167 Evaluation of multiple ancillary therapies utilized in combination with an antimicrobial in newly received high-risk calves treated for bovine respiratory disease. B. K. Wilson*[1], C. L. Maxwell[1], D. L. Step[2], C. J. Richards[1], and C. R. Krehbiel[1], *[1]Department of Animal Science, Oklahoma State University, Stillwater, [2]Department of Veterinary Clinical Sciences, Oklahoma State University, Stillwater.*

This experiment evaluated 3 commonly used ancillary therapies in combination with an antimicrobial in high-risk calves treated for bovine respiratory disease (BRD). Crossbred steers (n = 516; initial BW = 217 ± 20 kg) were monitored daily for clinical signs of BRD. Calves that met treatment criteria (n = 320) were randomly assigned to 1 of 4 experimental treatment groups: intravenous flunixin meglumine injection (NSAID), intranasal viral vaccination (VACC), intramuscular vitamin C injection (VITC), or no ancillary therapy (NOAC). Mortality attributed to BRD was 13%. Data were analyzed using the GLIMMIX procedure (SAS 9.3) with pen (n = 16; 4 per experimental treatment) serving as the experimental unit. Steers receiving VACC tended (P = 0.10) to require a second BRD treatment less frequently than steers receiving NSAID or NOAC. Calves receiving NSAID or VITC tended (P = 0.09) to require a third BRD treatment less often than calves receiving NOAC. Of calves treated 3 times for BRD, those receiving NOAC had lower (P = 0.05) severity scores than those receiving VACC or VITC and heavier (P = 0.02) BW than those receiving NSAID, VACC, or VITC at the time of third treatment. Between the second and third BRD treatments, calves receiving NOAC also had greater (P = 0.03) ADG than those receiving VACC or VITC and tended (P = 0.06) to have greater ADG than those receiving NSAID. Calves receiving NOAC tended (P = 0.07) to have heavier BW on d 28 than NSAID, VACC, or VITC with mortalities and removals excluded. When contrasted with the average of NSAID, VACC, and VITC calves, NOAC calves tended (P < 0.10) to have heavier BW on d 56, greater ADG and DMI from first BRD treatment through d 28, greater DMI from d 28 through d 56, and had greater (P = 0.05) DMI from first BRD treatment through d 56 with mortalities and removals excluded. Responses to ancillary therapy were negligible in this experiment. The use of NSAID, VACC, and VITC appears to have minimal benefits and could potentially be detrimental to animal performance in severely challenged calves.

Key Words: ancillary therapy, bovine respiratory disease, high-risk calf

168 Interactions of rectal temperature status and vaccine type with sire on weight gain and feed intake in *Bos indicus* crossbred steers following Bovine Viral Diarrhea Virus challenge. C. A. Runyan*[1], X. Fang[1], E. D. Downey[1], T. B. Hairgrove[2], J. E. Sawyer[3], J. G. Moreno[1], J. F. Ridpath[4], and A. D. Herring[1], *[1]Texas A&M University, College Station, [2]Texas Agrilife Extension, College Station, [3]Texas Agrilife Research, College Station, [4]USDA-ARS, Ames, IA.*

Half-blood (F_2 and F_3), yearling Angus-Nelore steers (n = 106) were evaluated in 2012 for weight gain, feed intake, and rectal temperature after vaccination for Bovine Respiratory Disease (BRD) pathogens and subsequent intranasal challenge with Bovine Viral Diarrhea Virus (BVDV). Steers were confirmed free of BVD persistent infection and stratified by sire over 3 vaccine groups of killed (KV; n = 35), modified-live (MLV; n = 35), and non-vaccinated (NON; n = 36). KV steers received immunizations at d −49 and d −28, and MLV steers received a single immunization at d −28. On d 0 all steers were challenged via intranasal ingestion of BVDV Type 1b strain CA0401186a. Weights and rectal temperatures were collected on d 0, 3, 7, 10, 14, 28, 42. Steers were housed in 4 pens (balanced across vaccine groups) with daily feed intake (DFI) collected via a Growsafe system. A rectal temperature threshold over 40°C on evaluation days was used to classify steers for rectal temperature status (RTEMP). Mixed model procedures, with repeated measures were used to analyze DFI with a model that included fixed effects of vaccine group (VAC), pen, day, sire, RTEMP, and 2-factor interactions for VAC × RTEMP, sire × RTEMP, Sire × VAC and day × VAC; all were significant except VAC. ADG was calculated for the three 14-d periods as well as the 42-d period and was analyzed with a model containing similar fixed effects plus d-0 weight as a covariate; pen, Sire x VAC, and Sire × RTEMP were significant. For the Sire × RTEMP interaction (DFI, P < 0.01; ADG from d 0–42, P = 0.03), most sires had progeny rank higher for DFI and ADG when below RTEMP threshold, but some had higher DFI and ADG for progeny above RTEMP threshold. There was not a consistent trend across sires for the Sire × VAC interaction for DFI (P < 0.01) or ADG from d 0–42 (P = 0.05), implying that DFI and ADG may be affected quite differently across genetic backgrounds following BRD vaccination and subsequent pathogen exposure.

