BEEF SPECIES: FEEDLOT AND STOCKER

0905 (T031) The effect of good or poor residual feed intake sires on feedlot heifer performance and carcass characteristics. K. M. Retallick*[1], D. B. Faulkner[2], and D. W. Shike[3], *[1]CalPoly, San Luis Obispo, CA, [2]University of Arizona, Oro Valley, [3]University of Illinois, Urbana.*

Performance and intake data were collected for 90 d on Angus yearling bulls (n = 8) to calculate residual feed intake (RFI) on these potential sires. These bulls were than used as herd sires during the fall breeding season. The Angus x Simmental heifer (n = 84) progeny of these sires were randomly allotted to pens, managed similarly, and fed a common diet. Heifers had intake data collected for 70 d and were weighed every 2 wk for calculation of RFI during this period. Thirty-seven heifers were sired by poor RFI (RFI = 0.64 to 1.35) sires, and 47 heifers were sired by good RFI (RFI = -0.08 to -0.86) sires. The objective of this study was to observe performance and carcass characteristics of feedlot heifers sired by good or poor RFI sires and determine phenotypic feed efficiency correlations between sire and heifer progeny. Data were analyzed using PROC MIXED of SAS with sire RFI classification (poor or good) as a fixed effect and pen a random effect. Individual animal was the experimental unit. Phenotypic correlations were analyzed with the PROC CORR procedure of SAS. Heifer performance did not differ for initial weight, final weight, or ADG. Heifers sired by good (low value RFI) sires had a 0.65 kg/d lower DMI ($P < 0.05$) than heifers by poor (high value RFI) sires. As a result, heifers by good RFI sires had a 0.51 kg/d lower RFI than heifers by poor RFI sires. Heifers by good RFI sires also had a desirable 4.4% increase ($P = 0.21$) in G:F. Hot carcass weight, rib eye area, backfat, and yield grade did not differ. A 28-unit marbling advantage ($P = 0.18$) was given to poor RFI sired heifers. Heifer RFI was correlated to DMI at 0.78 ($P < 0.05$). Heifer RFI and heifer G:F were correlated at -0.27 ($P < 0.05$); however, sire RFI was not significantly correlated to heifer G:F. Sire RFI was correlated to heifer DMI at 0.33 ($P < 0.05$). Sire RFI was correlated at 0.47 ($P < 0.05$) to heifer RFI. The significant correlation of sire RFI to heifer RFI as well as desirable effects on performance and carcass traits assists in the quantification of the advantages of selecting for RFI.

Key Words: sire residual feed intake, heifer performance, feed efficiency

0906 (T032) Feed efficiency and carcass traits for Nellore young bulls fed processed soybean grains. M. C. L. Alves, M. M. Ladeira*, D. R. Casagrande, J. R. R. Carvalho, P. D. Teixeira, L. A. Silveira, A. C. Rodrigues, and L. R. Santos, *Universidade Federal de Lavras, Brazil.*

Use of lipid sources in beef cattle diet is recommended to increase diet energy density, and reduce acetate:propionate ratio and methane production, which may benefit ruminal fermentation and improve feed efficiency. The objective of this study was to evaluate the feed efficiency and carcass quality of Nellore young bulls fed ground soybean or extruded soybean. Sixty animals (average body weight of 320.33 ± 8.12 kg) were used in a completely randomized design. Corn silage was fed as the forage source along with three different types of concentrates, representing the following treatments: no soybean, ground soybean (GSB) and extruded soybean (ESB). Dietary crude protein averaged 13.9%, while soybean diets contained 6.1% ether extract. Animals were allocated to 12 pens based on dietary treatment (four pens/treatment). Animals were weighed at the beginning, after 26 d of adaptation to experimental diets, and at the end of the feedlot to calculate average daily gain after fasting cattle for 16 h. After 88 d on feed, cattle were slaughtered using cerebral concussion and exsanguination followed by recording hot carcass weights. After 24 h of chilling at 1°C, cold carcass weights were recorded, along with measuring subcutaneous fat thickness and longissimus muscle area between the 12th and 13th ribs. The statistical model included the effects of diet with data analyzed using PROC GLM (SAS 9.3). There were no effects of diet on performance and carcass characteristics (Table 0906). The feeding of processed soybeans did not affect feed efficiency and carcass traits for young Nellore bulls. *Funded by Fapemig, CNPq, Capes, and INCT-CA.*

