

Animal Behavior and Well-Being I

280 Determining effects of castration timing with or without analgesia on growth performance and behavior in beef cattle. A. C. Brown^{*1}, J. G. Powell¹, E. B. Kegley¹, J. T. Richeson², and M. S. Gadberry¹, ¹University of Arkansas, Fayetteville, ²West Texas A&M University, Canyon.

The study objective was to determine the effects of surgical castration at 2 stages of maturity (birth or weaning) with or without pain control (meloxicam) on growth performance and behavior. Bull calves (n = 60) were assigned randomly to treatments at birth. Treatments were (1) surgical castration near birth (BTH), (2) oral administration of meloxicam followed by surgical castration near birth (1 mg/kg BW; BMX), (3) surgical castration at weaning (WNG), or (4) surgical castration at weaning with oral administration of meloxicam (1 mg/kg BW; WMX). For statistical analysis, bulls left intact at birth (BUL) were considered a positive control for observations that occurred before their treatment application at weaning; subsequently, bulls castrated at birth (STR) were considered a negative control during postweaning observations. Data were recorded to determine behavior and growth performance. Calf standing and lying activity was monitored for a 7-d period at both stages (birth or weaning) by recording the x- and y-axes of an accelerometer attached to the metatarsus of the right leg. Body weight was recorded at birth and d 4, 33, 66, 116, 162, 199, 214 (weaning), 228, 246, and 270. Data interpreted from accelerometer recordings revealed 3 distinct behaviors being characterized as lying flat on side, standing, and lying on sternum. Following castration at birth, no treatment differences were observed for any of the behavior positions. Postweaning behavior indicated that STR calves spent the least amount of time standing ($P = 0.007$) when compared with WNG and WMX. Furthermore, WMX calves exhibited a greater proportion of time spent standing ($P = 0.05$) compared with WNG. Average daily gain did not differ between treatments ($P \geq 0.88$) throughout the preweaning period. However, 56 d post-weaning ADG was greatest ($P = 0.02$) in STR, intermediate in WMX, and least in WNG. Early castration near birth did not affect weaning weight or behavior, whereas delaying castration until weaning reduced postweaning ADG, but this reduction was mitigated by the use of meloxicam at the time of castration.

Key Words: castration, meloxicam

281 Effects of pre- and postoperative carprofen on convalescence of calves following umbilical surgery. I. Schulze¹, J. Offinger¹, A. K. List¹, S. Kaestner², H. Meyer¹, and J. Rehage^{*1}, ¹Clinic for Cattle, University of Veterinary Medicine Hannover, Hannover, Germany, ²Clinic for Small Animals, University of Veterinary Medicine Hannover, Hannover, Germany.

Pain management protocols for surgeries in calves should include the application of efficient analgesics. Aim was to evaluate the effects of perioperative treatment with the non-steroidal anti-inflammatory drug carprofen on convalescence of calves following umbilical surgery. In a randomized and blinded study, 23 healthy calves aged 4–7 weeks were treated either with carprofen (n = 12; 1.4 mg/kg, i.v.) or an equivalent volume of physiological saline solution (n = 11), 1 h before and 72 h after surgery. Umbilical surgery took place under isoflurane inhalation anesthesia [induction with xylazine (0.1 mg/kg, i.m.) and ketamine (2 mg/kg, i.v.)] combined with an infiltration of the incision line (15 mL 2% procaine). Before surgery and in the following 10 d, feed intake and weight gain were measured; behavior was assessed using a mul-

tipale pain and discomfort scale by direct observation and from video recordings. Sensitivity of the traumatized tissue to palpation was evaluated by means of a visual analog scale. Serum cortisol and pepsinogen levels, red blood cell counts and occult blood in feces were monitored. Continuous data were evaluated by means of the GLM procedure for repeated measurements, scores by Wilcoxon non-parametric tests and frequencies by Fisher Exact Test of the SAS statistical package. Calves in the carprofen-treated group had significantly ($P < 0.05$) higher mean feed intake [0.31 ± 0.03 MJ ME/(kg BW d)] and weight gain (669 ± 197 g/d) than control calves [0.28 ± 0.03 MJ ME/(kg BW d)] and 459 ± 197 g/d). Increased well-being in the carprofen-treated calves was reflected by significantly ($P < 0.05$) lower scores in the multiple pain and discomfort scale (5 ± 0.5 vs. 9 ± 0.6) and visual analog scale (25 ± 4.7 vs. 38 ± 5.0). No group differences were found for red blood cell counts, serum pepsinogen and cortisol and fecal occult blood tests. Perioperative carprofen promotes postoperative well-being resulting in increased feed intake and weight gain. Repeated carprofen treatment appears to have no considerable effects on the integrity of the abomasal mucosa in calves undergoing umbilical surgery.

