

Beef Species

452 Relationships between residual feed intake, ultrasound, and temperament traits in Brangus heifers. P. A. Lancaster^{*1}, G. E. Carstens¹, E. G. Brown¹, R. D. Randel², T. H. Welsh, Jr.¹, T. D. A. Forbes³, D. T. Dean¹, and A. D. Herring¹, ¹Texas Agricultural Experiment Station, College Station, ²Texas Agricultural Experiment Station, Overton, ³Texas Agricultural Experiment Station, Uvalde.

Residual feed intake (RFI) is a moderately heritable feed efficiency trait that is independent of changes in ADG and BW. Objectives of this study were to measure RFI in growing heifers and examine phenotypic correlations between RFI and performance, body composition, and escape velocity (indicator of temperament). Purebred embryo-transfer Brangus heifers (Camp Cooley Ranch; n = 114) were individually fed a roughage-based diet (ME = 2.2 Mcal/kg) using Calan-gate feeders. Weekly BW and DMI were measured for 70 d, and RFI calculated as the residual value from linear regression of DMI on mid-test BW^{0.75} and ADG. Ultrasound measures of 12th rib fat thickness (BF), longissimus muscle area (REA), and percent intramuscular fat (IM), and escape velocity were measured on d 0 and 70. Overall, ADG, DMI, and RFI were 0.90 (SD = .15), 9.10 (SD = 1.11), and 0.0 (SD = .75) kg/d, respectively. Escape velocity on d 70 was correlated with ADG (r = -0.28; P < 0.01) and DMI (r = -0.22; P < 0.05), but not with RFI. Escape velocity on d 70 was also correlated with BF on d 70 (r = -0.25; P < 0.01) and gain in BF (r = -0.21; P < 0.05). Results suggest that heifers with calmer temperaments had improved DMI and ADG but not RFI. RFI was correlated (P < 0.01) with DMI (r = 0.68) and feed conversion ratio (FCR; r = 0.56), but not with ADG, initial or final BW. FCR was correlated with ADG (r = -0.69; P < 0.01) and DMI (r = 0.18; P = 0.05). Average RFI for heifers with low (< 0.5 SD below the mean; n = 36) and high (> 0.5 SD above the mean; n = 31) RFI was -0.79 and 0.97 ± .06 kg/d, respectively. Heifers with low RFI consumed 18% less (P < 0.01) DMI and had 16% lower (P < 0.01) FCR than high RFI heifers, even though final BW and ADG were similar for both groups. RFI was not correlated with REA, BF, or IM measured on d 70, but tended to be correlated with gain in BF (r = 0.17; P = 0.08) and gain in IM (r = -0.17; P = 0.07) from d 0 to 70 of the trial. Increased leanness may have contributed to the enhanced feed utilization of low RFI heifers, but the magnitude of this contribution was small.

Key Words: Net Feed Efficiency, Escape Velocity, Carcass Traits

453 Relationships between feed efficiency and real-time ultrasound traits in growing and finishing steers. E. G. Brown^{*1}, G. E. Carstens¹, J. T. Fox¹, S. A. Woods¹, D. T. Dean¹, A. D. Herring¹, S. Moore², and P. C. Genho², ¹Texas Agricultural Experiment Station, College Station, ²King Ranch, Kingsville, TX.

The objective of this study was to examine phenotypic correlations between three feed efficiency traits and ultrasound measurements of 12th rib fat thickness (BF), longissimus muscle area (REA), and percent intramuscular fat (IM) in growing and finishing steers. Individual DMI were measured in Santa Gertrudis steers (n = 116) fed a roughage-based diet (ME = 2.1 Mcal/kg) for 77 d during the growing (G) phase and a grain-based diet (ME = 3.0 Mcal/kg) for 80 d during the finishing (F) phase using Calan gate feeders. Residual feed intake (RFI), residual gain efficiency (RGE) and feed:gain ratio (FCR) were calculated for G and F phases. RFI was calculated as the residual value from linear regression of DMI on mid-test metabolic BW (MBW) and ADG; RGE as the residual value from linear regression of ADG on MBW and DMI. Ultrasound measures of BF, REA and IM were obtained on d 70 of the G and F phases. RFI was positively correlated (P < 0.001) with DMI during the G (r = 0.68) and F (r = 0.61) phases, but not MBW or ADG. RFI ranged from -2.1 (efficient) to 2.3 (SD = 0.89) kg/d and -1.9 and 2.5 (SD = 0.98) kg/d during the G and F phases, respectively. RGE was positively correlated (P < 0.001) with ADG during the G (r = 0.81) and F (r = 0.73) phases, but not MBW or DMI. RGE ranged from 0.58 (efficient) to -0.41 (SD = 0.16) kg/d and 0.39 and -0.46 (SD = 0.17) kg/d during the G and F phases, respectively. FCR was negatively correlated (P < 0.001) with ADG during the G (r = -0.66) and F (r = -0.63) phases. Ultrasound