Key Words: BVDV, feed intake, ADG

169 Using DNA paternity testing to evaluate commercial bull performance. D. J. Drake[2], K. L. Weber[1], and A. L. Van Eenennaam*[1], *[1]Department of Animal Science, University of California, Davis, [2]University of California Cooperative Extension, Yreka.*

DNA markers for paternity identification were used to evaluate the breeding performance of bulls in multisire natural service breeding pastures on 3 large ranches in northern California for 3 consecutive years. All bulls passed breeding soundness examinations and were grouped with bulls of similar age. Two of the ranches had both fall- and spring-calving herds, while the third ranch had only a single fall calving herd. Breeding seasons ranged from ~90 d to 120 d depending upon the ranch. The cow:bull ratio was approximately 25 cows to 1 although the size of the group varied, giving bulls in larger groups access to a larger number of cycling females on any given day. Birthdate records and DNA samples were collected on 5,382 individually identified calves enrolled in the trial. Of these 5,272 (98%) were assigned to an individual sire. Bulls present per season (n = 296) produced 17.8 ± 13.1 progeny per calf crop, ranging from 0 to 63. Bulls with reduced breeding seasons due to injury or lack of condition produced fewer calves 9.1 ± 2.2 compared with full breeding season bulls 18.9 ± 0.78 progeny (P < 0.01). Bulls produced similar numbers of progeny across ranches (18.5 ± 1.2, 20.4 ± 1.8, 18.5 ± 1.4, P = 0.63), years (19.6 ± 0.4, 19.2 ± 1.4, 17.9 ± 1.4, P = 0.68), and season (20.3 ± 1.5, 18.3 ± 0.9, P = 0.27). The maximum number of calves sired by one bull in one day was 11 when placed with naturally cycling, unsynchronized females. The more prolific bulls sired more early calves (d 1–21 of the calving season) than low prolificacy bulls (P = 0.05). SC EPD was positively related to prolificacy (R^2 = 0.05, P < 0.01). There was a trend (R^2 = 0.01, P = 0.14) for older bulls to sire an increased number of progeny. Although most bulls in the study were Angus, the calves that were sired by South Devon (n = 217) and Hereford (n = 145) bulls were on average 20.4 kg and 16.4 kg heavier (P < 0.01) at weaning respectively, due to heterosis in these herds with high percent Angus commercial females. Prolificacy was the main driver of bull contribution to ranch income explaining 98.4% of the variation, whereas the individual calf value explained only another 0.88% of the variation.

170 Field assessment of progeny from sires with divergent residual feed intake genetic test results. K. L. Weber*[1], B. Welly[1], J. A. Rendon[2], C. Antwi[3], G. Acetoze[1], E. Kebreab[1], E. D. M. Mendes[4], and A. L. Van Eenennaam[1], *[1]University of California, Davis, Davis, [2]Universidad Autonoma de San Luis Potosi, San Luis Potosi, Mexico, [3]Kwame Nkrumah University of Science & Technology, Kumasi, Ghana, [4]Embrapa, Corumba, MS, Brazil.*

