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Trailer Microclimate During Commercial Transportation of Feeder Cattle and Relationship to Indicators of Cattle Welfare

(C. Goldhawk et al., Agriculture and AgriFood Canada Research Centre, Lethbridge, AB, University of Calgary Faculty of Veterinary Medicine, Calgary, AB, University of Sydney, Australia, and University of Saskatchewan, SK)
J ANIM SCI. 2014. 92:5155-5165

Nineteen loads of commercial feeder cattle (body weight 829 lb) transported for 18 ± 4.5 hours in summer and winter seasons were used to collect data on internal temperature and humidity conditions in the deck and belly compartment of pot-bellied trailers and their relationship with shrink, cortisol and morbidity.

- Measurements of temperature or humidity at ceiling or animal level did not vary with transportation factors.
- Temperature and humidity ratio was greater at animal level than ambient conditions during nonhighway travel and stationary periods.
- During the three time periods evaluated within journeys, there was a larger difference between animal-level and ambient conditions during the winter than during the summer; however, this difference was not associated with other transport factors.
- Evening loads (5:00 pm and 9:00 pm) experienced

more shrink in the summer than in the winter (11.2% vs. 9.0% of body weight).

- A 1.8°F increase in difference between average animal-level temperature in transit and the mean ambient temperature during the 10 days before transport was associated with a 0.11% of body weight increase in shrink and 0.006 ng/mL increase in post-transport cortisol concentration.
- Animal-level temperature-humidity index events (consecutive observations of temperature-humidity index greater than 78°F) were more likely to last for longer than 1 hour when the trailer was stationary vs. traveling.
- During temperature-humidity index events at animal level, the disagreement with ambient temperature regarding temperature-humidity index classification was lower when the vehicle was

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traveling vs. stationary and was greatest in events less than 1 hour.

- The average magnitude of the difference during these events was 11.4°F and was not affected by transportation factors.

Despite association between indicators of calf welfare and microclimate, all cattle arrived in good condition and there was 0.96% treatment

rate within the first 30 days after arrival.

Management and auditing decisions related to transportation of feeder cattle should consider the relationship between animal-level and ambient conditions and conditions before transportation. Under the commercial conditions of the current study, the transportation process did not appear to cause distress, according to the dimensions of animal welfare that were assessed.

Trailer Microclimate and Calf Welfare During Fall-Run Transportation of Beef Calves in Alberta

(C. Goldhawk et al., Agriculture and AgriFood Canada Research Centre, Lethbridge, AB, University of Calgary Faculty of Veterinary Medicine, Calgary, AB, University of Sydney, Australia, and University of Saskatchewan, SK)
J ANIM SCI. 2014. 92:5142-5154

Twenty-four commercial loads of beef calves (body weight 662 lb) were evaluated for associations among transportation factors, in-transit microclimate, and calf welfare. Transport factors evaluated included vehicle speed, space allowance, compartment within trailer and transit duration. Calves were transported for 7 hours 44 minutes, with space allowances ranging from 0.56 to 1.17 m²/animal.

- Compartment within trailer, space allowance and vehicle speed did not affect the difference between compartment ceiling-level and ambient temperatures during a 30-minute period of steady-state microclimate.
- During the steady-state period, a 1.8°F increase in ambient temperature above the mean of 42°F was associated with a 1.12°F decrease in the difference between ceiling-level and ambient temperature.
- Ceiling-level temperature and humidity during the first 400 minutes of transport could be predicted by ambient conditions and vehicle speed.
- Events when animal-level temperature-humidity index was classified as above the “danger” level lasted for 10.2 consecutive minutes. Ambient and ceiling-level

temperature-humidity index values were not classified as above “danger” for 90% and 84.9% of animal-level events.

- The majority of calves arrived in good condition, and biochemical indicators of calf welfare were within reference ranges for healthy cattle. Within the study population, high pre-transport cortisol and hematocrit were associated with elevated post-transport values.
- A 1% increase in shrink during the weaning-to-loading interval (24 or 48 hours) decreased transportation shrink by 0.26% when average animal-level temperature was greater than 9°F and decreased transportation shrink by 0.11% when average animal-level temperature was less than 9°F.