Key Words: extruded, feedlot, lipids, oilseeds

Table 0906. Dry matter intake (DMI), average daily gain (ADG), feed efficiency (G:F), final body weight (FBW), hot carcass weight (HCW), cold carcass weight (CCW), longissimus dorsi muscle area (LMA), longissimus dorsi muscle area per 100 kg of carcass (LMA/100kg), backfat thickness (BF), dressing percentage (DP) for young bulls fed processed soybean

Item	NSB[1]	GSB[2]	ESB[3]	SEM	*P*–Value
DMI (kg/d)	10.2	9.85	9.96	0.298	0.73
ADG (kg/d)	1.50	1.44	1.53	0.059	0.55
G:F	0.14	0.14	0.15	0.004	0.46
FBW (kg)	440	438	451	10.029	0.56
HCW (kg)	250	249	259	4.633	0.26
CCW (kg)	246	244	255	4.410	0.24
LMA (cm^2)	66.1	66.6	68.2	2.252	0.86
LMA (cm^2/100kg)	27.8	27.3	26.8	1.089	0.83
BF (mm)	3.03	2.73	2.88	0.237	0.68
DP (%)	56.0	56.1	56.8	0.347	0.25

[1] Diet with no soybean

[2] Diet with ground soybean

[3] Diet with extruded soybean.

0907 (T033) Supplementing beef cattle finishing diets containing wheat distillers grain with feed enzymes to decrease the ratio of n-6/n-3 fatty acids in meat. Z. He*[1,2], M. He[1], Y. Zhao[1,3], N. D. Walker[4], K. A. Beauchemin[1], T. A. McAllister[5], and W. Yang[1], *[1]Lethbridge Research Centre, Agriculture and Agri-Food Canada, Lethbridge, AB, [2]Key Laboratory for Agro-Ecological Processes in Subtropical Region, Institute of Subtropical Agriculture, The Chinese Academy of Sciences, Changsha, [3]College of Animal Science, Inner Mongolia Agricultural University, Hohhot, China, [4]AB Vista Feed Ingredients, Marlborough, UK, [5]Agriculture and Agri-Food Canada, Lethbridge, AB.*

The objective of this study was to determine the effects of dietary feed enzyme (FE) supplementation on fatty acids (FA, % of total FA) profiles of the pars costalis diaphragmatis (PCD) muscle of beef cattle fed finishing diets with or without inclusion of wheat dried distillers grain with solubles (DDGS). One hundred sixty crossbred yearling steers (initial BW 495 ± 37.9 kg) were blocked by BW and randomized into 16 pens (10 steers/pen). The pens were randomly assigned to one of four treatments: 1) control (CON; 10% barley silage and 90% barley grain-based concentrate), 2) WDG (CON diet substituting 30% wheat DDGS for barley grain), 3) WDGL (WDG diet supplementing with low FE; 1 mL FE/kg diet DM), and 4) WDGH (WDG diet supplementing with high FE; 2 mL FE/kg diet DM). The PCD samples were collected from cattle at slaughter at the end of the finishing period (120 d) with a targeted live weight of 650 kg. Data were analyzed using the PROC MIXED of the SAS (SAS Institute Inc.), considering treatment (diet) as fixed effect. Contrasts were generated to compare the CON and WDG diet. Linear and quadratic orthogonal contrasts were generated to exam the effect of increasing FE in the diet containing wheat DDGS. Concentration of total polyunsaturated fatty acids (*P*UFA) in muscle was greater ($P < 0.01$; 4.52 vs. 3.41), whereas total monounsaturated FA tended ($P = 0.08$; 45.0 vs. 47.1) to be less for steers fed WDG than steers fed CON. In addition, inclusion of wheat DDGS into the diet vs. diet containing no DDGS increased ($P < 0.01$) concentration of conjugated linoleic acids and vaccenic acid (CLA+VA; 1.22 vs. 0.78) and decreased ($P = 0.03$) total trans FA (excluding CLA and VA; 0.98 vs. 1.27), consequently resulted in higher ($P < 0.01$) ratio of n-6/n-3 PUFA (10.95 vs. 7.72). Increasing FE application in wheat DDGS diets linearly decreased ($P = 0.02$) the ratio n-6/n-3 FA (10.95 to 9.23) in muscle without affecting amount of individual or total FA. These results suggest that application of FE in finishing diets containing wheat DDGS may improve FA profiles of beef which could benefit human health.