Key Words: calf, carprofen, pain management

282 Effect of surgical castration of bull calves at different stages of maturity with or without analgesia on the acute phase response (APR) and complete blood count (CBC). H. D. Hughes^{*1}, J. G. Powell², E. B. Kegley², A. C. Brown², N. C. Burdick Sanchez³, J. A. Carroll³, and J. T. Richeson¹, ¹Department of Agricultural Sciences, West Texas A&M University, Canyon, ²Department of Animal Science, Division of Agriculture, University of Arkansas, Fayetteville, ³USDA-ARS, Livestock Issues Research Unit, Lubbock, TX.

The study objective was to determine if surgical castration at birth or weaning affects the APR or CBC and whether concurrent administration of an oral analgesic (meloxicam) ameliorates inflammation. Bull calves (n = 29) from the University of Arkansas research herd were assigned to treatment at birth, moved with their dam into pens for 7-d, and returned to pasture until weaning on d 214. Treatments included: 1) castration near birth (BTH), 2) castration near birth with oral administration of meloxicam (1 mg/kg BW; BMX), 3) castration at weaning (WNG), or 4) castration at weaning with oral administration of meloxicam (1 mg/kg BW; WMX). For statistical analyses, bulls left intact at birth were considered a positive control for observations that occurred before their treatment application at weaning; likewise, bulls castrated at birth were considered a negative control (STR) during post-weaning observations. Blood samples were collected from the jugular vein on d 0 (birth), 1, 3, 7, 214 (weaning), 214+6 h, 215, 217, 221, and 228. Whole blood was analyzed for CBC using an automated hemocytometer; serum was analyzed for concentrations of interleukin-6 (IL6), interferon- γ , tumor necrosis factor- α , and haptoglobin (Hp) using an enzyme-linked immunosorbent assay. The APR was not affected by treatment near birth; however, an overall decrease (day effect; $P < 0.001$) in IL6 was observed between birth and d 7. At weaning, Hp was greater ($P \leq 0.005$) for castrates compared with STR on d 214+6 h, 215, and 217 and was greater ($P = 0.05$) in WNG vs. WMX on d 217. Neutrophils (NEU) increased ($P < 0.001$) and red blood cells decreased ($P \leq 0.03$) for castrates on d 214+6 h and 217, respectively; whereas, WMX tended ($P = 0.10$) to have lower NEU than WNG on d 215. Castration at weaning, but not near birth, altered immune parameters. Oral meloxicam reduced serum Hp when administered to calves castrated at weaning, but not in calves

castrated near birth. Therefore, oral administration of meloxicam may be efficacious when surgically castrating older bull calves at or beyond the typical weaning age.

Key Words: castration, haptoglobin, meloxicam

283 Effect of a cooling gel on pain sensitivity and healing of hot-iron cattle brands. C. B. Tucker^{*1}, E. M. Mintline¹, J. Banuelos¹, K. A. Walker², B. Hoar¹, D. Drake¹, and D. M. Weary², ¹University of California, Davis, ²University of British Columbia, Vancouver, BC, Canada.