We inferred that the study results support future investigation of the extension of in-transit microclimate as a risk factor for post-transport treatment for disease. The study also provided correction factors for estimating in-transit microclimate that could assist in evaluation of transportation management and decisions affecting profitability and calf welfare.

Relationships of Feeding Behaviors With Average Daily Gain, Dry Matter Intake and Residual Feed Intake in Red Angus-Sired Cattle

(M. McGee et al., University of Idaho, Moscow, and Texas A&M University, College Station)
J ANIM SCI. 2014. 92:5214-5221

Feeding behavior has the potential to enhance prediction of feed intake and to improve understanding of the relationships between behavior, dry matter intake, average daily gain and residual feed intake in beef cattle. Two cohorts, born in 2009 and 2010 and the progeny of Red Angus bulls (n = 58 heifers and n = 53 steers), were evaluated during the growing phase, and the latter group of steers was also evaluated during the finishing phase. All behavior analyses were based on seven feeding behavior traits (bunk visit frequency, bunk visit duration, feed bout frequency, feed bout duration, meal frequency, meal duration and average meal intake) and their relationships with average daily gain, dry matter intake and residual feed intake.

- During the growing phase, feeding duration traits were most indicative of dry matter intake with positive correlations between bunk visit duration and dry matter intake for cohort 1 steers, growing phase; cohort 2 steers, growing phase; and cohort 2 heifers, growing phase.
- There were similar trends toward correlation of bunk visit duration and residual feed intake for both steer groups and cohort 1 heifers, growing phase.

- Feed bout frequency was correlated with average daily gain in cohort 1 heifers, growing phase and in cohort 2 steers, finishing phase.
- Feed bout duration was correlated with average daily gain in heifer groups and dry matter intake for all growing phase animals.
- Evaluation of growing vs. finishing phase steer groups suggests that all behaviors, residual feed intake, and dry matter intake, but not average daily gain, are correlated through the growing and finishing phases, implying that feeding behaviors determined during the growing phase are strong predictors of dry matter intake in either life stage.

Sire maintenance energy EPD effects (measured as high or low groups) on progeny feeding behaviors revealed a difference in meal duration with a tendency to differ in average meal intake. Feeding behavior duration traits may be useful predictors of dry matter intake in Red Angus cattle.

Pasture Size Effects on the Ability of Off-Stream Water or Restricted Stream Access to Alter the Spatial/Temporal Distribution of Grazing Beef Cows

(J. J. Bisinger et al., Iowa State University, Ames)
J ANIM SCI. 2014. 92:3650-3658

For two grazing seasons, effects of pasture size, stream access and off-stream water on cow distribution relative to a stream were evaluated in six 27-acre cool-season grass pastures. Two pasture sizes [small (9 acres) and large (27 acres)] with three management treatments (unrestricted stream access without off-stream water, unrestricted stream access with off-stream water and stream access restricted to a stabilized stream crossing) were alternated between pasture sizes

every two weeks for five consecutive four-week intervals in each grazing season. Small and large pastures were stocked with 5 and 15 August-calving cows from mid-May through mid-October. At 10-minute intervals, cow location was determined with Global Positioning System collars fitted on two to three cows in each pasture and identified when observed in the stream (0-11 yards from the stream) or riparian (0-36 yards

from the stream) zones, and ambient temperature was recorded with on-site weather stations.

- Over all intervals, cows were observed more frequently in the stream and riparian zones of small than large pastures, regardless of management treatment.
- Cows' in-stream access restricted to a stabilized stream crossing pastures had 24% and 8% less observations in the stream and riparian zones than unrestricted stream access without off-stream water or unrestricted stream access with off-stream water pastures regardless of pasture size.
- Off-stream water had little effect on the presence of cows in or near pasture streams regardless of pasture size.
- In 2011, the probability of cow presence in the stream and riparian zones increased at greater rates as ambient temperature increased in unrestricted stream access without off-stream water or unrestricted stream access with off-stream water pastures than in 2010.

