining the average post-partum period of herds and should use the average post-partum period of a herd to help make management decisions.

Comparison of treatment history and antimicrobial sensitivity results of common bovine respiratory disease bacterial pathogens from cases submitted to the ISU-VDL from 2013-2015

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Introduction

Summarized susceptibility results from diagnostic laboratory cases are often used to evaluate trends in antibiotic resistance. The objective of this retrospective study was to evaluate summarized antimicrobial susceptibility data from bovine respiratory disease cases submitted to the Iowa State University Veterinary Diagnostic Laboratory in the context of reported antibiotic treatment history.

Materials and Methods

Diagnostic records from case submissions to the ISU-VDL from January 1, 2013, through December 2, 2015 were

searched, and inclusion in the study required the following criteria: 1) the cultured sample was from a bovine lung, 2) routine culture was positive for *Mannheimia haemolytica*, *Pasteurella multocida*, and/or *Histophilus somni*, 3) antimicrobial susceptibility results were available, and 4) the submission was from a clinical field case. Case submission forms and final diagnostic reports were individually reviewed for information regarding previous antibiotic treatments. Only those submissions that explicitly stated that no antimicrobials had been used were classified as "None"; cases where information regarding antimicrobial treatments was not given or was unclear were classified as "Unknown." Isolates from cases with treatment histories indicating 3 or more antimicrobials were used were classified as "3+."

Only antimicrobials with CLSI-approved breakpoints for respiratory disease cause by *M. haemolytica* were included in this study. These antimicrobials are ceftiofur, danofloxacin, enrofloxacin, florfenicol, oxytetracycline, spectinomycin, tilmicosin, and tulathromycin. Descriptive statistics were used to compare resistance of isolates to individual antimicrobials. One way analysis of variance and the Tukey-Kramer method were used to analyze the number of compounds to which each isolate was resistant.

Results

A total of 1,251 isolates met the above criteria and were included in the study: 540 isolates of *M. haemolytica*, 404 isolates of *P. multocida*, and 307 isolates of *H. somni*. Results showed a marked and often linear increase in the percentage of resistant isolates as the number of antimicrobial treatments increased. The percentage of isolates resistant to all antimicrobials with the exception of ceftiofur was greater in treated cattle than untreated cattle. Resistance increased as the number of antimicrobial treatments increased. The most dramatic difference between isolates from animals that received no treatment and animals that received 3 or more treatments was seen in *M. haemolytica*. The percentage of isolates resistant to enrofloxacin, spectinomycin, tilmicosin, and tulathromycin increased from below 10% to over 70%. A similar trend of increasing percentage of resistance with an increase in the number of treatments was apparent in both *P. multocida* and *H. somni*. Multidrug resistance (MDR) was evaluated using susceptibility results to the 8 antimicrobials included in this study. Sixty-eight percent of isolates from animals that did not receive antimicrobials were pan-susceptible; 7.7% of those isolates were resistant to 3 or more antimicrobials. In contrast, 19.4% of isolates from animals treated with 3 or more antimicrobials were pan-susceptible; 62.1% of those isolates were resistant to 3 or more antimicrobials. Statistical analysis showed a significant difference in the number of resistant classifications when comparing untreated and treated isolates.

Significance

Previous antimicrobial treatment has a dramatic effect on antimicrobial resistance in isolates of *M. haemolytica*, *P. multocida*, and *H. somni*. The effect was also apparent in regards to MDR. A large percentage of the isolates (>84%) from this study were found to have either received an antimicrobial treatment or had an unknown treatment history. Due to these findings, we suggest that summarized VDL antimicrobial sensitivity data should not be used to assess changes in antimicrobial resistance patterns, unless such data includes some context regarding antimicrobial treatment history.

Influence of vaccination with an inactivated or modified live viral reproductive vaccine on reproductive parameters in beef cows

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Introduction

Previous research has described the detrimental effects of modified-live virus (MLV) vaccines on reproductive parameters in naïve heifers. Less is known about the potential effects of MLV vaccines on reproductive parameters in well-vaccinated beef herds. This work describes a 2-year study involving 9 herds of well-vaccinated cows and heifers (n=1436) to evaluate whether a pre-breeding MLV or inactivated reproductive vaccine administered per label