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Agreement between observational and necropsy-derived diagnosis for cause of death for cattle in a commercial beef feedlot

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Agreement Between Observational and Necropsy-Derived Diagnosis for Cause of Death for Cattle in a Commercial Beef Feedlot

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Introduction

Necropsy information is an integral component for monitoring feedlot disease and designing preventive and therapeutic strategies; however, field necropsy is a laborious and time-consuming procedure and may be an occupational hazard because personnel can become injured or be exposed to zoonotic disease while conducting necropsies. The objective of this study was to determine the accuracy of a pre-necropsy mortality diagnoses made by feedlot personnel compared with diagnoses made from necropsy results.

Experimental Procedures

This study was conducted during the months of June and July 2009 in a feedlot in western Kansas. Each day, mortalities (n = 54 total) were brought to a designated necropsy area, and data pertaining to where the animal was found (i.e., home pen, hospital pen, chronic pen) were recorded. Feedlot health personnel were then asked to determine and record the cause of death for each mortality based on prior medical history and treatments recorded in the electronic animal health system, personal knowledge, and location where the animal was found. Study investigators who were blinded to the pre-necropsy diagnoses then conducted a thorough necropsy to determine the cause of death of each animal and obtained digital images of any lesions found.

The pre-necropsy and post-necropsy cause of death data were placed into 7 categories for data analysis: (1) bovine respiratory disease, (2) atypical interstitial pneumonia, (3) tracheal edema, (4) bloat, (5) traumatic injury/buller, (6) peritonitis, and (7) dystocia. A kappa test was performed to estimate the agreement between pre-necropsy and post-necropsy determined cause of death. Kappa was calculated using Stata version 10 (Stata Corp.; College Station, TX). The kappa equation used was calculated on mortalities by using the formula:

$$Kappa = \frac{(\text{Observed agreement} - \text{Expected agreement})}{1 - \text{Expected agreement}}$$

The resulting kappa values were categorized and interpreted according to Table 1.

Results and Discussion

Of the 54 mortalities observed in this study, the overall kappa value of agreement between pre-necropsy and post-necropsy determined cause of death was 0.6039, indicating a moderate level of agreement.

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This study found 100% agreement between pre- and post-necropsy cause of death for bovine respiratory disease cases (Figure 1); therefore, a necropsy is not warranted on mortalities previously diagnosed and treated for bovine respiratory disease, especially those found in the hospital or chronic pens. Out of the 25 bovine respiratory disease cases, 22 were found in the hospital or chronic pen (Figure 2), and the majority (24/25) had a previous history of treatment for respiratory disease (Figure 3).

Bloat also had an equal pre- and post-necropsy determined cause of death (Figure 1). All 5 of these animals were found in their home pens (Figure 2) and did not have a medical history (Figure 3). This is the second leading cause of mortality in feedlots and the third most prevalent pathology affecting feedlot cattle. This study shows that bloat is easily observed and diagnosed pre-necropsy, indicating that necropsy of bloat mortalities is not warranted.

Atypical interstitial pneumonia was under-reported in pre-necropsy determined cause of death ($n = 12$) compared with post-necropsy determined cause of death ($n = 15$; Figure 1). Of atypical interstitial pneumonia cases, 75% (9/12) died in their home pens without receiving treatment (Figure 2). Pre-necropsy under-reporting of the atypical interstitial pneumonia diagnosis suggests that animals found in their home pen without symptoms of bloat or history of bovine respiratory disease treatment should receive a necropsy.