Due to the high cost of feed in beef production systems, there is interest in selecting cattle for feed efficiency, or ability to convert feed to marketable product. One measure of feed efficiency is residual feed intake (RFI), defined as the difference between observed feed intake and that predicted from metabolic body weight and rate of gain. The objective of this demonstration project was to assess the RFI in progeny derived from 2 Angus sires (HIGH, LOW) whose RFI breeding values differed by 0.32 kg/d based on the HD 50K MVP genetic test (Zoetis, Kalamazoo, MI). At 8 mo of age, 8 steer progeny from each sire, selected by live weight, were fed a growing ration (NEm 0.915 MJ/kg, NEg 0.525 MJ/kg). The steers' feeding intake and behavior were measured over 70 d using the GrowSafe System (Airdrie, AB Canada), and RFI calculated (RFI-GROW). The steers were finished in individual pens at the UC Davis feedlot, and finishing ration (NEm 1.76 MJ/kg, NEg 1.18 MJ/kg) feed intake was manually recorded. Body weights and ultrasound measures were taken every 2 weeks. Finishing RFI (RFI-FINISH) was calculated over an average of 91 d (70–105 d). Slaughter end point was determined based on ultrasound backfat thickness (11 mm), and a variety of carcass measurements were collected. Significance testing was performed using GLM procedures in R. Steers from the LOW RFI sire tended toward lower RFI-GROW (−0.64 kg/d, $P = 0.087$), with reduced visits to the bunk ($P < 0.05$) and increased visit duration ($P < 0.01$) when group-housed with GrowSafe. RFI-FINISH was significantly lower for LOW steers (−0.56 kg/d, $P < 0.05$). During the finishing period, LOW steers had heavier mid-test weights ($P < 0.05$), and a trend toward higher ADG ($P = 0.078$) and higher mid-test weight/hip height ($P = 0.083$). At slaughter, LOW steers had heavier empty body weights ($P < 0.01$) and increased carcass specific gravity ($P < 0.05$), suggesting LOW animals were leaner than HIGH animals for their carcass weight. These data showed a consistent trend of improved feed efficiency during both the growing and finishing phase in the steer progeny derived from the LOW RFI MBV Angus sire.

Key Words: beef, feed efficiency, genomic prediction

171 Relationships between residual feed intake EPD and metabolic variables of progeny from Red Angus sires divergent for maintenance energy EPD. C. M. Welch*[1], S. E. Speidel[2], W. J. Price[1], J. K. Ahola[2], J. B. Hall[1], G. K. Murdoch[1], D. H. Crews Jr.[2], C. S. Schneider[1], and R. A. Hill[1], *[1]University of Idaho, Moscow, [2]Colorado State University, Fort Collins.*

The Red Angus Association of America has developed the maintenance energy (ME_M) EPD as an estimator of maintenance requirements. Due to the associations among energy expenditure, performance, and feed intake, it has been proposed that ME_M EPD may be associated with residual feed intake (RFI). Postweaning RFI and other performance measures were recorded in 3 birth year contemporary groups from the progeny (n = 222) of sires (n = 12) divergent for ME_M EPD. The objectives of this study were to 1) identify relationships between sire RFI EPD and progeny serum IGF-I concentration and myogenic gene expression, and 2) identify the relationship between sire ME_M EPD and RFI EPD. Sires were partitioned into high (inefficient) and low (efficient) RFI groups based on their RFI EPD. For modeling purposes, RFI groups were considered as fixed effects while contemporary groups were random effects. Serum IGF-I concentration (collected at weaning) was higher ($P < 0.05$) in the high RFI group. In addition, serum IGF-I concentration was positively correlated (r = 0.34; $P < 0.0001$) with RFI EPD. Using biopsy samples collected from the biceps femoris, the relationship between key genes in various regulatory pathways and RFI EPD were evaluated, and no associations ($P > 0.05$) were detected for gene expression and RFI EPD. Furthermore, sire ME_M EPD was found to be negatively correlated (r = −0.26; $P < 0.003$) with sire RFI EPD. Therefore, our data analyses indicate (1) serum IGF-I concentration may be an underlying metabolic indicator of RFI due to its relationship with RFI EPD, (2) evaluation of myogenic gene expression offered no insight into the physiological mechanisms associated with the RFI phenotype, and (3) the negative correlation between RFI EPD and ME_M EPD may suggest that a properly weighted selection index tool could be developed to improve efficiency of feed utilization.

Key Words: EPD, IGF-I, residual feed intake

172 Factors influencing feed efficiency of beef cows of varying proportion of Brahman influence. S. W. Coleman* and J. P. S. Neel, *USDA ARS, El Reno, OK.*