Hot-iron branding is painful for cattle, but little is known about the duration of or effective methods to control this pain. Previous work with pigs indicated that cooling burns with a gel (active ingredient, tea tree oil) improved healing compared with untreated wounds. Steers (210 ± 5 kg) were hot-iron branded and allocated to 1 of 3 treatments: control (n = 24), 1 gel application immediately after branding (1×; n = 12) or 2 gel applications, once immediately after branding and 24 h later (2×; n = 12). Wound sensitivity was assessed by applying, in 5 locations (in the center, at the top of, 5 and 10 cm above the brand and on the non-branded side), a known and increasing force with a von Frey anesthesiometer until the animal showed a behavioral response. Healing was measured with a 6-point scale (1 = fresh brand, 6 = no scabbing and fully re-pigmented). Both measures, along with weight gain and temperature of the wound were recorded before, 24, 48, 72 h and 1, 2, 3, 4, 5, 8 and 10 wk after branding and analyzed with a mixed model. The gel immediately cooled the brand (38.7 ± 0.7 vs. 34.9 ± 0.6°C for the control vs. 1×/2× treatments), but there were no treatment differences in wound temperature at any other time ($P > 0.26$). All wounds were at least partially re-pigmented by 10 wk, but only 46% of brands were fully healed this time. The healing process was slowed in the 2× group (e.g., at 21 d 2.6 ± 0.1 vs. 2.0 ± 0.2, for control/1× vs. 2×, respectively, $P < 0.01$). Brands remained sensitive throughout the 10 wk (before vs. all other time points, in center of brand, $P = 0.01$). Overall, wound sensitivity tended to be lower for the 1× treatment in the center, 5 and 10 cm from the brand (177 ± 31, 318 ± 68, 412 ± 60 vs. 205 ± 29, 355 ± 67, 460 ± 59 g force for the 1× vs. control treatments, $P \leq 0.07$). Weight gain was reduced in the week of branding, but was not affected by gel application. In conclusion, applying gel 1× tended to reduce wound sensitivity. However, 10 wk after the procedure, hot-iron brands remained more sensitive than non-branded tissue and 54% were not fully healed. These results contribute to animal welfare concerns about hot-iron branding.

Key Words: branding, beef, welfare

284 Relationships of various feeding behavior indicia with divergent residual feed intake measurements in Japanese Black cattle. M. McGee^{*1}, J. A. Ramirez², G. E. Carstens², J. B. Hall², and R. A. Hill¹, ¹University of Idaho, Moscow, ²Texas A&M University, College Station, ³University of Idaho Nancy M. Cummings Research, Education, and Extension Center, Carmen.

Objectives of this study were to examine relationships among residual feed intake (RFI) and feeding behavior indicia of Japanese Black cattle (Wagyu). Ninety-two yearling Wagyu bulls were examined for RFI and behavioral patterns using a monitoring system (GrowSafe Systems) over a standard 70 d period. Post-test, individual animal RFI was calculated; with top and bottom quartiles (with respect to RFI) used to analyze feeding behavior parameters. A population of 46 animals (n = 23 high RFI; BW initial 420.0 ± 46.1 kg, final 485.8 ± 51.3 kg; n = 23 low RFI

BW initial 416.6 ± 63.9 kg, final 485.0 ± 71.3 kg) were examined for feeding behavior. Analyses were performed using Proc GLM procedures of SAS by quartile. Of the behavior variables examined, RFI was positively correlated with feed bout duration (feeding event exceeded 300 s between initial and final transponder reading mean: efficient 4090.4 ± 151.9 s, inefficient: 4546.4 ± 151.9 s; $r = 0.40$; $P = 0.01$), bunk visit (time at bunk with or without feed intake) duration (mean: efficient 4223.8 ± 158.6, inefficient 4677.0 ± 158.6s; $r = 0.38$; $P = 0.01$), average meal intake (mean: efficient 1408.4 ± 63.3 s, inefficient 1565.9 ± 63.3; $r = 0.31$; $P = 0.03$) and meal duration (mean: efficient 7157.2 ± 278.3, inefficient 7813.1 ± 278.3; $r = 0.33$; $P = 0.03$); defined as one or more feed bouts exceeding 300 s between transponder readings. Residual feed intake was not correlated with feed bout frequency (mean: efficient 31.62 ± 1.65 events, inefficient 35.25 ± 1.65 events; $r = 0.22$; $P = 0.13$), bunk visit frequency (mean: efficient 36.10 ± 1.89, inefficient 39.92 ± 1.89 events; $r = 0.21$; $P = 0.17$) or meal frequency (mean: efficient 7.75 ± 0.47 events, inefficient 8.90 ± 0.47; $r = 0.23$; $P = 0.12$). Results provide insight of the unique characteristics of Wagyu cattle feeding behavior, not reported the literature. A strong positive correlation was found between consumption time and intake. Frequency parameters were not found to be associated with RFI. With this known, research in feeding behavior traits of Wagyu cattle may aid in selection for feed efficiency in this breed.

