more, this study has highlighted the role of the hindgut in the pathology of SARA, which warrants further investigation.

Key Words: cecum, rumen, sub-acute ruminal acidosis (SARA)

0226 Dietary manipulation of canine and feline gut microbiome. K. S. Swanson*, *Department of Animal Sciences, University of Illinois, Urbana.*

Dogs and cats evolved as Carnivora and have traditionally relied on high-protein, high-fat diets containing relatively low fiber concentrations. Despite having a simple gastrointestinal tract designed to digest such diets, a rich microbial community exists. Today's pet dogs and cats live in close proximity to humans and have similar environmental exposures, serving as potential vectors for pathogen exposure. Dogs and cats are also afflicted by many of the complex diseases present in humans, including obesity, diabetes, inflammatory bowel diseases, and cancers, all of which may be influenced by diet and the gut microbiota. Given their proximity to humans, similar disease incidence and etiology, and unique metabolism, microbiome research in dogs and cats may not only lead to improved pet nutrition and veterinary care, but may increase our understanding of host-microbe interactions, with relevance to human metabolism and diseases and public health at large. Molecular techniques, including high-throughput sequencing, have dramatically changed the research landscape in regards to gastrointestinal microbiology. These techniques have been used to characterize the phylogeny and functional capacity of the canine and feline gastrointestinal microbiota and identify the effects of diet, age, and disease on these communities. Several hundred bacterial phylotypes, predominated by members of Firmicutes, Fusobacteria, Proteobacteria, Bacteroidetes, and Actinobacteria, are now known to inhabit the dog and cat gastrointestinal tract. Recent studies have revealed that the functional capacity of the gastrointestinal microbiota in dogs and cats is quite broad and similar to that of humans and rodent models. Although these populations are quite stable over time, our laboratory has demonstrated that macronutrient profile (e.g., dietary protein:carbohydrate ratio), dietary fiber amount and type, and the form of food consumed (e.g., raw vs. extruded diets) may have dramatic effects on the gastrointestinal microbiome of these host species. These dietary changes have not only been reported to impact microbial diversity and richness, gene content, and metabolic activity, but to alter host physiology and metabolism as well. Unfortunately, the majority of research has been performed in healthy animals housed in research colonies rather than free-living pets. Continued research on the composition and activity of the canine and feline gastrointestinal microbiomes, and how they are impacted by dietary intervention and other environmental exposures, is needed to increase our understanding of the host-microbe interactions that occur in the gastrointestinal health and their relevance to health and disease.

Key Words: canine nutrition, feline nutrition, gut microbiota

BEEF SPECIES I

0227 Relationship between forage quality parameters and mineral intake in grazing beef cattle. J. D. Rivera*, M. L. Gipson, and R. G. Gipson, *Mississippi State Univ. South Branch Exp. Sta., Poplarville.*

One hundred ninety-two forage samples were collected over a 2-yr winter grazing season from cool-season pastures grazed by beef cattle (avg. BW = 294 kg) to determine the effects of periodicity and forage quality on mineral intake. Beef cattle minerals were offered to each pasture (n = 24 pastures) every 28 d from December through June. Refusals were weighed at the end of each interval, and forage samples were collected at the same time. Mineral refusals were used in conjunction with offered mineral to calculate mineral DMI. Forage samples were weighed and dried for 72 h at 50°C to determine DM; dried samples were analyzed using NIR technology to determine ADF and CP content. Data were analyzed to determine correlation (PROC CORR) of periodicity, CP, ADF, DM and mineral intake. As expected, as the season progressed, sampling period was highly correlated to forage quality ($P <$ 0.01) with decreasing CP ($r^2 = -0.92$), increasing ADF ($r^2 =$ 0.96) and DM ($r^2 = 0.80$) associated with periods later in the grazing season. No effect ($P = 0.25$) of sampling period was observed for DMI of mineral. Average mineral intake through the grazing season was 81.6 g ± 1.7 g. Crude protein averaged 18.7% ± 8.4%; ADF averaged 31.3% ± 11.7%. Crude protein had no effect on mineral intake ($P = 0.34$). Acid detergent fiber tended to negatively correlate ($P < 0.06$; $r^2 = -0.14$) with mineral DMI; greater mineral DMI was associated with lower ADF. Forage DM had a negative impact on mineral DMI ($P = 0.001$; $r^2 = -0.38$); with greater forage DM associated with lower mineral DMI. Results suggest that mineral intake of beef cattle grazing cool-season forages is not affected by forage quality (ADF, CP), nor sampling period, but rather more likely affected by forage DM content.

Key Words: beef cattle grazing mineral intake

0228 Feeding antibodies against interleukin-10 improved gain efficiency in beef steers. M. R. Schaefer*, M. E. Cook, D. M. Schaefer, *University of Wisconsin, Madison.*

Recent studies showed that oral anti-interleukin-10 antibody (aIL-10) is protective against gastrointestinal pathogens. The current objective was to evaluate oral aIL-10

Table 0229.

Table 1. Intakes (mean ± SD) for steers based on various marker predictions.

		LIPE®[2]			Cr_2O_3				
	LRNS[1]	iDM	iNDF	iADF	iDM	iNDF	iADF	C31:C32	C33:C32
Pasture DMI (kg/d)	7.10 ± 1.57	3.96 ± 1.33	5.42 ± 1.08	9.19 ± 1.48	5.36 ± 1.90	7.09 ± 2.05	11.81 ± 3.04	11.62 ± 5.30	14.93 ± 7.17
Total DMI (kg/d)	8.69 ± 0.75	5.55 ± 0.56	7.01 ± 0.75	10.79 ± 1.20	6.95 ± 1.45	8.69 ± 1.87	13.40 ± 2.88	12.86 ± 6.06	15.59 ± 7.96

[1]LRNS=Large Ruminant Nutrition System

[2]LIPE®= purified lignin product, iDM=indigestible dry matter, iNDF=indigestible neutral detergent fiber, iADF=indigestible acid detergent fiber

administration on top of best management practices in newly arrived weaned steers. Laying hens immunized with peptide VMPQAENG-conjugate with Freund's adjuvant (aIL-10 hens) or only Freund's adjuvant (control hens) were used to produce eggs containing aIL-10 and Control antibodies. One hundred thirteen black hided steers (initial BW 297 ± 7 kg) were purchased from a local auction barn (160 km) via 14 lot purchases, and allowed to rest for 4 d before starting the trial. Steers were blocked by initial BW and allotted to 18 pens (6 or 7 steers/pen). Pens (9/treatment) were randomly assigned to either Control antibody (42 g · hd^{-1} · d^{-1} whole liquid egg from control hens) or aIL-10 antibody (42 g · hd^{-1} · d^{-1} whole liquid egg providing 500 µg aIL-10 antibody) mixed in a common diet (70.0% corn silage, 15.9% cracked corn, 5.8% DDGS, 5% wheat midds, and 3.3% supplement, DM basis) for the initial 14 d of the trial. No additional eggs were fed for the remainder of the 64 d trial. Antibiotics were administered to treat bovine respiratory disease based on visual observations and whether rectal temperatures exceeded 39.7°C. Data were analyzed as a randomized complete block design using the PROC MIXED procedure of SAS, with pen as the experimental unit. Average DMI was similar between treatments (8.1 kg, $P = 0.84$), however G:F was greater for steers fed aIL-10 vs. Control (0.193 vs. 0.182, $P = 0.04$) over the 64 d trial. Average daily gain over 64 d was 1.58 and 1.48 kg/d for aIL-10 and Control groups, respectively ($P = 0.13$). Frequency of steers requiring a single antibiotic treatment was similar between treatments (16%, $P = 0.97$), but a greater percentage of steers fed the Control eggs required a second antibiotic treatment relative to steers fed the aIL-10 (7 vs. 0%, $P = 0.09$). Total antibiotic treatments per animal were statistically similar between treatments ($P = 0.15$), but was numerically lower for the aIL-10 vs. Control group (0.16 vs. 0.35, SEM = 0.08, respectively). Feeding aIL-10 increased G:F in newly received feedlot steers possibly by improving cattle health immediately after commingling.