- As ambient temperature increased, the probability of cow presence in the stream and riparian zones increased at greater rates in small than large pastures.
- Across pasture sizes, the probability of cow presence in the stream and riparian zone increased less with increasing ambient temperatures in stream access restricted to a stabilized stream crossing than unrestricted stream access without off-stream water and unrestricted stream access with off-stream water pastures.
- Rates of increase in the probability of cow presence in shade (within 11 yards of tree drip lines) in the total pasture with increasing temperatures did not differ between treatments. However, probability of cow presence in riparian shade increased at greater rates in small than large pastures.

Pasture size was a major factor affecting congregation of cows in or near pasture streams with unrestricted access.

Factors Affecting Cow-Calf Herd Performance and Greenhouse Gas Emissions

(T. Wang et al., Texas A&M University)

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A Cobb-Douglas stochastic frontier function is estimated for the cow-calf enterprises in the Texas Rolling Plains using Standardized Performance Analysis data. Technical efficiency provides a measure of the output of farm *i* over time *t* relative to the output that can be produced by the most efficient farm in the sample using the same inputs. The average technical efficiency level for the 76 cow-calf farms is 95.1%.

- Breeding season length is positively related to the technical inefficiency. Thus, farms with a longer breeding season have a significant lower productivity.
- We found that technical efficiency increased 8% if breeding season length decreased by 100 days.
- Another variable that significantly affects technical efficiency is percentage of operator labor, which indicates that farm

owners who devote more time on the beef cow operation to decrease spending on hired labor will achieve higher efficiency.

- A positive relationship exists between deviation from mean annual rainfall and technical inefficiency. A rainfall level close to mean annual rainfall will promote productivity, while too little or too much rain are both counterproductive.

In contrast, herd productivity is compromised by a longer breeding season, percentage of hired labor and deviation from mean annual rainfall. Interestingly, more technically efficient farms tend to emit fewer greenhouse gas units per unit of output. For example, net greenhouse gas emissions are 6.12 and -8.70 pounds of carbon equivalent, respectively, for farms with technical efficiency below 0.8 and above 0.96.

The USDA Quality Grades May Mislead Consumers

(E. A. DeVuyst et al., Oklahoma State University)

J ANIM SCI. 2014. 92:3142-3148

This study was designed to explore consumers' perceptions about and knowledge of USDA beef quality grades. Data were collected from over 1,000 consumers in online surveys in November and December 2013, and estimates were weighted to force the sample to mirror the U.S. population in terms of age, gender, education and region of residence.

- When asked to rank Prime, Choice and Select grades in terms of leanness, only 14.4% provided the correct ranking, with 57.1% of respondents incorrectly indicating steaks grading Prime were the leanest.
- Despite perceptions that the Prime name indicated the leanest product, in a subsequent question, 55.6% of respondents thought Prime grade to be the juiciest of the three grades.
- In addition to inquiring about perceptions of the grade names, respondents also

indicated perceptions of pictures of steaks. Only 14.5% of respondents correctly matched the steak pictures with their corresponding USDA quality grade name, an outcome that is statistically worse than would have occurred through pure random matching.

- When asked to match pictures of steaks with expected prices, 54.8% of respondents incorrectly matched the picture of the Prime steak with the lowest price level.

More highly educated consumers with greater preferences for steak consumption were more likely to provide correct answers. Results reveal substantial confusion over quality grading nomenclature and suggest the need for more education or for a transition toward more descriptive terminology at the retail level.