Cattle classified under the injury category ($n = 9$) were diagnosed pre-mortem as chronically lame, bullers, or had suffered a traumatic injury. The agreement between pre- and post-necropsy diagnosis for injured animals was poor (4/9), but two-thirds (6/9) had died in the hospital or chronic pens and had pre-mortem treatment history (Figure 2). The three animals in the injury category that died in their home pens had traumatic injuries and were either found deceased or were humanely euthanized. Post-necropsy diagnosis of traumatic injury/bullers was under-represented in this study, which could have been because the individual conducting the necropsy did not have the opportunity to observe the animal's gait. Animals that had a traumatic injury may have had multiple disease processes occurring at the same time, and without watching the animals walk, the animals would have been categorized in other, non-injury categories even though they would have been pulled, treated, and recorded as injured. This result supports the concept that for mortalities with a history of severe physical trauma, necropsy is not only unwarranted but also may provide misleading evidence contrary to the obvious, primary lesion.

Implications

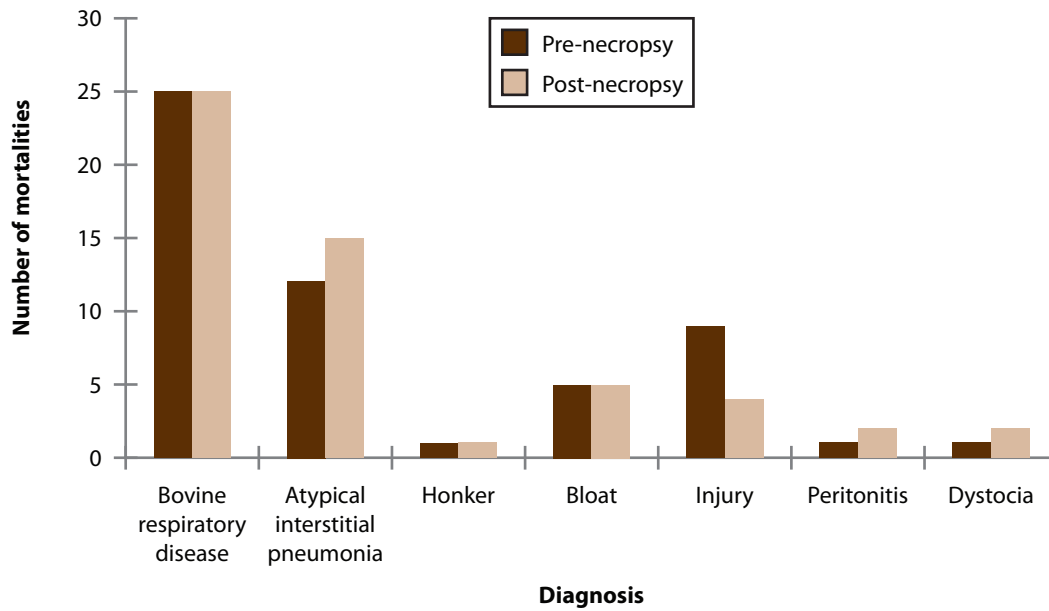
Most feedyard mortalities can be accurately diagnosed without the time, expense, and risk of performing necropsy; however, some questionable mortalities should still be investigated.

Acknowledgements

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Table 1. Kappa value interpretation

Kappa value	Interpretation
< 0.10	No agreement
0.10 to 0.20	Slight agreement
0.21 to 0.40	Fair agreement
0.41 to 0.60	Moderate agreement
0.61 to 0.80	Substantial agreement
0.81 to 1.00	Almost perfect agreement