Key Words: interleukin-10, respiratory disease, feedlot cattle

0229 Animal and digestibility marker variation influence predictions of dry matter intake and dry matter digestibility. K. A. Weld*[1], J. R. R. Dorea[1], F. A. P. Santos[2], and D. E. Oliveira[3], *[1]University of Wisconsin, Madison, [2]University of São Paulo, Piracicaba, Brazil, [3]Santa Catarina State University, Lages, Brazil.*

The current literature shows that there is animal and marker variability in digestibility marker recovery, but does not address the effect of this variability on individual animal DMI predictions. The objective of this study was to test the use of various markers and administration methodologies to predict DMI in grazing systems and determine the main contributors to variability. Eight rumen cannulated Nellore steers were randomly assigned to two 4 × 4 Latin squares. Steers had ad libitum access to pasture of *Brachiaria brizantha*. Steers were either not supplemented or individually supplemented with a mixture of fine ground corn and sodium monensin at 0.3, 0.6 or 0.9% of body weight. Steers were each administered 3 external markers via rumen cannula: a C32 controlled release capsule (CRC) on d 3; LIPE® (purified lignin), once daily on d 7 to 15; and Cr_2O_3 once daily on d 1 to 15 of each period. Fecal grab samples were collected twice daily for the last 5 d of the 15-d periods. Intake predictions were calculated using the Large Ruminant Nutrition System (LRNS), C31:C32 ratio, C33:C32 ratio, LIPE®, and Cr_2O_3. Indigestible DM (iDM), indigestible NDF (iNDF) and indigestible ADF (iADF) were used as internal markers. LIPE® was determined by infrared spectroscopy, Cr_2O_3 by inductively coupled plasma optical emission spectroscopy and alkanes by gas chromatography. A 240-h rumen incubation was used for the internal markers. A mixed model with the fixed effect of supplementation level and random effects of Latin square, animal(Latin square), period, and animal x period was used to determine treatment effects. LIPE® and Cr_2O_3 detected a treatment effect on pasture intake ($P < 0.10$) except for the Cr_2O_3/iADF combination ($P = 0.43$). Only LIPE® detected a treatment effect on total intake ($P < 0.03$). The alkanes provided greater and variable intake predictions. The final 4 d in each period demonstrated decreased CRC release rate compared with the previous 8 (mm/d = -0.012*d^2 + 0.091*d + 3.93, R^2

= 0.79). A completely random model containing internal and external markers, and their interactions with animal, period, and supplementation level determined which variables contributed to intake prediction variability. Variability was mainly due to internal and external markers (11–66% of variation), residual error (11–24% of variation), and external marker x animal interactions (5–16% of variation). Digestibility markers should be used cautiously to predict individual intakes in a grazing system due to animal by marker interactions, though markers can detect treatment differences.

Key Words: digestibility marker, intake prediction, steer

0230 Using hair cortisol concentrations to assess the adrenocortical stress response in beef cattle administered corticotrophin-release hormone.

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Our objective was to determine if hair cortisol concentrations can be used to assess the adrenocortical stress response in beef cattle receiving corticotrophin-release hormone (CRH) injections. Eight halter-trained Angus heifers (BW 189 ± 4 kg; age 225 ± 4 d) were ranked by BW and allocated to 2 groups (4 heifers/group), which were randomly assigned to a crossover design containing 2 periods of 35 d (d −7 to 28) and the following treatments: (1) 0.5 μg of CRH/kg of BW twice daily (i.v. at 0600 and 1800h) from d 0 to 13 (CORT), or (2) 5 mL of 0.9% saline (i.v.) concurrently with each treatment administration to CORT heifers (CON). Heifers were maintained in individual pens from d −7 to 13, or as a single group from d 14 to 28 of each period. Between periods, heifers were maintained as a single group and were not exposed to any experimental procedures for 24 d. Blood samples were collected via jugular venipuncture before and 90 min after each treatment administration. On d 0, 13, and 28, hair samples were collected from the tail switch before the first treatment administration of the day. Hair was collected using scissors as close to the skin as possible, and the hair material closest to the skin was stored (2.5 cm of length, 300 mg of weight). Plasma samples were analyzed for cortisol using a chemiluminescent enzyme immunoassay. Hair samples were cleaned with water and isopropanol, and then ground in a ball mill once dry. Cortisol was extracted with methanol before being measured using ELISA. Data were analyzed using the MIXED procedure of SAS, whereas hair cortisol concentration was analyzed using results obtained on d 0 of each period as covariate. A treatment × time interaction was detected for plasma cortisol concentrations ($P < 0.01$), which were less for CORT vs. CON heifers before treatment administration, but greater for CORT vs. CON heifers 90 min after treatment administration (2.1 vs. 4.8 ng/mL and 20.5 vs. 3.9 ng/mL, respectively; SEM = 0.8). Mean hair cortisol concentration was greater ($P = 0.04$) for CORT vs. with CON heifers (20.2 vs. 11.9 pg/mg of hair, respectively; SEM = 3.3). These results indicate that cortisol concentrations in hair samples collected from the tail switch can be used as an indicator of adrenocortical stress response in beef cattle.

Key Words: beef cattle, cortisol, hair, plasma, tail switch

0231 Effects of static or oscillating dietary crude protein levels on fermentation dynamics of beef cattle diets using a dual-flow continuous culture system.

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In nature several animal, microorganism, and plant species experience seasonal periods of undernourishment followed by periods of nutrient abundance. This nutrient oscillation promotes a period of accelerated growth defined as compensatory growth. The objective of this study was to evaluate the effects of increasing dietary crude protein (CP) levels and also comparing the effects of static versus oscillating dietary CP on ruminal nutrient digestibility, ruminal fermentation, nitrogen (N) metabolism, and microbial efficiency in beef cattle diets using a dual-flow continuous culture system. Eight fermenters (1223 ± 21 mL) were used in a replicated 4x4 Latin square design with periods lasting 12 d each (8 d for adaptation and 4 d for sampling). Dietary treatments were: (1) 10% CP, (2) 12% CP, (3) 14% CP, and (4) 10 and 14% CP diets oscillating at 48-h intervals. Experimental diets consisted of 50% orchard hay and 50% concentrate. Fermenters were fed 72 g/d and solid and liquid dilution rates were adjusted to 5.5 and 11%/h, respectively. Data were analyzed using the MIXED procedure in SAS. Partial data are presented in Table 1. Digestibilities of dry matter and organic matter were not affected ($P > 0.05$) by increasing dietary CP, nor by oscillating dietary CP. Total volatile fatty acids concentration and molar proportions of acetate, propionate, butyrate, valerate, iso-butyrate and iso-valerate were not affected ($P > 0.05$) by increasing or oscillating dietary CP. Ruminal NH_3–N concentration increased linearly ($P < 0.01$) in response to increasing dietary CP. Total N, non-ammonia N, and rumen undegraded protein flows did not differ among treatments or between oscillating dietary CP and static 12% CP. Microbial N and NH_3–N flows and microbial efficiency did not differ when comparing oscillating versus static CP ($P > 0.05$). However, there was a quadratic effect ($P < 0.05$) for these variables when dietary CP was increased.

Table 0231.

Table 1. Effects of static or oscillating dietary crude protein levels on fermentation dynamics.