Key Words: Wagyu, RFI, feeding behavior

285 Effects of supplementing endophyte-infected tall fescue with sainfoin and polyethylene glycol on the physiology and ingestive behavior of lambs. F. Catanese^{1,2}, R. A. Distel^{1,2}, and J. J. Villalba^{*3}, ¹Centro de Recursos Naturales Renovables de la Zona Semiárida (CERZOS), Bahia Blanca, Argentina, ²Departamento de Agronomía, Universidad Nacional del Sur, Bahia Blanca, Argentina, ³Utah State University, Logan.

Tannins in sainfoin might bind to alkaloids in endophyte-infected tall fescue (E+) and attenuate fescue toxicosis. If so, supplementing E+ with sainfoin will increase use of E+ by sheep and polyethylene glycol (PEG) -a polymer that binds to tannins- will attenuate such response. Thirty-six 2-mo-old lambs were randomly assigned to 3 treatments (12 lambs/treatment). Lambs were individually penned and fed E+ (CTRL), E+ and 200 g DM of fresh-cut sainfoin (SAIN) or the same amount of sainfoin + 33 g of PEG (SAIN+PEG) during 23 d. Daily food intake and rectal temperatures were estimated and jugular blood was extracted at the beginning and end of the period. While in pens, all lambs had choices between the novel forages endophyte-free fescue (E-) and orchardgrass for 4 d. Then, all lambs were allowed to graze a choice of E+ and sainfoin, or a monoculture of E+ for 14 d and grazing behavior was recorded. Response variables were analyzed using a mixed effects model which included treatment and day as fixed effects and lamb as random factor. Lambs in SAIN ingested more E+ than lambs in CTRL ($P = 0.05$), but no differences were detected between lambs in SAIN+PEG and CTRL ($P = 0.12$). Only SAIN lambs had lower rectal temperatures ($P = 0.02$), greater numbers of leukocytes ($P < 0.001$) and lymphocytes ($P = 0.03$), and greater plasmatic concentrations of globulin ($P = 0.01$) and prolactin ($P = 0.02$) than CTRL lambs. Lambs in SAIN showed the greatest intake of E- ($P < 0.001$). When lambs had a choice of E+ and sainfoin, all treatments grazed E+ to the same extent ($P > 0.05$). However, when they grazed on a monoculture of E+, lambs in SAIN+PEG showed the greatest use of E+ ($P < 0.05$). In summary, sainfoin supplementation increased intake of E+, preference for E- and improved some physiological parameters indicative of fescue toxicosis. Tannins in sainfoin partially accounted for such benefits since feeding

PEG along with sainfoin attenuated those responses. However, early exposure to E+ supplemented with sainfoin did not lead to an increased acceptance of or preference for E+ during grazing.

Key Words: alkaloid, ingestive behavior, tannin

286 Behavior of beef cattle as affected by horn fly numbers. A. R. Mays^{*1}, M. A. Brown², and C. F. Rosenkrans, Jr.¹, ¹University of Arkansas, Fayetteville, ²USDA-ARS, Grazinglands Research Laboratory, El Reno, OK.

Beef cattle profitability traits may be influenced by the effect of horn flies on cattle behavior. The objective of this study was to determine if horn flies affected beef cattle behavior. Crossbred cows (n = 53) from Brangus dams were sired by either Bonsmara, Brangus Charolais, Gelbvieh, Hereford, or Romosinuano bulls; and their Angus-sired calves were used in the study. Pasture behavior of individual cows was recorded twice a day (AM and PM) along with total horn fly counts (AM only) from May through October. Cattle were observed and recorded as grazing, lying or standing. Exit velocity (EV) was obtained monthly for cows and calves. Pasture behavior and horn fly numbers were analyzed by mixed model least squares using a linear model that included breed group, behavior (either AM or PM) and month. The linear model for EV included breed type, month and breed × month. Horn fly numbers varied over month ($P < 0.0001$), with the lowest numbers in May (94 ± 42 flies) and highest numbers in August (503 ± 41 flies). Pasture behavior in the AM was not associated ($P > 0.25$) with horn fly numbers; however PM behavior was ($P < 0.05$). Cows observed grazing and lying had greater horn fly numbers than cows observed standing in the afternoon (468 ± 52 and 419 ± 38 vs. 319 ± 27 flies; respectively). Numerically pasture AM behavior showed grazing cows having more horn flies than standing or lying cows. Exit velocity of both cows ($P < 0.0001$) and calves ($P < 0.05$) differed by month. Cow EV was greatest in October (1.42 ± 0.2 m/s) compared with May, June, July and September (2.69 ± 0.2 , 2.41 ± 0.2 , 2.34 ± 0.2 and 1.98 ± 0.2 m/s; respectively), with August being similar to September and October (1.64 ± 0.2 m/s). Calf EV was greatest in September, July, August and October (0.90 ± 0.2 , 0.84 ± 0.2 , 0.75 ± 0.2 and 0.74 ± 0.2 m/sec; respectively) compared with June (1.56 ± 0.2 m/s), with May being intermediate (1.06 ± 0.2 m/sec). Horn fly numbers appear to be associated with behavior of beef cattle in this study. The genetic and physiological mechanisms linking horn fly numbers with cattle behavior and profitability traits should continue to be the subject of future investigation.