Key Words: beef, fatty acid, feed enzyme

0908 (T034) Effects of fat level in distillers grain on finishing feedlot performance and carcass traits. V. L. Anderson*[1] and C. L. Engel[2], *[1]North Dakota State University, Carrington, [2]Carrington Research Extension Center, North Dakota State University, Carrington.*

The objective of this study was to evaluate the effects of different corn oil levels in distillers grains (DG) on beef cattle performance during finishing and the effects on carcass traits. Angus sired steers ($n = 182$, 461.97 ± 4.38 kg) were blocked by weight (fall calves and yearlings) and allocated to one of four treatments based on corn oil level in DG: 1) control (CON) no DG, 2) low corn oil (LOW, 5.47%), 3) medium corn oil (MED, 8.05%), and 4) high corn oil (HIGH, 12.96%). Eleven or 12 steers were assigned to each of 16 pens with four replicates per treatment. Steers were fed a corn-based diet (136 Mcal/kg) to appetite formulated to meet or exceed NRC requirements. Steers were weighed after 28 d on feed and at the end of the finishing period which was an additional 41 d for the light blocks and 77 d for the heavy blocks. Steers were marketed in two drafts at Tyson Fresh Meats, Dakota City, NE, with carcass traits evaluated by the same trained grader. Fat level in the ration for the respective treatments was 3.58, 4.02, 4.52, and 5.48, for CON, LOW, MED, and HIGH. DG was included in the finishing diet at 19.4% (DM basis) with sunflower meal (2.44% oil) used in the CON ration. DMI tended to increase linearly with corn oil during the first 28 d on feed ($P < 0.07$) with 12.54, 12.78, 13.11 kg/hd/d consumed by LOW, MED, and HIGH, respectively. Feed intake was affected quadratically during the final finishing period ($P < 0.03$) and over the entire feeding period ($P < 0.05$). There is some suggestion ($P < 0.13$) of linearly improving gain with increasing corn oil during the first 28 d on feed; however, overall ADG was not affected by treatment ($P > 0.27$). Gain efficiency was not affected ($P > 0.26$) by treatment. Marbling score increased linearly ($P < 0.02$) with increasing corn oil. Yield Grade tended to increase linearly ($P < 0.07$) from 2.98 to 3.27 for CON and HIGH, respectively, and REA tended to decrease ($P < 0.07$) with increasing corn oil but other carcass traits were not affected ($P > 0.27$). These data indicate that higher corn oil in DG has some positive effect on feed intake and marbling but does not affect gain or gain efficiency.

Key Words: beef, distillers grain, corn oil

0909 (T035) Effects of zilpaterol hydrochloride feeding time on Nellore bulls performance and carcass characteristics. A. C. R. Dos Santos*[1], M. Caetano[1,2], R. S. Goulart[1,3], S. B. Pflanzer[4], S. Luz e Silva[5], and D. P. D. Lanna[1], *[1]University of Sao Paulo/ESALQ, Piracicaba, Brazil, [2]University of Adelaide, Roseworthy, Australia, [3]MSD Saúde Animal, Sao Paulo, Brazil, [4]University of Campinas/FEA, Campinas, Brazil, [5]University of Sao Paulo/FZEA, Pirassununga, Brazil.*

Nellore bulls (n = 96; initial BW = 377 ± 21.4 kg) were used in a randomized complete block design arranged in a 4 × 2 factorial to evaluate effects of zilpaterol hydrochloride (ZH; 8.33 mg/kg of diet DM basis) on performance and carcass traits. Total days on feed (DOF) were 90 and 117, and there were four periods of ZH feeding (0, 20, 30, or 40 d before slaughter) plus a 3-d ZH withdrawal period for all animals. No interactions between ZH and DOF were detected for the performance or carcass characteristics (P > 0.10). There was a linear increase for G:F (β = 0.0005; P < 0.01), HCW (β = 0.4304; P = 0.03), dressing percentage (β = 0.0541; P < 0.01), and LM area (β = 0.1318; P = 0.01) with length of ZH feeding. Additionally, there was a linear decrease for kidney, pelvic and inguinal fat (β = -0.0384; P = 0.04) when ZH feeding period was increased; however, no difference was noted for 12th-rib fat. In conclusion, Nellore bulls fed ZH had improvements in feed efficiency and carcass traits over controls, and these were independent of DOF. The effects of increasing the length of ZH treatment to 30 or 40 d were relatively small, and this data can be used to find the best economic option based on feed, cattle, and ZH costs.