Item	Treatment, CP%				SEM	*P*-value		
	10%	12%	14%	OSC		OSC vs. 12%	Linear	Quadratic
Total N flow, g/d	1.8	2.0	2.1	1.8	0.15	0.27	0.30	0.81
NAN flow, g/d	1.8	1.9	1.8	1.9	0.09	0.70	0.72	0.24
Microbial N flow, g/d	0.9	1.1	1.0	1.1	0.04	0.78	0.06	0.01
Microbial efficiency	31.3	40.5	37.4	36.5	2.20	0.19	0.05	0.02
RDP supply, g of N/d	0.8	1.1	1.2	1.1	0.07	0.84	<0.01	0.34
RUP flow, g of N/d	0.9	0.9	1.0	0.9	0.07	0.95	0.27	0.34
NH_3-N, mg/100 mL	2.9	3.1	8.9	4.8	1.10	0.12	<0.01	<0.01
Total VFA, m*M*	60.5	64.7	64.7	63.0	3.37	0.58	0.17	0.41
Acetate, % total VFA	35.6	34.5	30.9	38.8	2.99	0.29	0.25	0.72
Propionate, % total VFA	28.9	31.2	33.2	28.9	2.38	0.41	0.14	0.95
Butyrate, % total VFA	29.1	29.1	30.5	26.1	3.37	0.51	0.76	0.85
CP digestibility, %	77.5	70.0	67.0	68.4	7.43	0.86	0.30	0.79
DM digestibility, %	41.8	39.0	39.1	43.6	2.21	0.15	0.39	0.61

These results indicate that either ruminal microorganisms do not respond to oscillating CP levels or are capable of coping with 48-h periods of undernourishment. It is possible that other levels of CP, other CP sources, or other oscillating regimes could help elucidating these issues. The diet with 12% CP provided positive effects on microbial N flow and microbial efficiency in the rumen; therefore, it was the best strategy to improve N utilization in the rumen. Beyond that level, there were no further benefits of feeding greater dietary CP.

Key Words: microbial protein, nitrogen metabolism, in vitro fermentation

0232 Reproductive development of rotationally grazed beef heifers when supplemented chelated trace minerals. H. A. Tucker*, S. Bettis, T. Hampton, and M. Vázquez-Añón, *Novus International Inc., St. Charles, MO.*

Supplementation of trace minerals, Zn, Cu, and Mn, impact the health and productivity of ruminants resulting in increased growth and greater reproductive performance. Furthermore, increasing the availability of key trace minerals to the animal through technologies, such as chelation, not only reduces the amount released back into the environment, but may allow for a reduction in the amount of minerals being provided to the animal for optimum performance. Therefore, the objective of this study was to evaluate reproductive development of beef heifers supplemented with chelated trace minerals provided at a reduced inclusion rate. Sixty beef heifers (BW = 264 ± 6 kg; mean ± SEM) were utilized in a randomized complete block design with 2 treatments. Heifers were rotationally grazed and offered pelleted supplements for 91 d. The control (CON) supplement supplied 8.8 ppm Cu, 28.4 ppm Zn, and 31.6 ppm Mn from inorganic sources (133% of NRC requirement). The treatment (MAAC®) supplement contained reduced concentrations of Cu, Zn, and Mn (100% of NRC requirement) achieved through a partial replacement (50%) of inorganic trace minerals with MAAC® chelated trace minerals (Novus International Inc., St Charles, MO). To determine cyclicity of heifers, reproductive tract score (RTS) and plasma progesterone concentrations, along with BW and BCS, were assessed on d −1, 21, 35, 49, 63, 77, and 91 of study. Body weight (P = 0.81), BCS (P = 0.72), and ADG (d 0 to 91; P = 0.34) were not altered by treatment. Heifers supplemented with MAAC® (2.8 ± 0.1) had significantly (P < 0.01) greater RTS than CON (2.5 ± 0.1) throughout the trial. Furthermore, RTS was significantly (P < 0.01) greater on d 91 for MAAC® (3.9 ± 0.2) compared with CON (3.2 ± 0.2). Progesterone levels were significantly (P = 0.02) greater on d 21 (0.56 vs. 0.39 ± 0.06 ng/mL; MAAC® vs. CON) and tended (P = 0.06) to be greater on d 77 for MAAC® (1.05 vs. 0.54 ± 0.19 ng/mL; MAAC® vs. CON). Heifers supplemented MAAC® had 1.66 greater odds of cycling by d 91 of study compared with those supplemented CON. These data suggest that supplementation of MAAC® chelated trace minerals improve reproductive performance of beef heifers. Additionally, current data suggests that a reduction in trace mineral supplementation may benefit reproductive performance while maintaining growth and ADG.

Key Words: chelated trace mineral, reproduction, beef

0233 Comparison of treatment protocols for bovine respiratory disease in high-risk, newly received beef calves. J. J. Ball*[1], E. B. Kegley[1], J. A. Hornsby[1], J. L. Reynolds[1], J. Sarchet[2], and J. G. Powell[1], [1]*Department of Animal Science, Division of Agriculture, University of Arkansas, Fayetteville,* [2]*Zoetis, Kalamazoo, MI.*

The objective of this study was to evaluate different treatment protocols for bovine respiratory disease (BRD) on performance, morbidity, antibiotic usage, and cost in newly received beef calves. Crossbred male calves (n = 176; BW = 232 ± 1.6 kg) were stratified by bodyweight and assigned randomly to 1 of 2 treatments in a randomized complete block design. Upon

arrival, calves were tagged with an individual identification tag, vaccinated for respiratory and clostridial pathogens, dewormed, castrated (if applicable), branded, tested for persistent infection with BVDV, and administered either 1.1 mL/45 kg BW of tulathromycin with a 7-d post-metaphylactic interval (PMI) or 1.5 mL/45 kg BW of tilmicosin with no PMI. A blinded pen rider observed cattle daily for signs of morbidity and a Clinical Attitude Score (0 [normal] to 5 [morbid]) was recorded. Calves that scored a 1 or greater and were PMI eligible were pulled and rectal temperatures were recorded; if temperature exceeded 40°C, calves on the tulathromycin treatment were given ceftiofur with a 7-d post-treatment interval (PTI) as the initial treatment antibiotic and tilmicosin calves were given enrofloxacin with a 3-d PTI. If the calf was pulled a second time and met the treatment criteria, a final antibiotic was administered, tulathromycin cattle received danofloxacin and tilmicosin cattle received florfenicol + flunixin meglamine. Calves were assigned to 1 of 16 replicated 0.4 ha grass lots with automatic waterers. Calves had ad libitum access to bermudagrass hay and were fed a grain supplement to exceed nutritional requirements. Calves were weighed on d −1, 0, 15, 41, and 42. Performance was similar across treatments throughout the duration of the study ($P \geq 0.10$). Percentage morbidity was greater for first treatment, second treatment, and relapse in the tilmicosin calves compared with the tulathromycin calves ($P < 0.01$). Initial antibiotic cost was greater in tulathromycin calves compared with tilmicosin calves ($P < 0.01$). Both first and second treatment antibiotic cost for cattle were greater in tilmicosin calves compared with tulathromycin calves ($P < 0.01$). However, there were no differences across treatments in terms of overall medical cost ($P = 0.51$), exclusive of labor or chute charges. Metaphylaxis treatment protocols did not affect performance, but differences were found in the percentage of calves treated with antibiotics for BRD and in the number of antibiotics used.

Key Words: bovine respiratory disease, tulathromycin, tilmicosin

0234 Glycerin as alternative energy source for ruminants: In vitro fermentation, total gas and methane production. P. Del Bianco Benedeti[1,2], T. Shenkoru[2], M. Fonseca[3], R. Bittner[2], K. Murphy[2], D. Ivey[2], B. Ribas[2,4], E. Marostegan de Paula[2], L. Galoro da Silva[2], H. Monteiro[2,5], I. Nicolis[2], L. Mariz[1,2], H. Costa[2,6], P. Amaral[1,2], M. I. Marcondes[1], and A. Faciola[*2], *[1]Federal University of Vicosa, Brazil, [2]University of Nevada, Reno, [3]Texas A&M University, College Station, [4]São Paulo State University, Botucatu, Brazil, [5]Maringa State University, Brazil, [6]Federal University of Minas Gerais, Belo Horizonte, Brazil.*

Glycerin has the potential to increase glycogenic potential of beef cattle diets; however, its effects on total gas and CH_4 production have been inconsistent. The objective of this study was to evaluate the effects of glycerin compared with corn and starch on ruminal fermentation, total gas, and CH_4 production using an in vitro system. Twenty-four bottles (620 mL each) equipped with wireless pressure sensors (Ankom[RF] Gas Production System) were used in 4 consecutive 48-h runs. Three ingredients were tested (corn, glycerin, and starch) at 0.5 g per bottle. The experimental design was: 4 incubation runs × 3 ingredients × 7 bottles per treatment, plus 12 blank bottles (3 per run), totaling 96 observations. Rumen fluid was collected from two rumen-cannulated steers and mixed with a buffer solution (1:2 v/v) in water bath at 39°C under anaerobic conditions. Bottles were inoculated with 75 mL of rumen/buffer solution. The data acquisition software was set

Table 0234.