Feed constitutes the greatest proportion of costs in cow-calf production. Therefore, genetic merit for feed efficiency has received interest from producers, but has generally been assessed in growing animals. The objectives of this study were to determine the main factors that contribute to variance in feed intake and determine whether proportion Brahman genetics (B) interacts with those factors. Ninety cows, varying in proportion Brahman influence (0, 1/4 and 1/2), were fed in groups of 30 over 3 seasons (S; 2 spring- and 1 fall-calving) in pens designed to determine individual feed intake. Within about 3 wk postpartum, cows and their calves were evaluated throughout lactation. Cow and calf weights and milk production and composition were determined at monthly intervals. Sorghum silage was the primary dietary component for cows, being supplemented with a grain and cottonseed mix to mimic forage from rangeland. Calves were offered whole oats in separate creep feeders. Diet samples were taken at weekly intervals and analyzed for CP and IVDMD while refusals were taken as needed. The diets averaged 8.2, 7.6, and 8.8% CP and 55.7, 50.3, and 48.9% IVDMD for each of the seasons, respectively. Digestible dry matter intake (DDMI) of cows was the variable of interest and analyzed using GLM of SAS. The model included class effects of S and B, continuous variables average daily milk energy produced, calf ADG, cow weight, and season-long weight change, and interactions of S and B with the continuous variables. Season ($P < 0.01$), milk energy ($P = 0.07$), calf ADG ($P < 0.01$), and the interaction of B with calf ADG ($P < 0.08$) and cow weight ($P = 0.06$) influenced DDMI ($R^2 = 0.9$). Each additional kg of calf ADG required 1.13 kg DDM, but cows with either 0 or 1/2 Brahman required less than those with 1/4 Brahman influence. A kg of milk energy required 1.32 kg additional DDM. Cows generally lost weight over the lactation on these diets, but the level of loss did not influence variation in intake. Dry matter intake of these cows was greater than that predicted by the NRC equation.

Key Words: feed efficiency, cow-calf, Brahman influence

173 The effect of heterosis of dam and crossbreeding on progeny's feed efficiency, performance and carcass characteristics. K. M. Retallick*[1], D. B. Faulkner[2], S. L. Rodriguez-Zas[1], J. D. Nkrumah[3], and D. W. Shike[1], *[1]University of Illinois, Urbana, [2]University of Arizona, Tucson, [3]Pfizer Animal Genetics, Kalamazoo, MI.*

Two experiments (1: n = 577) (2: n = 158) were conducted to analyze maternal effects and crossbreeding on subsequent steer performance,

carcass, and feed efficiency traits. Steers were early weaned at 78 ± 24 d of age and randomly pen allotted. Steers were managed similarly before weaning and fed a common finishing diet. In experiment 1, Angus (AN) and/or Simmental (SM) maternal dam breeds were represented: (1) 100% AN (AN), (2) 75% AN (75AN), (3) 50% AN (50AN), and (4) 25% AN (25AN). The remaining percentage was SM. Results from experiment 1 showed that DMI was 0.22 kg/d lower ($P < 0.05$) for progeny of 75AN and 50AN indicating a positive influence of maternal heterosis. Consequently, residual feed intake (RFI) had a tendency to improve ($P = 0.06$) for 75AN and 50AN compared with AN and 25AN dams. Residual BW gain of progeny tended to improve ($P = 0.07$) as percent of AN decreased in the dams. Steers whose dams had a decreased percentage of AN also had more desirable ($P < 0.05$) LM area, backfat, and yield grade. In conclusion, experiment 1 showed that dams of varying AN breed composition produce offspring that perform differently in the feedlot with progeny that were from 75AN dams excelling in the feedlot. In experiment 2, purebred AN and SM sires and dams were utilized. Experiment 2 resulted in progeny from SM dams having a more desirable RFI ($P < 0.05$). An improved HCW, backfat, LM area, and consequently yield grade was shown by progeny of SM dams ($P < 0.05$); however, marbling score was 80 units higher for progeny of AN dams ($P < 0.05$). When compared, sire breeds had no difference in HCW ($P = 0.82$), but SM-sired progeny had an advantage in LM area, backfat, and yield grade ($P < 0.05$). The only sire by dam breed interaction was for marbling score ($P = 0.05$). Experiment 2 showed both maternal and paternal effects on progeny in the feedlot with the maternal advantage in RFI given to progeny of SM dams. Overall, maternal breed effects on performance, feed efficiency measures, and carcass traits of resulting progeny appear to be important.

