EXTENSION
BEEF CATTLE RESEARCH UPDATE
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Risk Factors for Mid- and Late-Feeding-Stage Bovine Respiratory Morbidity and Mortality based on Individual Animal Treatments of Beef Feedlot Cattle

Shipping fever, or bovine respiratory disease complex (BRD), is the most common morbidity and mortality event among feedlot cattle in the United States.[1] BRD accounts for approximately 75% of morbidity[2] and 50 to 70% of mortality in feedlots.[3] A 2011 USDA study of the U.S. cattle feedlot industry reported that in feedlots with ≥1,000 head capacity that 16.2% of cattle are affected by respiratory disease.[4] As a result, BRD has a significant economic impact on the beef industry as a whole.[4] Most research that evaluates BRD incidence timing is from a decade ago and illustrates about 75% of morbidity has occurred by 55 days on feed (DOF).[5] Little work has been done evaluating risk factors potentially associated with disease at different DOF in the feedlot. Disease timing has important economic implications as cattle that have been on feed longer have incurred more costs compared with cattle early in the feeding phase. Timing of BRD onset is important as the probability of treatment failure following first treatment for BRD decreased as cattle were at the feedlot longer at the time of initial treatment. (Avra et al., 2017).[6]

Recently Kansas State University conducted a study with the objective identifying risk factors associated with BRD morbidity and mortality timing within the feeding phase.[7] This study used data from 25 commercial feedlots, representing multiple feedlots throughout the Great Plains and southern regions of the United States. Treatment records for a total of 423,216 individual animals were initially collected from collaborating feedlots. For their analysis, only cattle with first treatment records of BRD were included. Data were filtered to include only records where the cohort size at arrival was between 20 and 400 cattle. Arrival weight was averaged over cohorts, and criterion for inclusion was ~501 to 1002 lb. Total cohort DOF was limited to 250 days or fewer. Data were filtered to include only records from January 4, 2018, to December 28, 2020. In addition, data were filtered to include only first pull records for treatment of BRD for each individual animal.

A variable was created for quarter of arrival based on cohort arrival date (quarter 1, January to March; quarter 2, April to June; quarter 3, July to September; quarter 4, October to December). A variable was created by calculating the percentage of total feeding days that had passed when the animal had their first pull [(DOF at treatment/cohort total DOF) × 100]. Cattle were categorized as early-stage, middle-stage, or late-stage morbidity based on the percentage of the feeding phase they were in when they had their first treatment for BRD. Early stage was considered 0 to 33.3% of the feeding phase, middle stage was 33.3 to 66.6%, and late stage was 66.6 to 100% of the feeding phase completed at the time of treatment.

The final sample for morbidity consisted of 188,437 records for individual first pull treatment of BRD and 13, 991 records for mortality. Using case definitions for the timing of BRD morbidity in feedlot cattle, 74.9% (n = 141,097) of individual treatments were classified as early stage, 18.0% (n = 33,871) were classified as middle stage, and 7.1% (13,469) classified as late stage. For the timing of BRD mortality, 55.9% (n = 7,821) of individual treatments were classified as early stage, 25.9% (n = 3,625) were classified as middle stage, and 18.2% (n = 2,545) classified as late stage.

The data showed an interaction between sex and quarter of arrival. Steers were more likely to be early stage for morbidity across all quarters of arrival, whereas heifers were more likely to be mid or late stage, except in the third quarter, where there are the most cattle entering the yard and there was no difference associated with sex. Steers were also more likely to die from BRD early than heifers across most quarters of arrival. There was not a significant difference during the second quarter of arrival for mortality between heifers and steers.

The interaction for weight at arrival by sex indicated that lightweight steers were more likely to be early stage (82.3%) compared with heavyweight steers (66.8%). The same effect was seen in heifers. Lightweight heifers were more likely to be early (75.6%) compared with heavy heifers (59.2%). As might be expected, there was an increased probability of early stage BRD morbidity among cattle in the lightest arrival weight category (500 to 600 lb).

Overall cattle that arrived in the third and fourth quarters were more likely to be early, but when cattle arrived in the first and second quarters of the year, their risk was modified by other factors. Steers were more likely to be early, whereas heifers were more likely to be mid and late, and heavy animals were more likely to be mid or late.

The data showed that mortality was greatest for animals that arrived during the fall and winter months, which was also seen by another study in 2020.[8] This peak coincides with the most frequent time for cattle to arrive in the feedlot.

These researchers concluded that heifers had an increased probability to be mid or late compared with steers when quarter of arrival and arrival weight were accounted for in the statistical model. Heifers arriving in small lot sizes were more likely to have mortality early in the feedlot; however, lot size effects were not observed for steers. It was suggested that lot size at arrival could be a proxy for other risk factors that were not evaluated in this study (distance traveled, management structure within the feedlot, cattle source, and so on). In addition, heavier animals at arrival, and cattle that arrived at the yard in the first and second quarter were the most likely demographic categories to have an initial diagnosis of BRD in the mid or late stage of the feeding phase.

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[1] USDA-APHIS. 2013. Page 28 in Feedlot 2011 Part IV: Health and Health Management on U.S. Feedlots with a Capacity of 1,000 or More Head. USDA–APHIS–Veterinary Services, Fort Collins, CO. Available at: https://www.aphis.usda.gov/animal_health/nahms/feedlot/downloads/feedlot2011/Feed11_dr_PartIV_1.pdf.

[2] Edwards, A. J. 1996. Respiratory diseases of feedlot cattle in the central USA. Bovine Practitioner 30:5–7.

[3] Loneragan, G. H., D. A. Dargatz, P. S. Morley and M. A. Smith. 2001. Trends in mortality ratios among cattle in US feedlots. J. Am. Vet. Med. Assoc. 219: 1122-1127.

[4] N.K. Chirase, L.W. Greene, G.D. Graham, J.M. Avampato. 2001. Influence of clostridial vaccines and injection sites on performance, feeding and behavior, and lesion size scores of beef steers. J. Anim. Sci. 79:1409-1415.

[5] M.J. Schneider, R.G. Tait Jr., W.D. Busby, J.M. Reecy. 2009. An evaluation of bovine respiratory disease complex in feedlot cattle: Impact on performance and carcass traits using treatment records and lung lesion scores. J. Anim. Sci. 87:1821-1827.

[6] T.D. Avra, K.M. Abell, D.D. Shane, M.E. Theurer, R.L. Larson, B.J. White. 2017. A retrospective analysis of risk factors associated with bovine respiratory disease treatment failure in feedlot cattle. J. Anim. Sci. 95:1521-1527.

[7] Smith, K. J., D. E. Amrine, R. L. Larson, M. E. Theurer, J. I. Szasz, T. Bryant and B. J. White. 2022. Risk factors for mid- and late-feeding-stage bovine respiratory morbidity and mortality based on individual animal treatments of beef feedlot cattle. Appl. Anim. Sci. 38: 360-372.

[8] P.R. Broadway, S.A. Mauget, N.C. Burdick Sanchez, J.A. Carroll. 2020. Correlation of ambient temperature with feedlot cattle morbidity and mortality in the Texas panhandle. Front. Vet. Sci. 7:413.