Table 1. Least-square means of *in vitro* fermentation of dietary corn, starch, and glycerin

Item	Corn	Starch	Glycerin	SEM	*P*-value
24h total gas production, mL/g DM	324[a]	324[a]	287[b]	19.1	< 0.01
48h total gas production, mL/g DM	384[a]	344[b]	354[b]	24.1	< 0.01
Final pH	5.89[a]	5.67[b]	5.93[a]	0.13	< 0.01
N-NH_3, mg/100mL	18.9[a]	10.5[b]	16.6[a]	2.11	< 0.01
Total volatile fatty acids, mM/g DM	15.3[ab]	14.4[b]	17.4[a]	3.67	0.01
Acetate, mol/100mol	35.8[a]	35.2[a]	24.8[b]	0.42	< 0.01
Propionate, mol/100mol	24.8[b]	29.5[a]	30.0[a]	1.43	< 0.01
Butyrate, mol/100mol	23.0[b]	21.4[b]	28.9[a]	1.27	< 0.01
Valerate, mol/100mol	6.26[b]	5.67[c]	8.34[a]	0.41	< 0.01
Iso-butyrate, mol/100mol	3.13[a]	2.62[b]	2.40[c]	0.09	< 0.01
CH_4, %	5.22[b]	5.16[b]	8.92[a]	0.42	< 0.01
CH_4, mL/g DM	9.71[b]	8.49[b]	13.6[a]	1.67	< 0.01
CO_2, %	30.9[a]	30.1[a]	26.5[b]	1.29	< 0.01
CO_2, mL/g DM	57.1[a]	48.5[b]	40.8[c]	6.85	< 0.01

[a,b,c] Within a row, different subscripts differ at $P < 0.05$.

to record cumulative pressure every 5 min for 48 h. At the end of the incubation, 10-mL samples were filtered through two layers of cheesecloth, preserved with sulfuric acid and centrifuged for ruminal NH_3 and VFA analyses. The production of CO_2 and CH_4 were determined by chromatography. Data were analyzed using the MIXED procedure of SAS, with ingredients as fixed factors and replicate within ingredient as random. Least-square means are presented in Table 1. Glycerin decreased 24-h total gas production, and acetate concentration ($P < 0.01$). The 48-h total gas production was highest for corn ($P < 0.01$), and similar between glycerin and starch. Compared with glycerin, pH and NH_3–N decreased with feeding starch ($P < 0.01$) but not for corn. Starch had the lowest total VFA concentration ($P = 0.01$), while corn had the lowest propionate concentration ($P < 0.01$). Compared with corn and starch, glycerin had the highest butyrate and valerate concentrations ($P < 0.01$). Glycerin increased CH_4 (% and mL/g) production ($P < 0.01$). CO_2 (mL/g) was higher ($P < 0.01$) for corn, but similar for glycerin and starch. CO_2 (% and mL/g) production was lowest for glycerin ($P < 0.01$). These results suggest that glycerin may change ruminal fermentation relative to corn, increasing propionate, butyrate, and valerate concentrations. Glycerin had higher CH_4 concentration than both corn and starch; therefore, results indicate that glycerin would contribute more to the enhancement of methanogenesis than these carbohydrates.

Key Words: beef cattle, finishing diet, greenhouse gases

0235 The effects of supplementing ruminal bypass unsaturated fatty acids during late gestation on cow and calf serum fatty acids in beef cows.

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The objective of this study was to determine if supplementation with ruminal protected unsaturated fatty acids (FA) increased unsaturated FA in both maternal serum and colostrum during late gestation and in serum from their newborn beef calves. Commercial Angus and Angus crossbred heifers and young cows all bred to a single Angus sire were blocked by breed and parity and randomly assigned to either control (1.5 kg of corn gluten feed, CON $n = 29$) or an isocaloric isonitrogenous supplement containing 200 mg of ESSENTIOM (EFA, $n = 29$) for the last 90 d of gestation. All supplements were individually fed 5 d/wk. All cows had ad libitum access to the same pastures throughout the study. Maternal blood samples were collected at 90 and 45 d before expected parturition. At parturition, blood and colostrum samples were obtained from each cow. Blood samples was collected from calves at parturition and then at 5 d of age. Serum and colostrum FA content were determined. All data were analyzed using PROC MIXED procedure of SAS either as repeated measures or ANOVA depending on parameters. Maternal serum concentrations of C16:0, C18:0 C18:1c9, C18:2, C20:4, and total FA were similar in all cows at start of supplementation but increased (treatment × day interaction $P < 0.01$) in the EFA cows at 45 d before and at parturition compared with CON cows. Colostrum DM was increased ($P = 0.01$) in EFA cows compared with CON cows (30.4 vs. 25.4%, 1.30 SEM). Colostrum concentrations on a DM basis of C18:2, total FA, and total unsaturated FA were increased ($P < 0.05$) in EFA cows compared with CON cows. Serum from calves at birth whose dams were supplemented with EFA had increased ($P \leq 0.01$) concentrations of C16:0, C18:0, C18:1 t9, C18:2, C20:4 and total FA compared with calves whose dams were supplemented CON. At 5 d of age calves from EFA supplemented dams had increased ($P \leq 0.05$) serum concentrations of C18:0, C18:2, C20:4 and total FA compared with serum from calves whose dams were supplemented CON. The results of this study indicate that supplementation of rumen protected unsaturated FA in late gestation beef cows increased circulating and colostrum unsaturated FA, and this resulted in increased unsaturated and total FA at parturition and at 5 d of age in their calves.

Key Words: colostrum fatty acids, ruminal bypass fat, serum fatty acids

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0236 The effects of supplementing ruminal bypass unsaturated fatty acids during late gestation on transfer of passive immunity and growth in calves.

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The objective of this study was to determine if supplementation with ruminal protected unsaturated fatty acids (FA) increased colostrum and serum concentrations of IgG of calves and subsequent calf growth. Commercial Angus and Angus crossbred heifers and young cows all bred to a single Angus sire were blocked by breed and parity and randomly assigned to either control (1.5 kg of corn gluten feed, CON $n = 29$) or an isocaloric isonitrogenous supplement containing 200 mg of ESSENTIOM (Arm & Hammer Animal Nutrition, Princeton, NJ; EFA, $n = 29$) for the last 90 d of gestation. All supplements were individually fed 5 d/wk. All cows had ad libitum access to the same pastures throughout the study. At parturition a colostrum sample was collected from the dam and a blood sample was collected from calves at 24 h of age. Calf BW was collected every month and adjusted back to every 30 d of age. Serum and colostrum IgG content were determined by ELISA. All data were analyzed using PROC MIXED procedure of SAS either as repeated measures or ANOVA depending on parameters. Dam BW and BCS during late gestation were similar ($P > 0.14$) between treatments. Colostrum concentrations of IgG were increased ($P < 0.01$) in EFA cows compared with CON cows (166 ± 13 vs. 102 ± 18 mg/ml, respectively). Calves from EFA dams had a tendency for a reduced ($P = 0.08$) birth weight compared with calves from CON dams (30.9 ± 0.6 vs. 32.5.6 ± 0.6 kg, respectively). Serum from calves at 24 h of age whose dams were

supplemented with EFA had increased ($P \leq 0.01$) concentrations of IgG compared with calves whose dams were supplemented CON (11.4 ± 0.7 vs. 7.6 ± 0.7 mg/ml, respectively). Calf growth had a treatment X parity X day interaction ($P < 0.01$). Calves from EFA dams that had their second or third calves had increased BW ($P < 0.05$) at 90 to 210 d of age and at 210 d of age respectively compared with calves from CON dams. The results of this study indicate that supplementation of rumen protected unsaturated FA in late gestation beef cows increased colostrum and calf serum IgG and increased calf BW in cows with their second and third calves.

