Eating behavior in the feedlot: a tool to assist in detection of bovine respiratory disease

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Abstract

Historically, bovine respiratory disease (BRD) has caused major challenges in the North American feedlot industry. Commonly, BRD is the leading cause of morbidity and mortality in feedyards. Current BRD detection practices involve visual appraisal of clinical signs, such as depression, nasal discharge, altered locomotion, lack of fill, and cough. A novel high-frequency active integrated electronics system (AIES) was utilized to collect and record eating behavior of newly received, southeastern, auction-market derived calves. Two studies evaluated the health performance of calves managed by a traditional health system (cowboy assessment) versus a technology system. Results demonstrated the AIES decreased total percentage of respiratory pulls from 38.3 to 19.6 (P = 0.0001), while BRD mortalities were numerically lower for the technology treatment group, but not significantly different from the traditional system.

Key words: cattle, feedlot, BRD, detection

Résumé

Le complexe respiratoire bovin (CRB) constitue depuis longtemps un défi à l'industrie Nord-Américaine des parcs d'engraissement. Le CRB est très souvent la cause principale de morbidité et de mortalité dans les parcs d'engraissement. Les méthodes actuelles de détection du CRB s'appuient sur l'examen visuel de signes cliniques, tels la dépression, l'écoulement nasal, les changements de locomotion, le manque d'appétit et la toux. Un nouveau système actif à haute fréquence à composantes électroniques intégrées a été utilisé pour la cueillette et l'enregistrement du comportement alimentaire de veaux d'encan du sud-est nouvellement arrivés. Deux études ont évalué la performance de santé des veaux avec le système de surveillance traditionnelle de la santé par les employés du parc et avec le nouveau système de surveillance électronique. Les résultats ont montré que l'utilisation du nouveau système électronique a permis une réduction du pourcentage d'animaux retirés pour causes respiratoires de 38.3 à 19.6 (P = 0.0001). Par ailleurs, la mortalité associée au CRB était plus basse avec le système électronique qu'avec l'approche traditionnelle bien que la différence n'était pas statistiquement significative.

Introduction

Current feedyard metrics measure case fatality rates, therapy response, and days to fatal disease onset. However, as veterinarians, we are constantly trying to balance current metrics while incorporating judicious antimicrobial use and animal welfare, along with balancing economic sustainability. Health systems that would allow more accurate identification of calves with health abnormalities could potentially improve our metrics while allowing us to address challenges around judicious use, animal welfare, and sustainability. There is a poor correlation between visual appraisal of feeder calves and actual BRD infection[1]. Numerous studies have examined associations between cattle eating behavior and clinical infectious disease.[2,3,4] Sowell et al demonstrated healthy steers spend more time over a 24-hour period at the bunk, and also have more eating bouts than sick cattle. In addition, Quimby et al found unhealthy animals were detected 4.5 days prior to standard detection by feedyard personnel. While each of these systems may have merit, the commercial applicability has been limited due to defining the value that each system offers the industry.[5]

The objective of the studies was to evaluate the health performance of calves managed by traditional health system (cowboy assessment) versus technology system.

Materials and Methods

Two 60-day studies were conducted at a large commercial feedyard in southwest Kansas. In Study 1, 484 southeastern, auction-market derived calves were purchased and arrived weighing 448 lb (203 kg). In Study 2, 976 southeastern, auction-market derived calves were purchased and arrived weighing 478 lb (216.8 kg). Calves were processed on arrival using standard feedyard operating protocols (SOP). Calves were vaccinated against infectious bovine rhinotrachetis virus, bovine viral diarrhea virus type 1 and 2, parainfluenza virus, and bovine respiratory syncytial virus and *Mannheimia haemolytica.*[a] Calves were treated for internal and external parasites with ivermectin[b] (1 mL/110 lb (50 kg) bodyweight (BW) subcutaneously). All study calves received a lot/pen/individual identification ear tag and were tested for persistent infection with bovine viral diarrhea virus. All calves received tulathromycin[c] at 1.2 mL/100 lb (45.4 kg) BW subcutaneously upon arrival with a 10-day post-metaphylaxis moratorium. Calves were booster vaccinated against infectious bovine rhinotrachetis virus, bovine viral diarrhea virus type 1 and 2, parainfluenza virus, and bovine respiratory syncytial virus vaccine[d] approximately [something missing here?] after arrival.

Study 1 consisted of approximately 80 head/pen and 3 replicates. The first study contained 3 treatments: 1) traditional health system (cowboy assessment); 2) technology system and traditional system; and 3) technology system alone. The traditional and technology system hybrid was a combination of the traditional health system evaluation in conjunction with the technology system evaluation. Study 2 had approximately 95 head/pen and 5 replicates, with 2 treatments per replicate: 1) traditional health system (cowboy assessment) and 2) technology system. The active integrated electronic system (AIES) was utilized in the calves assigned to the technology treatment group. Randomization was accomplished by using a 5×5 gate sort of animals until the paired replicates were full.

