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Backgrounding Health Associated with Area of the Truck Where Cattle Were Housed During Transport

B. J. White, D. Blasi, and M. Epp

Introduction

Cattle are commonly moved between geographic regions by using commercial transport carriers, and the vast majority of cattle are transported at least one time during their lives. Both handling and travel associated with moving cattle between locations have been identified as potentially stressful events.

The objective of this research was to identify potential associations between calf location within the transport carrier and subsequent calf wellness in the short term (40 to 60 days) following shipment. Health outcomes and average daily gain (ADG) were used to measure calf wellness during the backgrounding period. Although some research has described the overall effect of hauling cattle, we are aware of no recent literature describing the effects of location within the vehicle on subsequent animal wellness and performance.

Experimental Procedures

Data for this project were collected in conjunction with normal operations of the Kansas State University Beef Stocker Unit; this research facility consists of 24 drylot pens in three strings of eight pens each. Southeastern origin cattle were procured and commingled in Tennessee and shipped to Manhattan, KS. Three loads would arrive over a period of 2 to 4 days during each backgrounding cycle. Upon arrival, cattle from each load were unloaded by section of the transport carrier and placed in holding pens, maintaining segregation of animals by original truck compartment. Cattle were weighed and individually identified by holding pen, and the section of the transport vehicle was recorded for each animal based on the schematic depicted in Figure 1.

Transport vehicles used in this project represent common configurations of cattle hauling systems. Animals were divided into up to eight compartments within the trailer: nose on top deck (NOT), nose on bottom deck (NOB), bottom deck middle forward (BDF), bottom deck middle rear (BDR), rear on the bottom (ROB), top deck middle forward (TDF), top deck middle rear (TDR), and rear on the top deck (ROT). Dividing gates exist between BDF and BDR as well as TDF and TDR; however, these gates were sometimes left open, creating a large compartment referred to as bottom middle (BOT) or top middle (TOP), respectively. A categorical variable was created to identify animals as having come from the bottom (NOB, BDF, BDR, BOT, ROB) or top decks (NOT, TDF, TDR, TOP, ROT). Proximity to the front of the transport vehicle was recorded by a variable with all truck compartments placed in into one of three categories: front (NOT, NOB), middle (TDF, TDR, TOP, BDF, BDR, BOT), or rear (ROT, ROB).

Arrival weight and gender (steer/bull) were used to randomly allocate calves from a single load to a string of eight pens, and load integrity was maintained for each string

(no mixing of cattle between loads within pens). During the study period, cattle at the facility participated in a variety of health and nutrition research projects, but the base preventative health program was similar among all studies. Approximately 24 hours post-arrival, cattle were processed with standard health protocols including castration for bulls, metaphylaxis, modified-live viral vaccines (infectious bovine rhinotracheitis, bovine viral diarrhea, para-influenza-3, bovine respiratory syncytial virus), 7-way clostridial vaccine, and anti-parasiticides. Vaccinations were boosted, and individual animal weights were recorded between 10 and 16 days after arrival for each load. Cattle were fed a total mixed ration twice a day that included a mixture of prairie hay, alfalfa, wet gluten feed, and cracked corn. Calves were fed for approximately 6 weeks, and just prior to exit from the facility, each animal was individually weighed.

Animals were evaluated twice daily for signs of potential illness including depression, anorexia, coughing, or musculoskeletal ailments. Calves with disease symptoms were removed from the pen and taken to a chute for further examination. Treatments were administered on the basis of predetermined treatment protocols. Because morbidity effects of transport conditions are potentially transient, these outcomes were evaluated in two manners: associations with treatment during the entire period and potential associations with treatment only in the first 14 days. This health figure also coincides with a similar period of time monitored through the gain between arrival and revaccination. Gross necropsies were performed on all cattle that died during the feeding phase.

Statistical Analysis

Individual animal health and performance data were imported into SAS to determine potential associations between these variables and transport conditions (location within the truck). Random effects were included in each model to account for the effects of arrival gender (steers/bulls), group arrival time, and lack of individuality of each animal due to hierarchical structure of lots (truckloads) within each arrival time period, and pens within each load.

Results and Discussion

Data were collected on 24 individual loads of calves procured between May 2006 and May 2008. Three lots were excluded from the dataset because of unloading conditions that resulted in mixing of cattle between truck segments prior to individual identification.

When effects of arrival time, gender, individual load, and pen were accounted for, no significant associations were identified between compartment of the transport vehicle and probability of dying or being treated for the first, second, or third time. Individual animal ADG over the entire period was not associated with section within the transport vehicle; however, period ADG from arrival to revaccination tended ($P=0.09$) to be associated with truck section. Cattle in the ROT section had lower gains compared with those in NOT and TOP and tended ($P < 0.10$) to have lower gains than those in BOT and NOB. Beyond ROT, few differences were identified between revaccination ADG associated with section of the truck.

