Evaluation of an ear-mounted tympanic thermometer device for bovine respiratory disease diagnosis

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Story in Brief

High-risk beef calves (n = 152) from Arkansas auction markets were used to investigate 2 bovine respiratory disease diagnosis procedures and metaphylaxis with tilmicosin phosphate. The 2 bovine respiratory disease diagnosis procedures consisted of 1) calves affixed with an ear-mounted tympanic thermometer device (FeverTag, FeverTags, LLC, Amarillo, Texas) that flashed an indicator light when tympanic temperature was ≥103.6 °F and treated for bovine respiratory disease based solely on the signal status of the device, or 2) pull and treat method based on ≥2 signs of bovine respiratory disease evident and rectal temperature ≥103.6 °F. Within each diagnosis procedure, cattle either received 1.5 mL/100 lb body weight of tilmicosin phosphate on-arrival with a 72 h post-treatment evaluation period or no metaphylaxis and immediately eligible for bovine respiratory disease therapy. During the 32-d receiving trial, no differences (P ≥ 0.53) in average daily gain were observed. The bovine respiratory disease morbidity rate was the same (P = 1.0) for either diagnosis procedure; however, metaphylaxis reduced bovine respiratory disease morbidity (13 vs. 39%; P = 0.03) and bovine respiratory disease antibiotic therapy cost/animal ($3.46 vs. $11.42; P = 0.04). When cattle were monitored for bovine respiratory disease by experienced personnel, there was no difference in performance or bovine respiratory disease morbidity using either diagnosis procedure; therefore, FeverTag may be an effective alternative for identifying bovine respiratory disease if labor or expertise is limited but additional cost of the device must be considered. Metaphylaxis reduced bovine respiratory disease morbidity but no differences in gain performance were observed in this study.

Introduction

Bovine respiratory disease (BRD) remains the leading cause of morbidity and mortality of stocker and feedlot cattle in the United States resulting in considerable economic costs through death loss, antibiotic treatment cost, reduced performance and increased labor. The most effective strategy available to mitigate the effects of BRD in high-risk, newly received cattle is to administer antibiotic metaphylaxis during initial processing (Smith, 2010). Use of this practice with tilmicosin phosphate has demonstrated favorable therapeutic responses over non-medicated controls in multiple studies. Another critical factor of effective BRD control is the timely and accurate identification of clinically ill cattle; however, experienced personnel with this ability are becoming more difficult to hire and retain. Furthermore, cattle are prey animals with an inherent instinct to conceal disease signs making BRD diagnosis difficult even for experienced personnel.

Rectal temperature is a chute-side, objective diagnostic method available to signify respiratory illness; yet, the practice is labor intensive, resulting in handling stress for people and animals because it requires proper animal restraint to verify. Use of an ear-mounted tympanic thermometer device that continuously monitors tympanic temperature and indicates via flashing light signal when a pre-determined temperature is breached may be an innovative and objective method to assist in pen or pasture diagnosis of BRD. Furthermore, these new technologies could aid feedlot personnel in the detection of cattle with subclinical BRD; thereby, reducing the negative consequences associated with untreated infection. Therefore, the objective of this study was to evaluate 2 different antibiotic treatment strategies using a tympanic temperature detection device or traditional pull and treat method to identify cattle requiring treatment for BRD, with or without antibiotic metaphylaxis on arrival.

Materials and Methods

High-risk beef calves (n = 152) of English-Continental breed type weighing 546 lb were acquired from 3 auction markets in Arkansas and delivered in 2 truck-load blocks on March 12 (block 1; n = 39 bulls, 33 steers) and April 11 (block 2; n = 80 heifers), 2010 to the University of Arkansas Stocker and Receiving Unit located near Savoy.

Upon arrival (d -1), calves were unloaded, weighed, gender was determined, and offered ad libitum access to bermudagrass hay and water overnight. The following day (d 0), calves were weighed, identified individually using a uniquely numbered ear tag, and ear-notched to test for persistently infected (PI) bovine viral diarrhea virus (BVDV). Calves were administered a pentavalent modified-live virus respiratory vaccine (Pyramid 5, Boehringer Ingelheim Vetmedica, St. Joseph, Mo.), a multivalent clostridial/tetanus bacterin-toxoid (Covexin 8, Schering Plough Animal Health, Summit, N.J.), and injectable mockeotin (Cydecetin, Boehringer Ingelheim Vetmedica) at a dosage of 1.1 mL/100 lb BW. Additionally, calves on appropriate treatment were administered tilmicosin phosphate (Micotil, Elanco Animal Health, Greenfield, Ind.) at 1.5 mL/100 lb BW and/or were affixed with a tympanic temperature monitoring device in the right ear. The bull calves in block 1 were banded on d 0, and all calves were revaccinated on d 16 of the study.