Key Words: calf growth, colostrum IgG, ruminal bypass fat, serum IgG

0237 Effect of OmniGen-AF® dietary supplementation on ultrasound parameters in purebred Angus steers fed a finishing diet.

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Dietary supplementation to aid the immune system of finishing steers is recommended to maintain health and growth; however limited knowledge exists regarding the influence on performance. The objective of this study was to determine the effect of OmniGen-AF® supplementation on ultrasound parameters in steers through the finishing phase. Nine purebred Angus half-sibling steers were divided into one of two treatment groups; Control (CNTL $n = 4$) and OmniGen-AF® (OG; $n = 5$). Cattle were offered 0 g/hd/d (CNTL) or 56 g/hd/d of OG through backgrounding and transition (42d). At the beginning of the finishing phase, cattle were scanned by ultrasound using an Aloka SSD- 500V console with UST-5044–3.5 linear transducer and analyzed using BIA Pro software (Designer Genes Technologies, Harrison, AR). Cattle were subsequently scanned on d 69 and 104 of supplementation to examine the effects of OG supplementation on ultrasound carcass parameters during the finishing phase. Weights, average daily gain (ADG), and dry matter intake (DMI), were collected through the backgrounding and finishing phases. Rib eye area (REA), 12th rib fat thickness (FT), rump fat (RF), REA/cwt and percent intramuscular fat (%IMF) were collected. Predicted yield grade was completed using FT, REA, live weight × 62% dressing percent and 2.5% Kidney Pelvic Heart fat (KPH); predicted quality grade was calculated using %IMF data. Data were analyzed using multiple *t* tests procedure of GraphPad Prism 6.03 with significance declared at $P < 0.05$. No difference between groups was detected for REA, FT, RF, %IMF, predicted yield on d 42 or 69. Predicted quality grade, weight, ADG and DMI did not differ between CNTL or OG. On d104 OG finished cattle had a tendency to have lower FT (CNTL 0.38 ± 0.01, OG 0.32 ± 0.02; mean ± SEM; $P = 0.06$), and higher REA/cwt (CNTL 0.86 ± 0.04; OG 1.01 ± 0.06; $P = 0.07$), and scan with a lower %IMF (CNTL 3.54% ± 0.11 OG 3.03% ± 0.18; $P = 0.06$) compared with controls. Similarly, OG finished cattle scanned with lower RF (CNTL 0.34 ± 0.034 in, OG 0.24 ± 0.02 in; $P = 0.03$) and larger REA (CNTL 11.56 ± 0.44 sq in, OG 13.79 ± 0.67 sq in; $P = 0.04$). Upon evaluation, the OG supplemented cattle had lower predicted numerical yield grades (2.64 ± 0.24) than their control counter parts (3.42 ± 0.16; $P = 0.04$). In this study, supplementing OG during finishing decreased predicted numerical yield grades by increasing REA and decreasing fat deposition.

Key Words: OmniGen-AF, ultrasound, beef cattle

0238 Total gastrointestinal tract digestibility of dry matter, neutral detergent fiber and starch of Nellore and 1/2 Angus x Nellore cattle adapted either for 9 or 14 d to high-concentrate diets.

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This study was designed to evaluate the length of the adaptation period to high-concentrate diets on total tract digestibility of DM, NDF and starch of Nellore (NE) and 1/2 Angus x Nellore (AN) cattle. The experiment was designed as completely randomized block with 2 × 2 factorial arrangement, replicated 6 times (3 animals/pen), in which 72 22-mo-old yearling bulls [36 NE (319.2 ± 18.5 kg), and 36 AN (307.9 ± 29.5 kg)] were fed in 24 pens for 89 d according to the treatments: NE adapted for 9 d; NE adapted for 14 d, AN adapted for 9 d, and AN adapted for 14 d. Measures over time were taken on d 10, 15, and 20 of the experimental period. Each of the adaptation diets containing 62%, 70%, and 78% concentrate was fed for 3 d to cattle adapted for 9 d. For cattle adapted for 14 d, the adaptation diets containing 62%, 70%, and 78% concentrate were fed for 5 d, 4 d, and 5 d, respectively. The finishing diet contained: 66.5% cracked corn grain, 14.0% sugarcane bagasse, 16.0% cottonseed meal, 1.5% supplement, 1.2% urea, and 0.8% limestone (DM basis). Diet samples were collected just after morning delivery (0830h) on d 8, 9, 13, 14, 18, and 19 of experimental period, and composite samples were made per pen for d 8 and 9, 13, and 14, and 18 and 19. Samples of orts and feces were collected just before morning (0800h) meals on d 9, 10, 14, 15, 19, and 20 of the experimental period, and a composite samples were made per pen for d 9 and 10, 14, and 15, and 19 and 20. Fecal samples were collected from the same animal in each pen, which was chosen randomly. No significant ($P > 0.10$) biotypes and adaptation length main effects were observed for DM and starch digestibilities. A significant ($P = 0.01$) interaction between biotype, adaptation length, and day of collection was observed for NDF

digestibility, where no differences were detected ($P > 0.10$) across treatments on d 10 and 20; however, on d 15 the NDF digestibility was greater for AN adapted in 14 d (53.9%) and NE adapted in 9 d (53.1%) when compared with AN adapted in 9 d (41.3%) and NE adapted in 14 d (35.1%). Thus, cattle should be adapted for 14 d regardless of biotype, because no differences in digestibility were detected on d 20, and because longer periods of adaptation are safer.

Key Words: adaptation, digestibility, feedlot

0239 Effect of OmniGen-AF® supplementation on the metabolic profile of growing beef cattle.

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To examine the effect of OmniGen-AF® (OG) supplementation on serum indicators of growth and development in growing beef cattle, healthy 8-mo old purebred Angus cattle were randomly assigned to 0 (control; 4 heifers, 2 bulls, and 2 steers) or 56 g/hd/day OG (OG; 4 heifers, 3 bulls, and 2 steers). Cattle were housed in a freestall barn with straw bedding and fed via Calan Broadbent system a diet including grass hay, alfalfa hay, and ground corn once per day. Blood was collected via jugular puncture on d 0, 3, 5, 7, 10, 14, 21, 28, 35, and 49 of supplementation and 1, 3, 7, 10, 14, and 21 d after supplementation and analyzed for serum concentrations of glucose, insulin, leptin, and haptoglobin. Using a repeated-measures-in-time design in PROC MIXED, we examined changes in serum parameters from baseline during the 49 d of supplementation and separately during the 21 d after supplementation. We hypothesized that OG supplementation alters carbohydrate metabolism during the supplementation period. We observed sex-specific effects of OG supplementation on serum indicators of carbohydrate metabolism and growth. During the supplementation period, serum glucose concentrations increased in control bulls and steers compared with male OG-supplemented cattle ($P = 0.01$), whereas no treatment effects were observed for heifers ($P = 0.80$); those gender-specific treatment group differences were also observed after supplementation. During the supplementation period, serum leptin concentrations decreased in female controls compared with female OG-supplemented cattle ($P < 0.01$). No treatment group differences for serum leptin were observed for bulls and steers combined ($P = 0.54$) or after supplementation irrespective of gender. Changes in insulin concentrations were not different between treatment groups ($P = 0.29$); however, insulin concentrations were lower during but not after supplementation in OG-supplemented cattle compared with controls, when baseline insulin concentrations were used as linear covariate ($P = 0.01$). During but not after the supplementation period, haptoglobin concentrations decreased in OG-supplemented bulls ($P = 0.03$) and increased in OG-supplement steers ($P = 0.06$) compared with their sex-specific controls. No differences in serum haptoglobin between treatment groups were observed in females or during supplementation withdrawal. These data suggest no consistent effects of OG supplementation on the metabolism of growing beef cattle.