Key Words: behavior, exit velocity, horn flies

287 The behavior of cattle unloaded for feed, water and rest during long-distance transportation in Canada. H. E. Flint^{*1}, K. S. Schwartzkopf-Genswein², K. G. Bateman¹, and D. B. Haley¹, ¹University of Guelph, Population Medicine, Guelph, Ontario, Canada, ²Agriculture and Agri-Food Canada, Lethbridge, Alberta, Canada.

Roughly half of the beef cattle finished in Ontario come into the province from western Canada. Transport regulations indicate that cattle only need to be rested en route (5 h minimum) if their journey is expected to exceed 52 h. There is public concern that this limit is outdated and may compromise cattle welfare. As a first step to evaluating how well cattle are coping with the stress of transit, the objective of our study was to examine the behavior of cattle being rested during long-distance transport. A total of 87 pens of cattle, from 53 different trucks, were observed at a commercial rest stop facility. Truck drivers were surveyed about their loads. During unloading and loading the number of times animals

slipped or fell was recorded. Behavior was recorded every 5 min for the first 5 h after unloading, using instantaneous sampling to document the number of cattle eating, drinking and lying. A mixed linear regression model was used for analysis with load as a random effect. The probability of an animal being observed performing a given behavior was the outcome. When feeding behavior was modeled there was increasing odds of feeding as time in transit increased ($P < 0.01$). There was a sex by distance traveled interaction; heifers had a decreased probability of feeding as distance traveled increased, while steers remained constant ($P = 0.02$). When drinking behavior was modeled, odds of drinking increased as outside temperature at unloading increased ($P = 0.02$). Cattle from loads with 4 slips during unloading had greater odds of drinking than those with less ($P = 0.03$). There was a quadratic relationship between distance traveled and drinking behavior where cattle had increasing odds of being observed drinking as distance increased up to a maximum of 1633 km traveled then odds of drinking decreased ($P < 0.01$). When lying was modeled, heifers had higher odds of lying than steers ($P < 0.01$) and odds of lying decreased with increasing time in transit ($P < 0.01$). Overall, these results suggest heifers may be more affected by the stress of transit, and that as journey duration increases cattle are more likely to eat and less likely to lie down.

Key Words: beef cattle, transport, behavior

288 Characterizing loads of cattle that stop for feed, water and rest during long-distance transportation in Canada. H. Flint¹, K. S. Schwartzkopf-Genswein², K. G. Bateman¹, and D. B. Haley^{*1}, ¹University of Guelph, Guelph, ON, Canada, ²Agriculture & Agri-Food Canada, Lethbridge, AB, Canada.

Roughly 200,000 beef cattle are transported into Ontario from western Canada each year. By law, if the trip will exceed 52 h, the cattle must be unloaded for feed, water, and rest, for ≥ 5 h. Some argue handling stress may outweigh the perceived benefits. The objective of our descriptive study was to characterize the loads of cattle stopping at one of 2 rest stations near Thunder Bay, ON and observe unloading/reloading. Drivers voluntarily completed a survey about their load and journey. We observed unloading and reloading for 104 truckloads, recording the time required to do these tasks and counting slips and falls by the cattle. A slip involved the animal losing its balance but remaining upright, while a fall was defined as any part of the animal's body, other than its legs, coming into contact with the ground. We also noted whether the driver carried an electric prod, although we could not quantify prod use. On average the loads we observed were in transit for (mean \pm SD) 29.20 ± 4.70 h before reaching the rest station and they stopped for 11.23 ± 2.75 h. The mean number of cattle per load was 100.7 ± 10.0 for weaned calves (< 300 kg), 63.9 ± 11.7 for backgrounded (300 – 550 kg), and 42.9 ± 2.7 for market-weight cattle (> 550 kg). The mean time taken to unload was 16.48 ± 5.77 min (n = 89) and was similar to the time required to reload: 15.70 ± 5.43 min (n = 99). The average number of slips and falls per load were low, but fewer occurred during unloading (slips = 0.67 ± 1.10 ; falls = 0.14 ± 0.38 /load) than reloading (slips = 1.51 ± 2.21 ; falls = 0.33 ± 0.69 /load). The drivers of 95/102 loads carried an electric prod while handling their animals. Twenty-three percent of drivers surveyed had taken Certified Livestock Transport training, which is a voluntary animal handling and transportation training program in Canada. In our study drivers stopped for feed, water and rest well before the maximum legal time limit of 48 h. Our results also show that animals are rested for substantially longer than the legal minimum requirement of 5 h. Last, in this study, the unloading and reloading of animals happened relatively quickly with few slips or falls.