Key Words: feed efficiency, feedlot, maternal breed effect

174 Relationship among performance, carcass, and feed efficiency characteristics and their ability to predict economic value in the feedlot. K. M. Retallick*[1], D. B. Faulkner[2], S. L. Rodriguez-Zas[1], J. D. Nkrumah[3], and D. W. Shike[1], *[1]University of Illinois, Urbana, [2]University of Arizona, Tucson, [3]Pfizer Animal Genetics, Kalamazoo, MI.*

A 4-year study was conducted utilizing 736 steers of known Angus, Simmental, or Simmental × Angus genetics to determine performance, carcass, and feed efficiency factors explaining variations in economic performance. Steers were pen-fed and individual DMIs were recorded using the GrowSafe feeding system (GrowSafe Systems Ltd., Airdrie, Alberta, Canada). All steers received similar diet and management. Feed efficiency values investigated were: feed conversion ratio (FCR), residual feed intake (RFI), residual BW gain (RG), and residual BW gain and intake (RIG). Data were analyzed using stepwise option of PROC REG in SAS (SAS Inst., Inc., Cary NC) to determine regression intercept, slope, and model fit (R^2) explaining variation within each pricing scenario. Dependent variables were carcass value ($/steer), profit ($/steer), feed costs ($/steer*$d^{-1}$), and cost of gain ($/kg). Independent variables were year, DMI, ADG, HCW, LM area, marbling, yield grade, dam breed, and sire breed. A 10% improvement in RG ($P < 0.05$) yielded the most favorable cost of gain (−0.09 $/kg) and carcass value (17.92 $/steer). Carcass value increased ($P < 0.05$) as feed efficiency improved by 10% for FCR, RG, and RIG. Profit increased with a 10% improvement feed efficiency ($P < 0.05$) with FCR at 34.65 ($/steer), RG at 31.21 ($/steer), RIG at 21.66 ($/steer), and RFI at 11.47 ($/steer). The model for carcass value explained 96% of the variation among carcasses and included HCW, marbling score, and yield grade. Average daily gain, marbling score, yield grade, DMI, HCW, and year born constituted 81% of the variation for the prediction of profit. Variation in cost of gain was mainly explained by ADG and DMI ($R^2 = 0.78$). Prediction equations were developed that excluded ADG and DMI and included feed efficiency values. Cost of gain was explained primarily by FCR ($R^2 = 0.71$). Seventy-three percent of profitability was explained with RG and marbling accounting for 55% of this total explained variation. These models represent the relative importance of factors contributing to economic success in feedlot cattle based on current prices.

Key Words: feedlot economics, feed efficiency

175 Grass-finishing high-value beef: A pilot project in northern United States. P. Lammers*[1], M. Honeyman[2], R. Dewell[2], and S. Millman[2], *[1]Illinois State University, Normal, [2]Iowa State University, Ames.*

Grass-finished beef is a growing niche market but producer adoption of this feeding strategy has been limited. Consistently producing high-value beef on forage alone is challenging. Intramuscular fat (IMF) is a key factor in beef quality grading; both diet and genetics influence IMF. Ultrasound scanning of growing cattle can be used to identify cattle with high-IMF potential and predict carcass quality. This pilot study examined the potential for producing USDA Quality grade Choice beef by combining scanned IMF data with pasture management. Yearling Angus heifers (22 hd) were blocked by scanned IMF and body weight. Blocks of cattle were allotted to either pasture or feedlot on May 7, 2012 at the Armstrong Research Farm, Lewis, IA (41°N 95°W). The 10.5 ha pasture was a mix of alfalfa (*M. sativa*) and smooth brome (*B. inermis*). Initially, grazing cattle were moved to a fresh paddock every 3–4 d with surplus forage harvested to maintain pasture quality. In mid-July, overly dry conditions prevailed and cattle were given access to the entire pasture until marketing. Feedlot cattle were fed a mixed ration of 45% corn grain, 32% modified distillers grain, 20% ground hay, and 2% supplement that included monensin (DM basis). No cattle were implanted, fed hormones, or antibiotics. Cattle were weighed every 28-d until the average BW of the treatment group reached 453.5 kg. Cattle were weighed and scanned before harvest at a commercial abattoir where carcass data was collected. Initial BW and IMF and final BW were not different for the 2 treatments ($P > 0.5$). Feedlot cattle grew faster (1.78 vs. 0.94 kg/d, $P < 0.001$), had 0.41 cm more fat cover ($P = 0.02$), and produced a 7% larger carcass ($P = 0.05$). Yield grade, LMA, and scanned IMF at market were similar ($P \geq 0.08$) for both groups. All cattle increased IMF content during finishing and based on final scanned IMF, ≥90% of cattle in both treatments were expected to grade Choice. Ultimately 92% of feedlot heifers but only 60% of pasture heifers graded Choice or better. Fat cover of the pasture cattle was yellow which may explain why the scanned IMF did not predict the quality grade at the abattoir.

Key Words: beef quality, grass-finished, grazing