Key Words: beef cattle, metabolism, OmniGen-AF

0240 Dietary melatonin and growth responses in feedlot heifers.

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Two trials were conducted to determine if feeding melatonin (MEL) to growing beef heifers altered feedlot performance or carcass composition. Trial 1 was initiated on October 22 while Trial 2 commenced on April 15, and both utilized black-hided, non-implanted heifers ($n = 90$ per trial) which were blocked by initial BW (380 kg, Trial 1; 300 kg, Trial 2). Heifers were assigned to a pen (6 hd/pen) within block and pen was randomly assigned 1 of 3 treatments which provided 0, 20 or 100 mg MEL $\cdot$ hd^{-1} $\cdot$ d^{-1} for Trial 1, while Trial 2 treatments provided 0, 100 or 200 mg MEL $\cdot$ hd^{-1} $\cdot$ d^{-1}. Heifers were fed twice daily at 0700 and 1100 h a basal diet that contained (DM basis) 15% corn silage, 70.9% cracked corn, 5.8% DDG, 5.0% wheat midds, 1% urea, and the residual was micro ingredients which included MGA (NEg = 1.46 Mcal/kg, CP = 12.9%). Melatonin supplements were made monthly for each treatment by diluting MEL powder into finely ground corn and were fed at 0.45 kg as-fed $\cdot$ hd^{-1} $\cdot$ d^{-1} as a replacement for cracked corn at the 1100 h feeding. Slaughter occurred by block, and carcasses were chilled for 48 h before data collection. Pen (experimental unit) data were analyzed using the MIXED procedure of SAS and orthogonal contrasts were used to assess linearity (-0.5345, -0.2673, and 0.8018 for Trial 1, and -1, 0, 1 for Trial 2). In Trial 1, a positive linear effect for G:F (0.156, 0.160, and 0.169) and calculated dietary NEg (1.36, 1.41, and 1.45 Mcal/kg) was observed ($P \leq 0.02$) for the 0, 20, and 100 mg treatments, respectively. Positive linear tendencies ($P \leq 0.09$) were detected for ADG (1.84, 1.88, and 1.95 kg/d) and HCW (354, 355, and 361 kg), while all treatments had similar rib-eye ether extract percentages ($P = 0.41$) in Trial 1. In Trial 2, feeding 200 mg MEL increased HCW vs. 0 mg (348 vs. 342 kg, $P = 0.05$) and 100 mg HCW = 343 kg. No differences in 12th rib fat depth or marbling score were recorded ($P \geq 0.13$) in either trial. Results indicate that feeding MEL to non-implanted feedlot heifers may increase gain efficiency and HCW with no effects on carcass composition.

Key Words: melatonin, feedlot, heifers

0241 Dietary melatonin and growth responses in implanted feedlot steers. M. R. Schaefer* and D. M. Schaefer, *University of Wisconsin, Madison.*

Two trials were conducted to determine if feeding melatonin (MEL) to growing beef steers altered feedlot performance or carcass composition. Trial 1 was initiated on October 23 while Trial 2 started on March 19, both utilized black-hided steers (n = 90 per trial) which were blocked by initial BW (325 kg, Trial 1; 410 kg, Trial 2). Steers were assigned to a pen (6 hd/pen) within block and pen was randomly assigned 1 of 3 treatments which provided 0, 100 or 200 mg MEL per animal/d. All steers received a single implant of 120 mg trenbolone acetate and 24 mg estradiol on d 28 (Trial 1) or d 0 (Trial 2). Steers were fed once daily at 0800 h a basal diet that contained (DM basis) 15% corn silage, 70.9% cracked corn grain, 5.8% dried distillers grains, 5.0% wheat midds, 1.4% limestone, 1% urea, and the residual was micro ingredients (NEg = 1.46 Mcal/kg, CP = 12.9%). Melatonin supplements were made monthly for each treatment by diluting MEL powder into finely ground corn and were fed at 0.45 kg as-fed per animal/d as a replacement for cracked corn. On d 154 in Trial 1, three steers per pen in the lightest 2 blocks were restrained between 1400 and 1600 h to collect blood and urine samples. Data were analyzed using the MIXED procedure of SAS with treatment as a fixed effect while block and trial were recognized as random effects, and an orthogonal contrast was used to compare the 0 vs. 200 mg treatments. No growth responses were different across the treatments ($P \geq 0.19$). Feeding MEL increased ($P \leq 0.01$; 0 vs. 200 mg) 12th rib fat depth (1.2 vs. 1.4 cm) and yield grade (2.9 vs. 3.3), tended ($P = 0.10$) to increase HCW (379 vs. 386 kg); however, it did not alter marbling score (563 vs. 566; $P = 0.74$). Plasma serotonin levels were similar across treatments; however, urine 6-hydroxymelatonin-sulfate increased ($P = 0.01$) in MEL fed steers (5, 217, and 253 ng/ml urine). Dietary MEL may increase HCW in steers; however, the additional weight accumulation might be attributed to more fat gain as implied by the increased rib fat depth.

Key Words: feedlot, melatonin, steers

0242 Use of the residual retained energy as a measure of efficiency in growing Nellore cattle bulls. A. M. Castilhos*[1], A. M. Jorge[1], C. L. Francisco[1], M. E. Z. Mercadante[2], S. F. M. Bonilha[2], C. M. Pariz[1], D. C. M. Silva[1], and R. H. Branco[2], *[1]Universidade Estadual Paulista-FMVZ, Botucatu, Brazil, [2]Centro APTA Bovinos de Corte, Instituto de Zootecnia, Sertãozinho, Brazil.*

This study used 357 Nellore bulls (212 + 38 kg BW; 279 + 29 d of age) to evaluate the effect of a new efficiency measure (residual retained energy) on feedlot performance and economic viability of the cattle production system. GrowSafe automated feeding system (GrowSafe Systems Ltd., Airdrie, AB, Canada) and individual pens were used to record DMI. Residual retained energy (RRE) was calculated as difference between net energy required for gain (NEFG) and the retained energy (RE) for animal. Net energy required for gain was estimated as (DMI– feed required for maintenance) * diet NE_g. Retained energy for animal was predicted by equation of the NRC (2000). Other efficiency measures as residual feed intake (RFI), residual intake and BW gain (RIG), and residual BW gain (RG) were used. Residual feed intake was calculated as the residuals from the regression of total DMI on $BW^{0.75}$ and ADG. Residual gain was calculated as the residuals from the regression of total ADG on $BW^{0.75}$ and DMI. Residual intake and BW gain was determined from linear combination into RFI and RG. Animals were classified for each efficiency measure as Low (< 0.5 SD mean), Medium (within ± 0.5 SD), and High (> 0.5 SD mean) groups. Carcass characteristics [LM area and back fat thickness (BF); 12th–rib] were evaluated using ultrasound measures. Economic value included was profit ($/bull.d^{-1}). Feedlot performance variables were ADG (kg/d), DMI (kg/d), and final BW (kg). Data were analyzed using PROC MIXED in SAS. For feedlot performance, High group had greater ($P < 0.001$) final BW and ADG compared with other groups. No group effects ($P = 0.94$) were detected for DMI. For carcass characteristics, no group effects ($P = 0.50$) were detected for BF. However, High group had greater LM area ($P = 0.001$) than other groups. High group demonstrated better efficiency values for the three measures evaluated (RFI, RIG, RG; $P < 0.001$), and greater profit ($P < 0.001$) compared with other groups. In conclusion, the residual retained energy proved to be a new measure of efficiency able to identify more productive and profitable animals on herd, without detriment to the degree of finish of the carcass.