traits were not correlated with feed efficiency traits during the G phase. During the F phase, BF was positively correlated with RFI (r = 0.30; P < 0.001), but not RGE or FCR. Feed efficiency traits were not correlated with REA and IM during the F phase. Correlations between G and F phase feed efficiency traits were higher for RFI (r = 0.48; P < 0.001) than for FCR (r = 0.22; P < 0.05) or RGE (r = 0.27; P < 0.01), suggesting that RFI may be a more appropriate trait to assess feed efficiency across various production phases. More research is warranted to examine effects of diet and physiological status on RFI.

Key Words: Residual Feed Intake, Carcass Composition, Residual Gain

454 Optimizing use of distiller's grains in finishing cattle diets. B. E. Denbusch^{*}, J. S. Drouillard, E. R. Loe, and M. E. Corrigan, Kansas State University, Manhattan.

Two hundred ninety-nine crossbred-yearling steers (363 ± 15 kg initial BW) were fed for 114 days in a finishing study comparing 7 diets in which steam-flaked corn was used as the principal energy source. A control diet (CONTROL) with no distiller's grains was compared to six diets in which a portion of the flaked corn was replaced with distiller's grains with solubles (approximately 15% of DM). These diets contained wet sorghum distiller's grains with 0 or 6% alfalfa hay (WSDG0H, WSDG6H); dry sorghum distiller's grains with 0 or 6% alfalfa hay (DSDG0H, DSDG6H); and wet or dry corn distiller's grains with alfalfa hay (WCDG6H and DCDG6H, respectively). Average daily gains were 1.44, 1.35, 1.37, 1.22, 1.41, 1.41, 1.45 kg/d; DMI were 9.34, 8.71, 9.39, 8.66, 9.57, 9.21, 9.48 kg/d; and feed efficiencies were 0.154, 0.155, 0.147, 0.142, 0.148, 0.153, 0.153 for steers fed CONTROL, WSDG0H, WSDG6H, DSDG0H, DSDG6H, WCDG6H and DCDG6H, respectively. Steers fed sorghum-based distiller's diets with hay consumed more feed (P < 0.01) and gained more weight (P < 0.01) than steers fed diets without hay, but gain efficiencies were not different (P > 0.78). Dry matter intake and ADG were similar for steers fed wet and dry sorghum-based distiller's grains (P > 0.30), but steers fed wet sorghum distiller's grains tended (P = 0.08) to be more efficient than those fed dry sorghum distiller's grains. Steers fed corn- and sorghum-based distiller's grains had similar (P > 0.12) DMI, ADG, and efficiencies. Carcass attributes were largely uninfluenced by diet. These data suggest that distiller's grains with solubles derived from sorghum and corn are comparable when added to feedlot diets. Furthermore, complete removal of hay from the diet is not advised on the basis of these data.

Key Words: Distiller's Grains with Solubles, Roughage, Steam-Flaked Corn

455 Effects of vegetable and animal lipid sources on meat sensory attributes and longissimus muscle fatty acid profile from yearling beef steers. E. R. Loe^{*1}, J. S. Drouillard¹, K. A. Hachmeister¹, and F. N. Owens², ¹Kansas State University, Manhattan, ²Pioneer Hi-Bred International, Des Moines, IA.