For block 1, calves were stratified by initial BW and gender (bull or steer) and for block 2, heifers were stratified by initial BW and allocated randomly to 1-acre mixed-grass treatment pens. Cattle were then assigned randomly to 1 of 2 BRD diagnosis procedures with or without on-arrival metaphylaxis with tilmicosin phosphate. The 2 BRD diagnosis procedures consisted of calves affixed with an ear-mounted thermometer device (FeverTag [FT], FeverTags, LLC, Amarillo, Texas; Fig. 1) that flashed a flashing indicator light when tympanic temperature was ≥103.6 °F and treated for BRD based

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solely on the signal status of the FT, or pull and treat method based on ≥2 signs of BRD evident and rectal temperature ≥103.6 °F (PT). Furthermore, within each BRD diagnosis procedure, cattle either received metaphylaxis with 1.5 mL/100 lb BW of tilmicosin phosphate solution on-arrival (d 0) (META) or no metaphylaxis (CON). A 2 × 2 factorial arrangement of treatments was used to evaluate BRD diagnostic procedure, metaphylaxis with tilmicosin phosphate, and their interaction resulting in 4 treatments consisting of 1) FTMETA, 2) FTCON, 3) PTMETA, and 4) PTCON. The post-evaluation interval (PEI) following metaphylaxis was 72 h; thus, immediately for CON calves, and once the PEI had expired for META, PT calves were evaluated daily for clinical signs of BRD by experienced personnel.

BRD Diagnosis. The PT calves were observed once daily (0800) for clinical signs of BRD (depression, nasal discharge, ocular discharge, cough, gaunt appearance, inappetence) by 2 experiment station personnel with a combined 35-yr experience evaluating cattle with BRD. If ≥2 visual signs existed, calves were brought to the restraining chute, weighed, and rectal temperature was recorded via a digital thermometer. If rectal temperature was ≥103.6 °F, cattle were considered morbid, administered antibiotic therapy with enrofloxacin (Baytril, Bayer Animal Health, Shawnee Mission, Kan.), and immediately returned to their home pen. A 48-h post-treatment interval (PTI) was implemented after administration of enrofloxacin, and a second temperature was recorded upon expiration of the initial antibiotic PTI. If the second temperature was ≥103.6 °F, a second antibiotic treatment with florfenicol (Nuflox, Schering-Plough Animal Health) was administered. A 48-h PTI was also implemented for cattle administered florfenicol, and rectal temperature was evaluated upon expiration of the second antibiotic PTI. If the temperature was ≥103.6 °F, a third and final antibiotic treatment with ceftiofur HCl (Excenel RTU, Pfizer Animal Health, Shawnee Mission, Kan.), and immediately returned to their home pen. A 48-h post-treatment interval (PTI) was implemented after administration of enrofloxacin, and a second temperature was recorded upon expiration of the initial antibiotic PTI. If the second temperature was ≥103.6 °F, a second antibiotic treatment with florfenicol (Nuflox, Schering-Plough Animal Health) was administered. A 48-h PTI was also implemented for cattle administered florfenicol, and rectal temperature was evaluated upon expiration of the second antibiotic PTI. If the temperature was ≥103.6 °F, a third and final antibiotic treatment with ceftiofur HCl (Excenel RTU, Pfizer Animal Health, Shawnee Mission, Kan.), and immediately returned to their home pen. A 48-h post-treatment interval (PTI) was implemented after administration of enrofloxacin, and a second temperature was recorded upon expiration of the initial antibiotic PTI. If the second temperature was ≥103.6 °F, a second antibiotic treatment with florfenicol (Nuflox, Schering-Plough Animal Health) was administered. A 48-h PTI was also implemented for cattle administered florfenicol, and rectal temperature was evaluated upon expiration of the second antibiotic PTI. If the temperature was ≥103.6 °F, a third and final antibiotic treatment with ceftiofur HCl (Excenel RTU, Pfizer Animal Health, Shawnee Mission, Kan.), and immediately returned to their home pen. A 48-h post-treatment interval (PTI) was implemented after administration of enrofloxacin, and a second temperature was recorded upon expiration of the initial antibiotic PTI. If the second temperature was ≥103.6 °F, a second antibiotic treatment with florfenicol (Nuflox, Schering-Plough Animal Health) was administered. A 48-h PTI was also implemented for cattle administered florfenicol, and rectal temperature was evaluated upon expiration of the second antibiotic PTI. If the temperature was ≥103.6 °F, a third and final antibiotic treatment with ceftiofur HCl (Excenel RTU, Pfizer Animal Health, Shawnee Mission, Kan.), and immediately returned to their home pen. A 48-h post-treatment interval (PTI) was implemented after administration of enrofloxacin, and a second temperature was recorded upon expiration of the initial antibiotic PTI.