Placement of cattle on the top or bottom deck was not significantly associated with any health or performance outcomes measured. When the truck was categorized as forward, middle, or rear, no associations were identified between placement in one of these three

areas and the probability to die, be treated within the first 14 days, or be treated a second or third time. However, cattle in the middle section were significantly ($P=0.02$) more likely to be treated at least once (0.17) than cattle in the most forward sections (0.12). Calves in the rear sections did not have a different model-adjusted probability for being treated (0.15) compared with calves in the other two sections. The least squares mean rate of gain from arrival to reweigh for cattle in the rear section (3.8 lb/head daily) was lower ($P<0.05$) than that for calves housed in the front section (4.2 lb/head daily). Cattle in the middle section also tended ($P=0.06$) to have lower least squares mean ADG during this period (4.0 lb/head daily) than cattle in the front section.

Although individual compartment of the transport vehicle was not related to health outcomes, an interesting tendency between compartment and short-term ADG was identified. Previous investigators identified a transient depression in ADG associated with transport, yet no literature has identified differences between cattle housed by section of the truck. The relationship with this short-term gain was further explored when the rear of the truck (ROT, ROB) was compared with the rest of the vehicle. Cattle in the two rear truck sections had lower ADG relative to cattle in the middle and forward sections of the truck. One hypothesis to explain this finding is that potentially toxic fumes from the transport vehicle move behind the vehicle because of airflow currents and enter the rear of the truck, exposing these calves to lower quality air first. This could lead to short-term mechanical or physiological insults that limit short-term ADG. This hypothesis may be supported by the fact that one of the few associations between health outcomes and location on the truck was identified between cattle in the most forward sections (NOT, NOB) when compared with cattle in the middle (BDF, BDR, BOT, TOP, TDF, TDR) or rear (ROT, ROB) compartments. In many transport vehicles, the front of the first two sections is solid or directly behind the cab of the truck and thus protected from direct intake of exhaust. If airflow from the exhaust enters the trailer from the rear and sides of the truck, the most forward sections would tend to be somewhat protected from this effect.

This research illustrates some associations between health and performance in backgrounded beef calves and location within a commercial transport vehicle. Much research has evaluated the potential welfare implications and stress associated with cattle transportation; however, very little information is available comparing the effect of areas within the truck. This data set is unique because included cattle had comparable arrival weights between lots, similar distributions between truck compartments, and were transported a similar distance from procurement to the backgrounding facility.

Implications

Our current project reveals that the environment within a commercial transport carrier is not likely homogeneous and cattle position within the transport vehicle may result in differing health and performance outcomes.

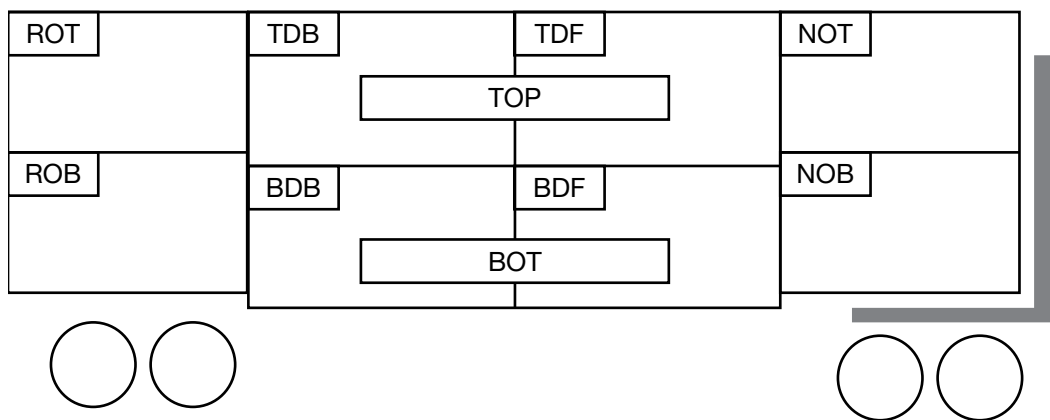


Figure 1. Location of compartments within a standard cattle transport trailer.

Truck compartments abbreviated as bottom deck rear (BDB), bottom deck front (BDF), bottom deck (bottom deck forward and back combined, BOT), rear on top (ROT), bottom deck nose (NOB), nose on top deck (NOT), rear on bottom (ROB), top deck back (TDB), top deck forward (TDF), and top deck (top deck back and forward combined, TOP).