Key Words: β-agonist, beef cattle, feedlot

Table 0909. Effect of ZH feeding period on Nellore performance and carcass traits

	ZH feeding period					
	0	20	30	40	SEM	*P*-value
Final BW, kg	561	572	566	571	10.60	0.68
ADG, kg/d	1.75	1.87	1.81	1.91	0.06	0.28
DMI, kg/d	10.22	10.12	9.96	9.83	0.27	0.60
G:F	0.171	0.185	0.182	0.194	0.006	< 0.01**
HCW, kg	306	320	319	324	7.06	0.03*
Dressing percentage, %	54.6	55.9	56.3	56.7	0.30	< 0.01**
Kidney, pelvic and inguinal fat, kg	13.4	11.6	11.9	11.9	0.55	0.04*
12th-rib fat, mm	5.38	4.63	4.72	5.17	0.27	0.17
LM area, cm^2	76.3	79.2	81.7	81.1	1.87	0.02*

* Linear effect (P < 0.05).

** Linear effect (P < 0.01).

0910 (T036) Influence of calcium depletion and repletion on beef tenderness of steers fed zilpaterol hydrochloride. J. O. Carothers*, D. N. Burton, K. R. Underwood, and R. H. Pritchard, *South Dakota State University, Brookings.*

The objective of this study was to evaluate the influence of manipulating dietary Ca to influence tenderness via the calpain system in steers fed zilpaterol HCl (ZIL). Steers (n = 120; BW 478 ± 18 kg) were blocked by BW, and randomly assigned to one of three treatments 50 d before initiating dietary treatments. Dietary treatments included: 1) Control, conventional finishing diet (sans ZIL); 2) Control diet plus ZIL (6.78 g/T) fed for 20 d; and 3) depleted dietary Ca while feeding ZIL. Cattle on treatments 2 and 3 were changed to diet 1 for 3 d before harvest, which restored dietary Ca for cattle on treatment 3 and accommodated ZIL withdrawal requirements. A subsample of steers were taken to quantify serum Ca levels, and shear force values for strip loins and sirloin butts. Blood was collected from the subsample 24 h before harvest (48 h after cattle treatment 2 and 3 switched to diet 1). Muscles were cut into steaks and aged 14 d. Orthogonal contrasts were used to compare control vs. ZIL (treatment 1 vs. 2 and 3) and Ca manipulations (treatment 2 vs. 3). Feeding ZIL caused increased (P < 0.05) BW (610 vs. 620 kg), ADG (1.32 vs. 1.66 kg), and G:F (116 vs. 152 g/kg) compared to control. Zilpaterol increased (P < 0.05) HCW (373 vs. 392 kg), dressing percentage (63.08 vs. 65.10%) and LMA (82.26 vs. 91.52 cm^2) but did not affect (P > 0.05) marbling score (Small73 vs. Small55) when compared with control. Calcium manipulation did not affect (P > 0.05) live or carcass variables or serum Ca levels (10.6 vs. 11.0 mg/dl). Zilpaterol increased WBSF values (P < 0.05) for 14 d aged strip steaks (5.28 vs. 6.99 kg), while having no effect (> 0.05) on shear force values for sirloin butts (6.24 vs. 6.83 kg). Dietary Ca manipulations did not affect (P > 0.05) shear force values. Manipulating dietary Ca did not adversely affect live performance or carcass traits. Prolonged repletion (3 d) may have been too long to allow for influences on the calpain system to affect tenderness.