Key Words: efficiency measure, Nellore cattle, profit, retained energy

Table 0242.

	RRE			
Variable	Low	Medium	High	SEM
Final BW, kg	301.91^{c}	326.92^{b}	367. 24^{a}	7.75
ADG, kg/d	0.93^{c}	1.03^{b}	1.16^{a}	0.19
DMI, kg/d	6.95	6.93	6.89	0.03
RFI	0.57^{a}	0.06^{b}	-0.62^{c}	-0.45
RIG	-0.61^{c}	0.01^{b}	0.75^{a}	0.09
RG	-0.05^{c}	0.08^{b}	0.14^{a}	0.02
LM area, cm^2	53.87^{b}	57.00^{b}	60.34^{a}	2.52
BF, cm	1.77	1.57	1.65	0.18
Profit, $/bull.d^{-1}	0.33^{c}	0.50^{b}	0.78^{a}	0.05

$^{abc}P < 0.05$

0243 Effects of rumen-protected PUFA supplementation to late-gestating beef cows on performance and physiological responses of the offspring.

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Our objective was to evaluate the effects of PUFA supplementation to beef cows during late gestation on performance and physiological responses of the offspring. On d 0 of the experiment, 96 multiparous, non-lactating, pregnant Angus × Hereford cows at the end of their second trimester of gestation were stratified by BW and BCS, and divided into 24 groups of 4 cows/group. Groups were randomly assigned to receive (as-fed basis) 452 g of soybean meal per cow daily in addition to 1) 200 g/cow daily of rumen-protected PUFA mix based on eicosapentaenoic, docosahexaenoic, and linoleic acids (PF) or 2) 200 g/cow daily of rumen-protected fatty acid mix based on palmitic and oleic acids (CON). Groups were maintained in 2 pastures (12 groups/pasture) with ad libitum access to water and alfalfa hay. However, groups were segregated 3 times/wk and offered treatments (Mondays, Wednesdays, and Fridays) from d 0 until calving. Within 12 h after calving, calf BW was recorded. Calves were weaned on d 280, and preconditioned for 45 d. Blood samples were collected from all calves on d 280, 282, 285, 288, and 293 to evaluate plasma haptoglobin concentration. Supplementing beef cows with PF did not ($P \geq 0.24$) impact cow BW change or pre-calving BW, as well as cow BCS change and pre-calving BCS. No treatment effects were detected ($P \geq 0.14$) for calf birth BW, calving rate, percentage of male calves born, and kg of calf born per cow assigned to the experiment. At weaning, no treatment differences were detected ($P \geq 0.24$) for weaning rate, calf weaning BW (205-d adjusted or not), and kg of calf weaned per cow assigned to the experiment. Calves from CON cows were older at weaning ($P = 0.03$) than PF cohorts. No treatment effects were detected ($P \geq 0.22$) for calf preconditioning ADG, BW, and percentage of calves treated for BRD symptoms. Nevertheless, a treatment × day interaction was detected ($P = 0.03$) for plasma haptoglobin concentration, which was greater for calves from CON vs. PF cows on d 282. In summary, PF supplementation to late gestating beef cows did not impact overall cow and offspring productive parameters, but reduced offspring acute-phase protein reaction elicited by weaning.

Key Words: beef cows, offspring, PUFA, supplementation

0244 Effects of injectable trace mineral supplementation on yearling bull growth, carcass characteristics, testicular development and semen quality attributes.

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The study objective was to evaluate effects of injectable trace mineral supplementation on growth, carcass characteristics, testicular development and semen quality in yearling Angus bulls. Bulls (446 kg ± 35, SD) were blocked by age into 4 pens of 15, and randomly assigned to receive Multimin 90 (MM) or a saline injection (CON; $n = 30$ per treatment) at 1 mL/68 kg BW and fed a common finishing diet for 73d. Breeding soundness exams (BSE) and scrotal circumference measurements were conducted on d 53 on all bulls. Liver and blood mineral concentrations ($n = 14$/treatment) were determined on d 1 and 53, and semen mineral concentrations were also determined on d 53. Bulls were harvested on d 74, and testicles were assessed for testicular density and histology, and carcass data collected after a 48-h chill. Data were analyzed using MIXED or GLIMMIX procedures of SAS with the fixed effect of treatment and bull as the experimental unit. Days of age (BSE, testicular data) and initial mineral concentrations (plasma, liver) were used as covariates. No differences due to treatment were observed in ADG, carcass characteristics, testicular density or histology ($P \geq 0.27$). Results from BSE indicate no differences in scrotal circumference, testicular tone, morphology, or pass/fail percentages ($P \geq 0.30$) between treatments; however, overall motility ($P = 0.07$) tended to be lesser in MM-bulls. Based on reference ranges, d 1 liver mineral concentrations were considered adequate in all bulls. Day 53 liver and plasma mineral concentrations were similar between MM and CON treatments ($P \geq 0.15$). Treatment did not affect whole semen mineral concentrations ($P \geq 0.18$), or Se, Zn, and Mn concentrations ($P \geq 0.48$) of seminal plasma. However, seminal plasma Cu concentrations were greater in MM bulls ($P = 0.04$). Spermatozoa concentrations of Se and Zn ($P \geq 0.27$) did not differ due to treatment; however, spermatozoa Cu tended ($P = 0.07$) to be lesser and spermatozoa Mn concentrations were decreased ($P = 0.03$) in MM-bulls. Interestingly, spermatozoa Mn concentrations were negatively correlated with morphology ($r = -0.41$, $P = 0.04$). These data suggest supplementing bulls adequate in mineral status with MM does not affect growth, carcass characteristics or semen attributes. However, semen mineral concentrations may be related to semen quality and more work is needed to clarify the importance of mineral distribution in semen fractions on semen quality.

Key Words: bulls, semen quality, trace minerals

0245 Effect of α tocopherol acetate and ascorbic acid on performance, carcass traits, and incidence and severity of liver abscesses in finishing cattle.
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Liver abscesses (LA) in cattle negatively affect feedlot performance by decreasing ADG, feed intake, and G:F. Abscessed livers are condemned and abdominal adhesions associated with LA can result in extensive carcass trimming during harvest, further compounding adverse economic impact. Given pending regulatory changes pertaining to the use of in-feed antibiotics in cattle production, there is growing interest in alternatives to antibiotics for LA control. The objective of this study was to evaluate use of a combination of the antioxidants, ascorbate and α tocopherol acetate, for mitigation of LA in feedlot cattle. Yearling crossbred heifers (n = 390; initial BW 481 ± 9.4 kg) were blocked by previous treatment and allocated randomly to 24-dirt surfaced feedlot pens (10 m × 35 m) with 13 to 14 heifers/pen. Heifers were weighed, implanted with TE-200 implants, and placed into feeding pens. Finishing diets consisted of 60% steam-flaked corn, 30% wet corn gluten feed, 8% alfalfa, and 2% supplement (DM basis) and provided 300 mg/d monensin, no tylosin, and either 200 IU/d α tocopherol acetate (CTL) or 2000 IU/d α tocopherol acetate plus 500 mg/day crystalline ascorbate (AOX). Heifers were fed once daily ad libitum for 94 d, then weighed and transported 450 km to a commercial abattoir for harvest. The HCW and incidence/severity of LA were determined the day of harvest, and carcass traits were evaluated following 32 h of refrigeration. Compared with CTL, feeding AOX tended to decrease DMI (10.66 vs. 10.31 kg/d; P = 0.08) and improve G:F (0.1204 and 0.1254; P = 0.12), but did not impact ADG, incidence of LA (25.6 vs. 23.5% for CTL and AOX, respectively), HCW (828.4 vs. 830.5 kg for CTL and AOX, respectively), or other carcass traits (P > 0.20). In conclusion, feeding antioxidants is not a viable alternative to decrease incidence of liver abscesses in finishing cattle.