Effects of Gestation and Lactation on Forage Intake, Digestion and Passage Rates of Primiparous Beef Heifers and Multiparous Beef Cows

(D. R. Linden et al., Kansas State University)

J ANIM SCI. 2014. 92:2141-2151

Angus-cross cows (n = 13; 8 pregnant, body weight = 1,345 lb and 5 nonpregnant, body weight = 1,259 lb) and heifers (n = 13; 8 pregnant, body weight = 1,127 lb and 5 nonpregnant, body weight = 994 lb) were individually fed chopped warm-season grass hay (5.5% crude protein, 67% NDF) for *ad libitum* intake and soybean meal (46% crude protein) at 1 lb/day. Intake was measured daily and dry matter digestibility, digesta passage rate, and plasma glucose and β -hydroxybutyrate concentrations were measured every 14 days from 49 days prepartum to 49 days postpartum.

- Dry matter digestibility decreased with advancing gestation; pregnant animals had greater digestibility than nonpregnant cows and heifers. Digestibility was not influenced by age.
- Pregnant cows and heifers had faster digesta passage rates than their nonpregnant counterparts.
- Pregnant animals had lower plasma glucose. Plasma β -hydroxybutyrate concentrations were greater in pregnant animals than in nonpregnant animals but were not influenced by age or time prepartum.
- Postpartum dry matter intake (% of body weight) was greater for lactating heifers than other groups (age \times lactation status) and increased over time.
- Prepartum dry matter intake (% of body weight) increased over time for pregnant heifers through 2 weeks prepartum before declining but did not change over time for pregnant cows.

- Diet digestibility increased with time postpartum, and heifers had greater digestibility than cows from 3 to 7 weeks postpartum but not at 1 week postpartum (age × time).
- Postpartum passage rate was not influenced by age or lactation status.
- Lactating animals had lower plasma glucose and greater plasma β -hydroxybutyrate concentrations postpartum than nonlactating animals.
- Calves from mature cows grew faster than calves from heifers.

These data show that although primiparous beef heifers have similar dry matter digestibility, passage rates and plasma glucose and β -hydroxybutyrate concentrations, intake patterns differ between heifers and cows. Although dry matter intake (% of body weight) and digestibility did not differ between pregnant beef heifers and pregnant mature cows, the dry matter intake (% of body weight) was greater for lactating primiparous cows (heifers) than for lactating multiparous cows. Even with their postpartum increase in dry matter intake, primiparous beef heifers were not able to consume adequate amounts of the warm-season forage to support their requirements for maintenance, growth and lactation.

Healing of Surgical Castration Wounds: A Description and an Evaluation of Flunixin

(E. M. Mintline et al., University of California, University of British Columbia and Iowa State University, Ames)

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Previous studies have shown that surgical castration wounds take between 10 and 61 days to heal. The objectives of this work were to describe healing, inflammation and lying behavior after surgical castration in beef calves and to evaluate the effect of a possible intervention, a single injection of flunixin meglumine on the healing process. Calves (25 days of age; body weight = 119 lb) were surgically castrated with or without an injection of flunixin immediately before the procedure (n = 24/treatment). Healing was measured with a 5-point scale (1 = fresh wound, 5 = no visible incision or inflammation) as well as weight gain, scrotal size and scrotal surface temperature on days 1, 2, 3, 7, 14, 21, 28, 35, 49 and 63 after castration. Lying behavior was recorded with loggers from 2 days before to 29 days after castration.

- Inflammation, as measured by scrotal size, peaked on days 2 and 3 after the procedure

(e.g., 2 inches on day 2 versus 1 inch before castration) and then declined with time.

- The first wound to be scored as fully healed (i.e., 5/5) was seen on day 28; by day 63, 98% of wounds were fully healed.
- The greatest changes in healing score occurred between day 21 and 35; this was also the peak of wound surface temperature and may correspond with revascularization.
- Calves given flunixin had more lying bouts than those that received saline (flunixin by time interaction), but this pattern emerged on and after day 8, well after the three- to eight-hour half-life of flunixin.

In conclusion, castration caused inflammation in the days that followed, and the wounds required a minimum of four weeks to heal. Provision of flunixin had no effect on these outcomes.



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