From 363 harvested steers, 108 carcasses were selected based on visual appraisal of phenotype and fat thickness for analysis of meat sensory attributes and fatty acid profiling of fat from the longissimus muscle. Finishing diets had been fed for 132 d: 1) control - no added lipid, 2) tallow, 3) dry-rolled soybeans, 4) high-linoleic sunflowers, 5) mid-oleic sunflowers, and 6) high-oleic sunflowers. Rib sections were removed from one side of each carcass (2 carcasses/pen; 9 pens/treatment) approximately 24 h postmortem. Ribs were de-boned, packaged in impermeable vacuum bags, and stored at 0°C. After 14 d of storage, rib sections were removed from the vacuum packages and cut into steaks 2.5 cm thick for sensory analysis by trained panelists. Pen was the experimental unit and data were analyzed using SAS Proc Mixed, testing for linear and quadratic effects of oleic acid within sunflower treatments. Intensity of beef flavor was greater for cattle fed no added lipid than for cattle fed added lipid (P < 0.01). Off-flavor intensity was greater for steers receiving supplemental lipid (P < 0.05). Myofibrillar and steak tenderness were greater for steaks from cattle

fed mid-oleic vs high-linoleic or high-oleic sunflowers (quadratic; $P < 0.05$). Intensity of beef flavor and off-flavor intensity responded quadratically ($P < 0.001$) to dietary oleic acid; steaks from cattle fed mid-oleic sunflowers had greater intensity of beef flavor and lower intensity of off-flavor than steaks from cattle fed high-linoleic or high-oleic sunflowers. Steaks from cattle fed soybeans had more C18:2 fatty acids than steaks from steers fed sunflowers. Oleic acid content of steaks increased and linoleic acid decreased (linear; $P < 0.001$) as oleic acid content of sunflowers was increased. Dietary lipid source and fatty acid profile of lipid sources can influence flavor intensity and fatty acid profile of beef.

Key Words: Vegetable Oil, Tallow, Fatty Acid

456 Effects of source of lipid on finishing cattle performance and carcass characteristics. E. R. Loe^{*1}, J. S. Drouillard¹, and F. N. Owens², ¹*Kansas State University, Manhattan*, ²*Pioneer Hi-Bred International, Inc., Des Moines, IA*.

Crossbred steers ($n = 376$; 340 ± 21 kg) were fed for 132 d to evaluate effects of lipid source on feedlot performance and carcass merit. Steers were blocked by BW and allotted randomly to diet (9 pens/diet). Diets included 1) control - no added fat; 2) tallow; 3) dry-rolled soybean; 4) whole high-linoleic sunflower seed; 5) whole mid-oleic (66.7% of oil) sunflower seed; 6) whole high-oleic (86.8% of oil) sunflower seed; dietary fat concentrations were 3.2, 6.6, 6.5, 6.8, 7.1, and 6.0% (DM basis), respectively. Diets contained steam-flaked corn (mean = 72%) and 6.3% ground alfalfa hay (DM basis), and were formulated to contain 14% CP, 0.8% Ca, 0.75% K, and to provide 300 mg monensin and 90 mg tylosin daily. For the randomized complete block design, pen was the experimental unit; data were analyzed with PROC MIXED of SAS. Compared to steers fed rolled soybeans, steers fed sunflowers consumed 6% more feed ($P = 0.007$, DM basis), 7% more lipid ($P < 0.001$), and gained 7% faster ($P = 0.02$); steers fed tallow were intermediate; as oleic acid content of the sunflowers increased, DMI increased linearly ($P = 0.001$) but lipid intake decreased linearly ($P = 0.02$) and quadratically ($P < 0.001$). Steers receiving lipid were 9% more efficient ($P < 0.001$) and had more KPH fat ($P = 0.01$) than steers not receiving lipid. Steers fed tallow had fewer USDA Standard carcasses ($P = 0.03$) and tended ($P = 0.06$) to produce more USDA Choice carcasses than steers fed vegetable oils. Compared with those receiving mid-oleic sunflowers, steers fed high-oleic or high-linoleic sunflowers had greater 12th rib fat thickness, more KPH fat, higher USDA Yield Grades, and fewer USDA Yield Grade 1 carcasses (quadratic response; $P < 0.02$). Marbling linearly increased with oleic acid content of sunflowers ($P = 0.03$; marbling scores of Slight 53, Slight 47, and Slight 74 ± 12). Lipid source and fatty acid profile can influence feedlot performance and carcass characteristics of yearling steers.

Key Words: Vegetable Oil, Tallow, Fatty Acid

457 Effects of ractopamine-HCl (Optaflexx) and protein source on performance and carcass characteristics of feedlot heifers. B. E. Deppenbusch^{*}, D. K. Walker, E. C. Titgemeyer, E. R. Loe, M. E. Corrigan, M. J. Quinn, A. S. Webb, and J. S. Drouillard, *Kansas State University, Manhattan*.