**Figure 1. Number of mortalities by category diagnosed either pre- or post-necropsy.**

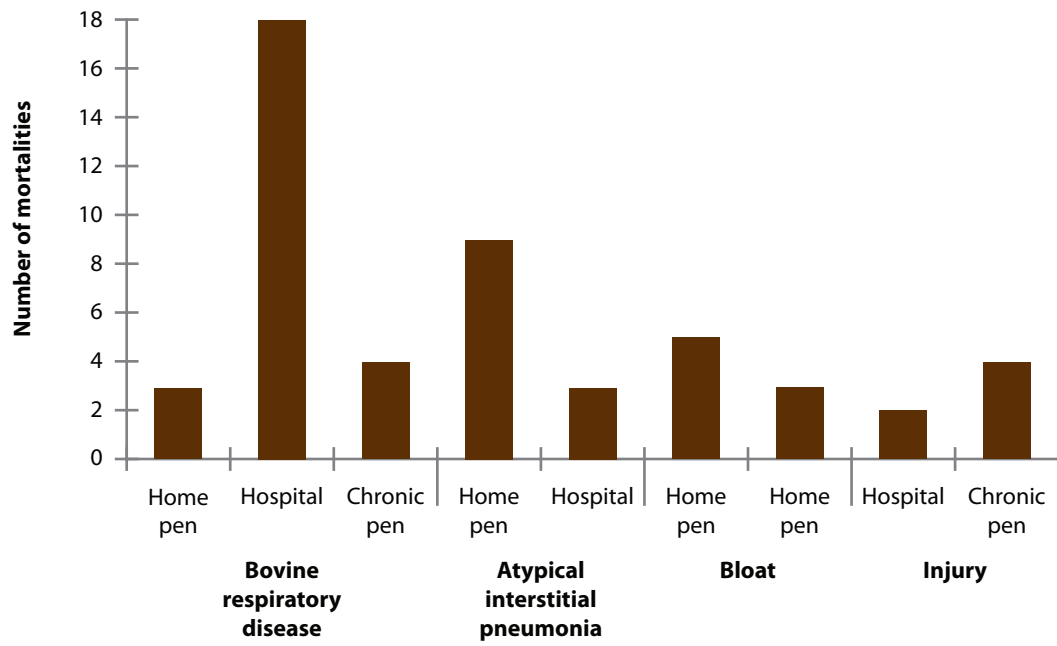


Figure 2. Number of mortalities within each category found in either the home pen, the hospital pen, or the chronic pen.

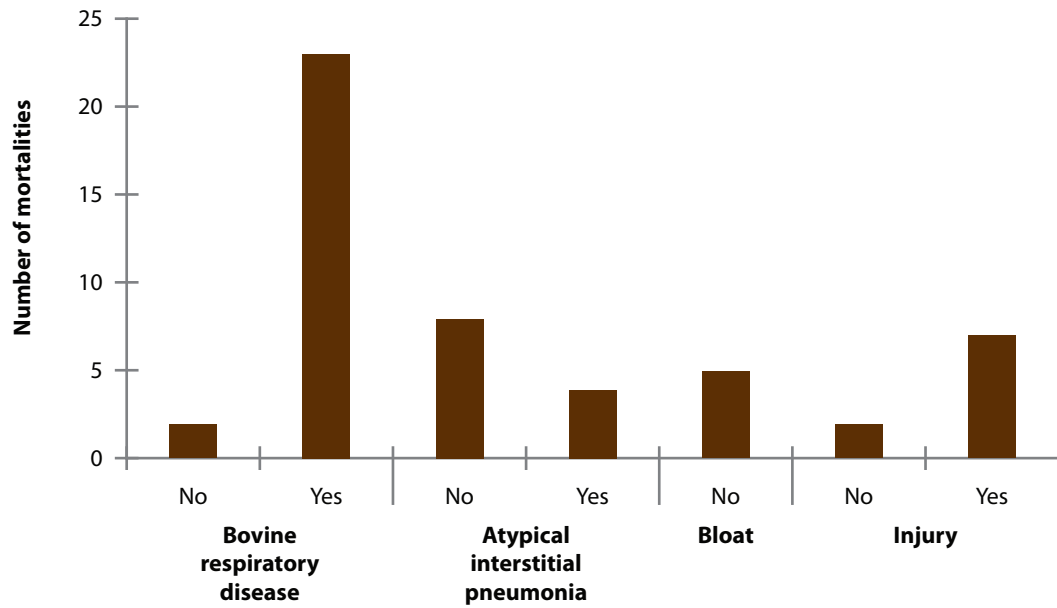


Figure 3. Number of mortalities within each category that either did ("Yes") or did not ("No") receive treatment prior to mortality.