Key Words: transportation, beef cattle, welfare

289 Evaluation of temperament scoring methods for beef cattle.

R. C. Vann^{*1}, D. G. Riley², D. A. Neuendorff³, N. C. Burdick Sanchez⁴, J. A. Carroll⁴, T. H. Welsh Jr.^{5,2}, and R. D. Randel³, ¹MAFES-Brown Loam Exp. Station, Raymond, MS, ²Department of Animal Science, Texas A&M University, College Station, ³Texas A&M AgriLife Research, Overton, ⁴Livestock Issues Research Unit, USDA-ARS, Lubbock, TX, ⁵Texas A&M AgriLife Research, College Station.

The objective of this study was to evaluate methods of temperament scoring in beef cattle. Crossbred (n = 228) calves were evaluated for temperament by an individual evaluator at weaning by 2 methods of scoring: (1) pen score (1 to 5 scale, with higher scores indicating increasing degree of nervousness, aggressiveness, etc.; groups of 3 animals) and (2) exit velocity (m/s; as the rate the animal traverses 1.83 m upon exiting a squeeze chute). Temperament score was the average of pen score and exit velocity. In addition, these same calves were re-evaluated for temperament with 2 methods of pen score 1 wk later: (1) individual pen score (1 to 5 scale) and (2) group pen score (1 to 5 scale; groups of 3 animals, same format as weaning measure); however every animal was given a pen score regardless of scoring method. Data were analyzed using mixed linear models with sire as a random effect. Age and sire breed of calf did not ($P \geq 0.05$) affect temperament measurements; however, sex of calf did influence group and individual pen score measurements ($P \leq 0.05$) and tended ($P = 0.08$) to influence weaning pen score measurement. Heifers had greater pen score measurements compared with bulls and steers when scored as a group (3.87 ± 0.12 vs. 3.08 ± 0.21 and 3.36 ± 0.14 , respectively), and greater than bulls when scored as individuals (3.69 ± 0.13 vs. 3.19 ± 0.21 and 3.37 ± 0.14 , respectively) and at weaning. Pen scores in groups were highly correlated ($P \leq 0.0001$) with individual pen score (0.81); weaning pen score (0.62), weaning exit velocity (0.54) and weaning temperament score (0.67). For residual correlation coefficients, pen scores in groups were highly correlated ($P \leq 0.0001$) with individual pen score (0.79); weaning pen score (0.61), weaning exit velocity (0.55), and weaning temperament score (0.66). In summary, (1) female calves have greater pen scores compared with male calves; (2) temperament score did not differ between group or individual pen scoring methods; and (3) results from these methods were highly correlated with each other and with results derived from other established methods of temperament scoring.

Key Words: beef cattle, temperament, pen scoring

290 Effects of weaning, repeated handling and transport on immune- and inflammatory genes and stress hormones.

W. R. Binion^{*}, T. H. Friend, J. E. Sawyer, P. K. Riggs, K.J. Kochan, and J. T. Jaques, Dept. of Animal Science, Texas A&M University, College Station.