Crossbred heifers ($n=72$; 475 ± 6 kg initial BW) were used in a 28-d finishing study with a 2×3 factorial arrangement of treatments. Factors consisted of protein source (with increasing UIP concentrations) and level of ractopamine-HCl (0 or 200 mg/heifer daily). Heifers were implanted with Revalor-H 60 d prior to starting the study. After allotment to treatments (12 heifers/treatment), heifers were placed into individual feeding pens (10 m²). Flaked corn finishing diets were formulated to 14% CP (dry basis) using 1.5% urea (UREA); 0.5% urea + 6.6% solvent extracted soybean meal (SBM); or 0.5% urea + 7.9% expeller process soybean meal (EXSBM), and provided 300 mg monensin, 90 mg tylosin, and 0.5 mg melengestrol acetate per heifer daily. DMI were not different among treatments ($P > 0.21$). There was an interaction between ractopamine and protein source for live weight gain and gain efficiency ($P < 0.05$). Gains and efficiencies for heifers fed no ractopamine increased as dietary UIP increased (1.37, 1.53, 1.81 kg/d and 0.156, 0.179, 0.198 gain/DMI for UREA, SBM, and EXSBM, respectively). Conversely, gains and efficiencies for cattle fed 200 mg/d ractopamine increased in response to higher DIP concentrations (1.71, 1.80, 2.06 kg/d and 0.205, 0.202, 0.223 gain/DMI for EXSBM, SBM, and UREA, respectively). No interactions existed for carcass-adjusted ADG or carcass-adjusted efficiencies ($P > 0.61$). Heifers fed ractopamine gained more weight and were more efficient than controls ($P < 0.01$). Heifers fed ractopamine tended ($P < 0.10$) to have greater carcass weights compared to controls (318, 316, and 319 kg for UREA, SBM, and EXSBM in cattle fed no ractopamine; and 328, 324, and 323 kg for UREA, SBM, and EXSBM in cattle fed 200 mg/d ractopamine). Marbling score and fat thickness were not different among treatments ($P > 0.30$). These data suggest that additional UIP supplementation is not required to optimize response to ractopamine in heifers.

Key Words: Ractopamine, Heifers, Protein

458 Effects of ractopamine and days on feed on performance and carcass traits of yearling steers. J. P. Hutcheson^{*1}, W. T. Nichols¹, C. D. Reinhardt¹, R. S. Swingle², and K. J. Karr², ¹*Intervet, Inc., Millsboro, DE*, ²*Cactus Research, Ltd., Amarillo, TX*.

Two-thousand two hundred fifty English \times Continental cross yearling steers (avg. 313 kg) were used in a randomized complete block study to evaluate the effects of ractopamine and days on feed on performance and carcass traits. Steers were blocked by arrival time at the research facility. On each arrival day cattle were processed and randomly allotted to 6 pens of 91 to 97 head each. Within each block, three pens were randomly selected to receive ractopamine (RAC) and the remaining three were controls (CON). Within each block and within each treatment, pens were randomly assigned to be fed for either 150, 171, or 192 days. RAC was fed at 200 mg/hd/d for the final 28 days on feed. When measured over the entire feeding period, feeding RAC increased ADG 4.6%, increased final weight 11 kg, improved G:F 3.4%, and increased HCW 8.2 kg ($P < 0.01$), and tended ($P = .12$) to reduce percent YG 4+5. All other carcass measurements were similar. Additional days on feed had a significant ($P < 0.10$) effect on final wt, ADG, DMI, G:F, dressing percentage, HCW, Yield Grade distribution, and Quality grade. There was an interaction between treatment and days on feed for G:F ($P = .09$) and carcasses weighing > 431 kg ($P < 0.01$) with greater differences between RAC and CON at 192 than at 150 or 171 days on feed. Feeding RAC improved performance regardless of days on feed. Increasing days on feed decreased performance but increased dressing percentage and carcass weight.

Key Words: Ractopamine, Feedlot, Steers

Breeding and Genetics: Beef Cattle Breeding and Genetics

459 Educating beef cattle breeders on the use of genomic technology for quantitative traits. W. Shafer^{*}, *American Simmental Association, Bozeman, MT*.

Individuals with little or no technical expertise make the majority of beef cattle breeding decisions. Even so, due to an extensive educational effort and the

technology's effectiveness, the decidedly technical EPD has become common currency in beef cattle breeding—evolving into the primary tool for affecting additive change in a population. Traditional EPDs have shortcomings, however. Specifically, Mendelian sampling relegates non-parents to low-accuracy evaluation and some economically important traits are not suited to the large-