The FT device was affixed to the ear of cattle and monitored tympanic temperature in 15 minute intervals. When the tympanic temperature exceeded the factory pre-set temperature of 103.6 °F, an indicator light flashed every 3 seconds enabling straightforward, objective identification of an animal experiencing fever. The FT calves received the same antibiotic regimen and PTI as PT calves; however, BRD morbidity was determined based solely upon status of FT indicator light. The FT calves were observed once daily (0800) for indicator light status; if a treatment eligible calf had a flashing FT device it was removed from the pen and treated with the same antibiotic treatment regimen described for PT.

Statistical Analyses. Animal performance data was analyzed with pen as the experimental unit. A randomized complete design with a 2 × 2 factorial arrangement of treatments was utilized, and computations were made using the mixed models procedure of SAS (SAS Inst. Inc., Cary, N.C.).

Results and Discussion

During the 32-d receiving trial, no differences (P > 0.05) in ADG were observed (data not shown). Furthermore, no treatment interactions were evident; therefore, only main effects of BRD diagnosis method and metaphylaxis are reported. Treatment protocol for diagnosing BRD (FT vs. PT) resulted in the same (P = 1.0) morbidity rate (26%) for the 2 procedures (Table 1). Therefore, FT may be an effective alternative for identifying BRD in newly received calves if labor or expertise is limited, but the additional cost of the FT device should be considered. The cost of a FT at the time the current study was conducted was $17.50/tag. The manufacturer states that the battery life of the FT is approximately 180 d and can be used for up to 3 60-d receiving periods. Therefore, the estimated cost of a FT when used for 3 animals during 3 separate 60-d receiving periods is $5.83/animal. Application of the FT did not seem to significantly reduce processing speed; however, processing time with and without FT application was not measured in the current study. It is important to note that significant design improvements to the FT were made after the current study was conducted. Regarding the original FT design (Fig. 1), several anecdotal observations are worth mentioning: 1) the FT indicator light was difficult to see on bright sunny days, 2) the failure rate (tag was not retained or was not working properly by the end of the 32-d receiving period) of the original design was relatively high, and 3) the FT caused “ear drop” which could be mistaken for signs of clinical depression. However, the updated FT was modified to address each of these concerns. Further research on the effectiveness of the new FT design for diagnosing BRD in cattle is needed.

Morbidity was reduced (13 vs. 39%; P = 0.03) for META compared to CON (Table 1). The reduction in BRD morbidity rate for META resulted in a lower (P = 0.03) BRD antibiotic therapy cost/animal than CON ($3.46 vs. $11.42). The additional cost of on-arrival metaphylatic therapy ($9.92/animal) was greater than the subsequent reduction in antibiotic therapy cost/animal for META ($7.96). However, additional time and labor costs associated with pulling sick animals were not included in the antibiotic therapy cost. Therefore, even when BRD morbidity is relatively low, on arrival metaphylaxis with tilmicosin phosphate was cost-effective.

Implications

The morbidity rate between treatment methods (FeverTag vs. Traditional pull and treat) was the same, which suggests that FeverTags may be an effective alternative to traditional “pull and treat” method, particularly when experienced personnel or labor is limited. Morbidity rate was reduced for calves receiving on-arrival antibiotic metaphylaxis compared to the control. No differences in ADG were observed in this study.

Literature Cited


Acknowledgements

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Table 1. Effects of metaphylaxis and bovine respiratory disease (BRD) diagnosis procedure on health of stocker calves.

<table>
<thead>
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<th>Item</th>
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<tr>
<td></td>
<td>FT</td>
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<td>FT</td>
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<td>Morbidity, %</td>
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<td>12.71</td>
<td>16.64</td>
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</table>

\(^1\)BRD diagnosis procedure = FeverTag or Pull and Treat.
\(^2\)Total cost includes metaphylaxis ($9.92) and FeverTag ($5.83) if relevant.

Fig. 1. A) FeverTag before (with applicator), B) during, and C) and D) after application.