The objective of this study was to determine if changes in expression of certain stress related genes could be useful indicators of stress. Angus sired steers (n = 20) between 5 and 6 mo of age and 166 ± 32 kg were weaned and then transported in 4 groups of 5 steers at a stocking density of 0.9 m² per head for 12 h. Jugular blood samples were taken before loading (0 h), and steers were briefly unloaded after 4, 8 and 12 h of transport for resampling. Steers were allowed ad libitum access to feed and water after transport and were then resampled 12 h post transport (24 h). RNA was extracted from leukocytes and transcript levels were quantified by real-time PCR for 15 genes using ribosomal RNA 18S as the reference gene and quantified by the delta delta CT method. Eleven

genes (LSP1, IL4R, HSP90AA1, IL10RB, SERP1, HSF2, CCRL1, TNFRSF1A, CXCR2, IL1RN, and IL12B) showed significant increases, or decreases, across the 3 sampling intervals ($P < 0.05$). CCRL1 showed the greatest increase in expression of all genes between the 8 h and 12 h sample ($P < 0.001$). Four genes (CCRL1, CXCR2, IL12B, and TNFRSF1A) decreased in expression during the 12 h recovery period ($P < 0.05$); no genes increased in expression during recovery. Four genes (CCR5, CXCR5, IFIT5, and IK) showed no response to transport or recovery ($P > 0.10$). Serum cortisol, triiodothyronine (T₃), and thyroxine (T₄) increased ($P < 0.05$) in concentration from 0 h to 12 h. Cortisol and T₃ decreased ($P < 0.05$) from 12 h to 24 h, with T₄ unchanged from 12 h to 24 h ($P < 0.30$). Mean weight loss of calves was significant (11.43 kg, $P < 0.05$) from 0 h to 12 h, and did not recover BW ($P = 0.59$) at 24 h. Cortisol, T₃, and T₄ responded to transport stress and recovery. Significant changes in expression for 11 genes indicate that these genes may be useful indicators of detrimental stress.

Key Words: gene expression, transport, stress

291 Genetic parameters of three methods of temperament evaluation of beef calves.

S. E. Schmidt^{*1,2}, D. A. Neuendorff¹, D. G. Riley², R. C. Vann³, S. T. Willard⁴, T. H. Welsh Jr.², and R. D. Randel¹, ¹Texas A&M AgriLife Research, Overton, ²Texas A&M University, College Station, ³MAFES-Brown Loam, Mississippi State University, Raymond, ⁴Mississippi State University-Starkville, Starkville.

The objective of this study was to estimate the heritability of 3 measures of temperament in Brahman and Brahman-influenced calves (n = 1,209). Individual animal pen scores (PS) were determined by a trained observer who evaluated groups of 4 calves at a time for willingness to approach a human. Exit velocity (EV) was the rate (m/s) at which each calf exited a squeeze chute. Temperament score (TS) was calculated individually (PS+EV/2). Temperament was evaluated at 5 different ages (28 d preweaning, weaning, 28 d postweaning, 56 d postweaning, yearling). Contemporary groups (n = 34) were comprised of calves of the same sex born in the same season of the same year. There were an average of 86 calves per contemporary group which ranged from 60 to 224. Average weaning age (186 d) ranged from 105 to 304 d. Calves were born from 2002 through 2012. Random effects included additive genetic and the permanent environmental variance. The fixed effects analyzed were age of dam, sex of calf, contemporary group, fraction of Brahman (2 levels: 1 and 0.5), age of calf at record, and weaning age. At weaning, the mean PS was 2.68 ± 0.1 , the mean EV was 2.41 ± 0.1 , and the mean TS was 2.48 ± 0.1 . PS was affected by fraction of Brahman ($P = 0.034$) and tended to be affected by age of dam ($P = 0.06$). EV was affected by contemporary group ($P < 0.001$) and tended to be affected by weaning age ($P = 0.074$). TS was affected by contemporary group ($P < 0.001$). All 3 methods of temperament evaluation were affected by age of calf at record ($P < 0.001$). The regression coefficients for PS, EV, and TS were 0.0023 ± 0.0014 , 0.0022 ± 0.0012 , and 0.0015 ± 0.0012 , respectively. Estimates of maternal genetic effects were always 0 and omitted from final models. Estimates of heritability were 0.27 ± 0.1 , 0.49 ± 0.1 , and 0.43 ± 0.1 for EV, PS, and TS, respectively. Estimates of permanent environmental variances as proportions of phenotypic variance were 0.33 ± 0.1 , 0.23 ± 0.1 , and 0.33 ± 0.1 for EV, PS, and TS, respectively. There appears to be sufficient additive genetic variance for selective improvement of temperament characteristics in Brahman cattle.

Key Words: temperament, heritability, Brahman