A linear antennae, spanning the entire length of the feed bunk, was placed in all feed bunks. This recognized individual animal identification and recorded frequency and duration of visits to the bunk. Every 24 hours data was sent to a centralized off-site location for analysis. Previously modeled algorithms determined if calves had an abnormal eating behavior and should trigger an alert. Alerts were sent daily to the feedyard identifying calves with abnormal eating behavior patterns that were to be evaluated.

All study calves received the same therapy regimen. Calves deemed as 'sick' the first time were treated with ceftiofur[e] (1.5 mL/100 lb (45.4 kg) BW, at the base of the ear) and vitamin C[f] (4 mL/100 lb (45.4 kg) BW, subcutaneously). A 5-day post-treatment interval (PTI) was used. Calves treated a second time received florfenicol (6 mL/100 lb (45.4 kg) BW, subcutaneously) and vitamin C[f] was given (4 mL/100 lb (45.4 kg) BW, subcutaneously). A 4-day PTI was observed following treatment with florfenicol. The third treatment was danofloxacin[g] (2 mL/100 lb (45.4 kg) BW, subcutaneously) and vitamin C[f] (4 mL/100 lb (45.4 kg) BW, subcutaneously); a 6-day PTI was utilized for danofloxacin.[g]

Treatment success was defined as a calf that was pulled for BRD, treated, and subsequently did not get treated again. Necropsies were performed by feedyard staff under the guidance of the on-staff veterinarian. Study 1 and Study 2 were combined for statistical analysis. It was apparent, via numerical comparison, that the traditional and technology system hybrid treatment group in Study 1 was not advantageous compared to the other 2 treatment groups. Therefore, no statistical comparisons between the traditional system or the technology system and the traditional and technology system hybrid were completed. A mixed linear model was used for analysis of all dependent variables. For the analyses, the model included a fixed treatment effect and random effects of phase, block within phase and error. The error term was used to test the effect of treatment.

Results and Discussion

The respiratory morbidity rate was significantly (P = 0.0001) lower in the technology system than in the traditional system. The traditional system resulted in 38.3% morbidity rate and the technology system had 19.6% morbidity rate. It is important to note that while the technology system resulted in fewer animals being treated, it did not negatively affect the mortality rate. In fact, the BRD mortality rate was numerically lower in the technology system compared to the traditional system (3.9% vs 5.1%, respectively).

Medication and processing costs were reduced when using the technology system as compared to the traditional system ($39.99 vs $33.74; P = 0.04). This resulted in a $6.25 savings/head treated. In addition to the advantage in medi-

Table 1. Health performance of calves managed in either a traditional or a technology system: 60-day study.

	Traditional system	Technology system	*P*-value
Number head	730	730	
Effective head count*	697	699	
Initial pulls,† %	38.2	19.6	0.0001
Second pulls,† %	44.4	23.1	0.0001
Third pulls,† %	54.4	36.7	0.0001
Fourth pulls,† %	6.5	0	0.0001
Medication and processing charges, $/hd	39.99	33.74	0.04
Bovine respiratory deads, %	5.1	3.9	
Treatment success rate,‡ %	67.6	81.5	0.05

*Effective headcount = number of head enrolled – (number of BVD-PI head removed + number of head diagnosed with pneumonia during the 10-day post-metaphylaxis interval).
†Least Squares Means
‡Treatment success = a calf that was pulled for BRD, treated, and subsequently did not get treated again

cation and processing costs, the calves on the technology system also responded better to treatment therapy ($P = 0.05$). Cattle on the technology system had a treatment success rate of 81.5% vs only a 67.6% treatment success rate in the traditional system.

Conclusions

Today, feedyards have to manage challenges around labor resources, time management, and judicious antimicrobial usage, along with maintaining high health and growth performance of the cattle. The feeding industry continues to evaluate technologies that have potential to allow for more efficient daily operations, while maintaining economic sustainability.

This technology system demonstrated a statistically significant ($P = 0.0001$) reduction in the number of times a calf had to pass through the chute, with a numerical advantage in overall BRD mortality. In addition, those calves identified by the technology system and subsequently treated had a higher percentage treatment success rate ($P = 0.05$). These studies suggest this technology to be an asset in the identification of cattle with health abnormalities leading to potential economic value by reducing treatment rates and improving treatment success.

Endnotes

[a]Pyramid® 5 + Presponse® SQ, Boehringer Ingelheim, St. Joseph, MO

[b]Noromectin®, Norbrook Laboratories, LTD, Corby, Northamptonshire, Ireland

[c]Draxxin®, Zoetis, Florham Park, NJ

[d]Titanium 5®, Elanco Animal Health, Greenfield, IN

[e]Excede®, Zoetis, Florham Park, NJ

[f]Vitamin C, Vedco Inc, St Joseph, MO

[g]Nuflor Gold™, Merck, Kenilworth, NJ

[h]Advocin™, Zoetis, Florham Park, NJ

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