Key Words: beef, zilpaterol, tenderness

0911 (T037) Using early ultrasound measurements to predict beef carcass quality grade. J. K. Smith*, M. D. Hanigan, S. P. Greiner, and M. A. McCann, *Virginia Polytechnic Institute and State University, Blacksburg.*

Although many cattle producers have focused selection efforts toward enhancing carcass marbling, a number of pre- and post-weaning management factors often limit the ability of finished cattle to achieve their marbling potential. Enhancing the ability of a feeder to predict finished quality grade (QG) before entry into a finishing program would allow for more strategic utilization of management practices that impact QG,

particularly for cattle with lower likelihood of achieving QG-based retail brand acceptance. The objective of this experiment was to evaluate the ability of early ultrasound measurements collected before finishing to predict finished carcass marbling score (MS) and QG. Serial early ultrasound measurements of ribeye area (REA), 12th-rib subcutaneous fat thickness (SFT) and percent intramuscular fat (IMF) were collected from early- and conventionally-weaned Angus-sired steers ($N = 60$) from three separate calving seasons within a single herd. Ultrasound measurements were collected at the time of early-weaning (EW; 105 ± 18 d of age), conventional-weaning (CW; 210 ± 18 d of age), and again on conclusion of backgrounding (360 ± 60 d of age) immediately before feedlot arrival. Cattle were adapted to a concentrate and corn silage-based ration and finished for 131 ± 34 d at one of two feedlots before being harvested on reaching a common ultrasound predicted SFT of 1 cm. Carcasses were evaluated by a panel of trained analysts to determine MS and QG. Initial screening for factor effects of weaning treatment, sire, and ultrasound predicted REA, SFT and IMF measurements for each of the three time points via the screening procedure of JMP Pro (version 10.0.2; SAS Institute, Cary, NC) indicated that IMF and REA measurements collected at CW and immediately before feedlot arrival explained a significant ($P < 0.05$) portion of the variation in carcass MS. Full four-way factorial regression models were then generated to predict carcass MS ($R^2 = 0.83$; $P < 0.05$) and the probability of achieving a specific QG ($R^2 = 0.95$; $X^2 = 129$; $P < 0.0001$) using the Fit Model procedure of JMP Pro. These results provide evidence that early carcass measurements for REA and IMF can be effectively utilized to explain a major portion of the variation in finished carcass MS and QG. Such information could be utilized to produce models that allow feeders to predict carcass QG at receiving.

Key Words: beef, quality, marbling

0912 (T038) Influence of breed on the sensory meat quality and consumer acceptability in extensively reared beef.

M. E. A. Canozzi[1], L. Sphor[1], C. M. Pimentel[2], J. O. Barcellos[3], C. H. E. C. Poli[1], R. D. Sainz[4], and L. Kindlein[*1], *[1]Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil, [2]Universidade de Brasília, Brazil, [3]Universidade Federal Do Rio Grande Do Sul, Porto Alegre, Brazil, [4]University of California–Davis, Davis.*

We evaluated the sensory characteristics of meat from different animal types, including cattle (Angus and Brangus) and buffalo raised on pasture, and collected information on socio-demographic determinants of consumer preference. Samples were roasted rib eye, sliced and served in a disordered and monadic manner to 188 untrained tasters. A nine-point hedonic scale was used to assess odor, color, tenderness, succulence and overall appearance. Analysis of variance was conducted using the GLM procedure, considering animal type and socio-demographic characteristics as fixed effects and using the LSMEANS procedure for multiple mean comparisons. Differences ($P < 0.001$) between animal types were observed only for tenderness, with Brangus (7.02) and buffalo (6.82) meat being superior to Angus (6.25). Regardless of the meat origin, age, income, smoking and place of purchase affected the perceived attributes ($P < 0.05$). People aged over 50 yr gave higher mean scores for odor and color ($P < 0.05$), indicative of greater satisfaction and less demanding tastes when compared to other age categories. Most meat was purchased from supermarkets and butchers (82%). The majority (84%) of the panelists reported acquiring chilled rather than frozen meat, which may account for the high juiciness, flavor intensity, flavor, and overall acceptability reported. Despite the variability in the intrinsic characteristics of the meat products, differentiation by the consumer is not easy to determine, with little impact of socio-demographic characteristics on organoleptic perception. The different types of animals did not affect the general visual appearance of the meat as perceived by the consumer. Meat from Brangus cattle and buffaloes raised on pasture was considered more tender by an untrained taste panel than that from Angus cattle raised under the same conditions.

