The economic impact and factors influencing the comparison of three metaphylactic options to control Bovine Respiratory Disease in feedlot cattle

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INTRODUCTION

Bovine Respiratory Disease is one of the most economically impactful diseases in feedlot cattle. Metaphylactic antibiotics are a commonly used, yet expensive, intervention for the control of Bovine Respiratory Disease. Antimicrobial stewardship is important to ensure continued antimicrobial efficacy and to protect animal welfare.

OBJECTIVE AND HYPOTHESIS

- We will identify key characteristics of cohorts of cattle that benefit economically from the use of one of three metaphylactic options: no metaphylaxis, a low cost/low efficacy metaphylaxis, or a high cost/high efficacy metaphylaxis
- We will discover information needed to update antimicrobial use decisions leading to improved antimicrobial stewardship and economic success
- We hypothesize that cohorts of cattle with higher average entry weights will have a lower probability of economically benefiting from metaphylaxis

MATERIALS AND METHODS

- Feedlot cattle data from 13 yards over a 6-year period were compiled from the Beef Cattle Institute's database
- Data were cleaned, as defined in Fig. 1, resulting in 12,785 cohorts included
- Data were analyzed using an economic model that determined optimum metaphylactic option of each cohort based on highest net return among the 3 metaphylactic options
- Efficacy for the low cost/low efficacy metaphylactic option was assigned an odds ratio of 0.6 compared to no metaphylaxis. Cost was set at $0.75/cwt of entry weight
- Efficacy for the high cost/high efficacy metaphylactic option was assigned an odds ratio of 0.3 compared to no metaphylaxis. Cost was set at $3.75/cwt of entry weight
- All cohorts were adjusted to a constant entry date of October 5, 2018, with exit dates based on actual days on feed
- Purchase and sale prices came from historic data with the former based on entry weight and the latter based on exit date
- The association of sex, entry weight, cohort size, exit weight, average daily gain, and days on feed on the probability of benefiting economically from metaphylaxis was evaluated with a logistic regression analysis with feed yard as a random effect
- Among cohorts benefiting economically from metaphylaxis, the association of the same variables on the probability of benefiting from high cost/high efficacy metaphylaxis was evaluated with a logistic regression with feed yard as a random effect

Figure 1. The data cleaning process. Inclusion criteria included sex (steer or heifer), cohort size (≥40 calves), days on feed (70-400 days), and Bovine Respiratory Disease morbidity greater than Bovine Respiratory Disease mortality

RESULTS

- Median percent morbidity was 5.1% with an interquartile range of 2.5% to 10%
- Cohorts within the 3 lowest average entry weights had the highest probability of benefiting economically from metaphylaxis
- Cohorts of steers have a higher probability of benefiting economically from metaphylaxis in comparison to heifers
- Of cohorts selected for metaphylaxis, those within the 3 lowest average entry weights had the highest probability of benefiting economically from a high cost/high efficacy metaphylaxis

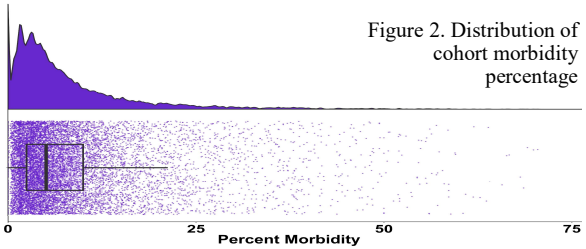

Figure 2. Distribution of cohort morbidity percentage

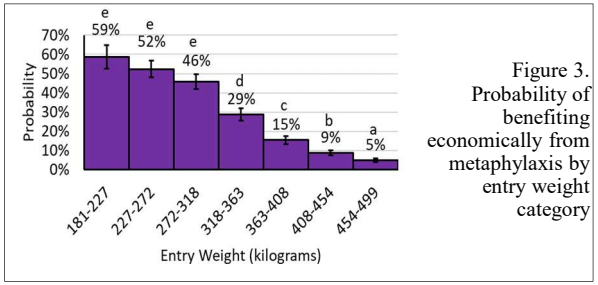

Figure 3. Probability of benefiting economically from metaphylaxis by entry weight category

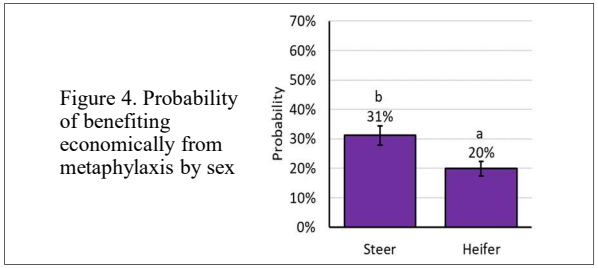

Figure 4. Probability of benefiting economically from metaphylaxis by sex

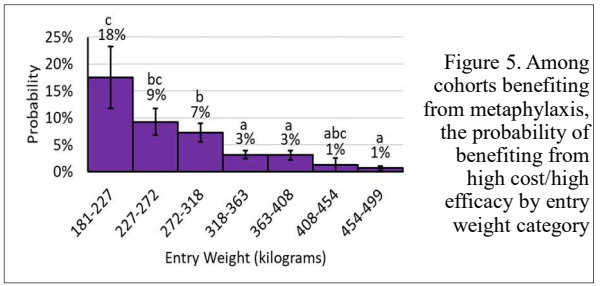

Figure 5. Among cohorts benefiting from metaphylaxis, the probability of benefiting from high cost/high efficacy by entry weight category

DISCUSSION AND CONCLUSION

- 72% of cohorts did not benefit from metaphylaxis, 25% of cohorts benefited from a low cost/low efficacy metaphylaxis, and 3% benefited from a high cost/high efficacy metaphylaxis
- Cohort demographics influence the probability of a cohort benefiting economically from metaphylaxis and the type of metaphylaxis utilized
- In order to balance the concerns for animal health and welfare and net return of feedlot cattle while considering antimicrobial stewardship, factors such as sex and animal entry weight should guide decisions for optimized outcome

ACKNOWLEDGEMENTS

This study was funded by the Foundation for Food and Agriculture Research grant #ICASATWG-0000000041. Scholar funding was provided by FFAR Veterinary Student Research Fellowship Program and K-State's VRSP. Thank you to Blaine Johnson, Phillip Lancaster, and Brad White.