Key Words: beef, quality, palatability

0913 (T039) Evaluation of growth and performance characteristics before entering the feedlot as an indicator for contracting bovine respiratory disease.

S. Miller[*1], M. D. Garcia[2], R. Walker[3], T. Page[1], and K. W. Harborth[1], *[1]Louisiana State University, Baton Rouge, [2]Louisiana State University, Baton Rouge, [3]Louisiana State University AgCenter, Homer.*

The objective of the current study was to evaluate growth and performance traits before entering the feedlot as potential indicator of bovine respiratory disease (BRD) susceptibility. A population of 560 spring-born crossbred steers (2009–11) from the Central Research Station and the Hill Farm Research Station in Louisiana were evaluated for growth and performance before being shipped (2010–12) to a commercial feedlot in Guymon, OK. The growth and performance traits evaluated consisted of birth weight, weaning weight, and hip height. Bovine respiratory disease status was recorded by the feedlot and consisted of animals treated for BRD or animals that subsequently perished due to BRD infection. A total of 24 steers over the 2-yr evaluation period contracted BRD and were subsequently treated or perished in the feedlot. The PROC MIXED model of SAS was utilized to determine if associations between growth and performance traits and BRD status in the feedlot were linked. Fixed variables in the model included year of entrance into the feedlot, farm of origin and BRD status while in the feedlot. Growth and performance traits were fit in the model as random variables. Analyses revealed that no one trait had a significant effect ($P < 0.05$) on BRD status in the feedlot. However, birth

weight did exhibit a genetic trend ($P < 0.09$) in which animals with larger average birth weights (39.84 kg) had a higher degree of BRD incidence in the feedlot than animals with smaller birth weights (37.63 kg) in the utilized population. While no one growth and performance trait was statistically significant ($P < 0.05$), the fixed variable of year was highly significant ($P < 0.0001$) in the statistical model, thus necessitating further evaluation of other environmental and management variables that could be influencing susceptibility of contracting BRD during the feedlot stage of production.

Key Words: bovine respiratory disease, feedlot, growth and performance

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0914 (T040) Maximizing profit in a feedlot enterprise using systems analysis thinking and linear programming. K. J. Retallick*[1], T. E. Adcock[1], T. R. Schultz[1], J. M. Bormann[1], R. L. Weaber[1], D. W. Moser[1], and M. D. MacNeil[2], *[1]Kansas State University, Manhattan, [2]Delta G, Miles City, MT.*

Systems' thinking is a management discipline that concerns understanding a complex entity studying the components and interactions between them that form the entirety of that entity. In this case, a system analysis approach was applied to a stereotypical situation of a farmer/feeder. Feedlot enterprises were evaluated using linear programming to maximize profitability from excess feedlot capacity. The hypothetical feedlot analyzed was based on data recorded by Iowa State University Extension. Four alternative beef cattle enterprises: weanlings, yearlings, performance-tested bulls, and beef replacement heifers, were investigated as alternative uses for the excess capacity. An earthen feedlot facility with shelter was modeled. Capacity was constrained by 60,000 linear inches of bunk and a weekly feed holding capacity of 5000 bushels of whole corn. The objective function summed the products of per head profit and numbers of each class of cattle. Results from three alternative scenarios have been presented here. Linear programming models were solved using Microsoft Excel. Simulation 1 involved only the two initial constraints on capacity and maximum profit resulted when 4630 yearlings and 159 performance-tested bulls filled the feedlot. This system assumed both yearlings and performance-tested bulls were turned over twice a year with consistent availability of cattle. In Simulation 2, it was assumed the owner-operator owned 1500 weaned calves, and these were forced into the solution. In this scenario, profit margins were maximized when 3439 yearlings, 26 performance-tested bulls, and the 1500 weaned calves filled the feedlot. Simulation 3 included 200 owned replacement females. This constraint pushed the system to fill the feedlot with 3200 yearlings, 1500 owned weanlings, and 200 owned replacement females. This simulation exercise represents the value of applying both systems thinking and linear programming in real management situations to determine maximum profits with resources available.

Key Words: cattle, feedlot, profit