Key Words: antioxidant, feedlot, liver abscess

0246 Feed intake and production efficiency of beef cows.
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The objective of this study was to determine the relationships between DMI and growth as heifers and cows and calves weaned, weight of calf weaned, and milk production. Cows born in 1999–2001and sired by industry AI bulls (Angus, Hereford, Simmental, Limousin, Charolais, Gelbvieh, and Red Angus) and with Angus, Hereford, and MARC III (composite) dams were randomly mated to F_1 bulls from these same crosses (with the exception of MARCIII dams) resulting in heifers (F_1^2) that were 2-, 3-, and 4-breed crosses. Heifers (F_1^2) born in 4 consecutive years (2004–2007) were retained and bred to produce four successive calf crops, calving first at 2 yr of age. Individual feed intake and BW gain were measured for an 84-d period between weaning and first breeding on F_1^2 heifers born in years 2005–2007 (n = 220, 249, and 218, respectively). At 5 yr of age, F_1^2 cows were not bred. Twenty-one d after weaning, F_1^2 cows (n = 158, 179,154, and 131, respectively, for birth years 2004–2007) were individually offered 120 kcal ME/kg $BW^{0.75}$·d^{-1}in Calan gates for 112 d, and then given ad libitum access for an additional 98 d. Milk production at approximately 100 d after calving was measured using a 16-h weigh-suckle-weigh at 2- and 5-yr of age. Heritability and genetic correlations were estimated with MTDFREML. The heritability estimates were Heifer DMI (0.69) Heifer ADG (0.49), Cow DMI (0.48), Cow ADG (0.46), and 5-yr-old milk production (0.41). There were positive genetic correlations between heifer DMI and heifer ADG (0.89), cow DMI (0.65), cow ADG (0.73), average weaning weight of calves (0.52), and total calf weight weaned (0.23). There were positive genetic correlations between cow DMI and average weaning weight of calves (0.28), and total calf weight weaned (0.21). In conclusion, there are genetic correlations between DMI and total weight of calf weaned; also, heifer intake does offer some opportunity to select for intake in mature cows. Selection for reduced DMI may have a negative effect on total BW of calf weaned. USDA is an equal opportunity provider and employer.

Key Words: cows, feed intake, production efficiency

0247 Effects of concurrent selection for residual feed intake and average daily gain on fertility and longevity in black Angus beef females.
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During an individually fed feed efficiency test, traits including ADG, DMI, G:F, residual feed intake (RFI), and residual gain (RG) are evaluated. Almost invariably, ADG and RFI are the only traits in this list that are not correlated. Previous data would suggest that RFI does not affect fertility; however, a selection index that incorporates RFI and improves fertility has not been well defined. Thus, the objective was to determine if concurrent selection for RFI and ADG may identify beef heifers that have improved fertility and longevity in the beef herd. Yearling feed efficiency testing and subsequent production data were collected on 540 purebred, Black Angus heifers from 14 contemporary groups over 6 yr. These data were unbiased in that heifers were retained based on fertility, irrespective of feed efficiency performance indicators. Cattle that were both above contemporary group average for ADG as well as below contemporary group average for RFI were categorized as PASS, and all other heifers were categorized as FAIL. The MIXED and GLIMMIX procedures of SAS were used to analyze continuous and binary variables, respectively.

The model included heifer category as the main effect and included contemporary group as a random effect. Across the dataset, ADG and RFI were not correlated ($P = 0.64$). Yearling pregnancy rates did not differ ($P = 0.14$) between PASS (87.2%) and FAIL (82.3%), nor did the proportion of heifers that became pregnant in the first 21 d of the breeding season ($P = 0.69$). Pregnancy rate as a 2-yr-old tended to be greater ($P = 0.07$) in PASS (85.7%) compared with FAIL (75%). Moreover, the proportion of females that remained in the herd at 3, 4, and 5 yr of age was greater ($P \leq 0.05$) in PASS than FAIL. It should be noted that PASS did not differ from FAIL for phenotypic birth BW, weaning BW, yearling BW, or yearling height ($P \geq 0.53$). Furthermore, nonparent EPDs for calving ease maternal, scrotal circumference, milk, and rib-eye area did not differ between PASS and FAIL ($P = 0.42$). However, PASS tended to have a greater nonparent marbling EPD than FAIL (0.409 vs. 0.375, respectively). These data indicate that dual selection for ADG and RFI may identify beef heifers that have improved fertility and longevity without impacting growth and maternal EPDs.

Key Words: feed efficiency, fertility, residual feed intake

0248 Efficacy of a novel intranasal Zn solution on health and growth performance of high risk, newly received stocker cattle. M. M. Foster*, E. B. Kegley, J. G. Powell, J. L. Reynolds, J. A. Hornsby, D. L. Galloway, J. J. Ball, and J. Zhao, *Department of Animal Science, Division of Agriculture, University of Arkansas, Fayetteville.*

The objective of this study was to determine if using an intranasal Zn solution would impact health and growth performance of high-risk stocker cattle. Upon arrival from regional sale barns, male beef calves ($n = 239$; 3 arrival dates [block]; initial BW = 276 ± 2.4 kg) were identified with individual ear tags, vaccinated with clostridial and 5-way modified live bovine respiratory viral vaccines, dewormed, branded, and castrated (if necessary). In addition, nasal swabs were collected from 24 calves (12/treatment) in block 2 and cultured for bacterial pathogens on d 0, 1, 2, and 7. Calves were stratified by arrival gender and BW into 2 treatments: Zn treated, 3 mL of a solution containing 32.4 mg of Zn administered intranasally, or control, in which calves were not treated. Calves were penned without fenceline contact to calves on the other treatment in replicated 0.42-ha grass pastures (24 pens), and cattle had ad libitum access to bermudagrass hay along with receiving a grain supplement to meet or exceed their nutritional requirements. Rectal temperatures were taken on d 0, 1, 7, and 14 after arrival. Calves were observed daily for signs of morbidity and a Clinical Illness Score (CIS 1 [normal] to 5 [morbid]) was recorded. Cattle that scored > 1 on the illness score and had a rectal temperature greater ≥ 40°C were treated with an antibiotic per a preplanned treatment protocol. If rectal temperature ≥ 40°C persisted past first antibiotic post-treatment interval, cattle were re-treated according to pre-planned protocol. Body weights were similar across treatments throughout the duration of the study ($P \geq 0.22$). Calves treated with Zn had a lower ADG from d 7 to 28 and d 14 to 28 compared with the control ($P < 0.01$). Control calves tended to be treated with 3 antibiotics more often than Zn treated calves ($P = 0.06$). Overall treatment antibiotic costs did not differ across treatments ($P = 0.64$). There were no differences ($P \geq 0.10$) for rectal temperature of calves across treatment. The prevalence of bacterial pathogens were not different across treatments ($P \geq 0.24$) except the presence of *P. aeruginosa* which tended to be greater in the control compared with the Zn treated calves ($P = 0.08$). From the results of this study, calves treated intranasally with Zn showed no differences in overall performance and minimal differences in morbidity compared with the control.

Key Words: bovine respiratory disease, morbidity, Zn

0249 Performance and net energy in High and Low RFI beef cattle on restricted intake. K. C. Dykier and R. D. Sainz*, [1]*University of California, Davis.*

To determine how beef cattle with known residual feed intake (RFI) phenotypes would perform under restricted feeding, 36 weaned Angus cross beef calves (24 steers and 12 heifers) were selected from a group of 98 calves that had been previously phenotyped for RFI. High and Low RFI animals (24 steers and 12 heifers) were subjected to a 52-d feeding trial with intake limited to 1.5% of BW. Feed offered and refused were measured daily, BW was taken at 14-d intervals, and ultrasound measures (LM area and subcutaneous fat over the 12th–13th ribs) were taken at the beginning, middle and end of the trial. After 52 d of intake restriction, RFI groups had similar BW, ADG, DMI, RFI and G:F. Fat gain, protein gain, and estimated recovered energy (RE) were similar between groups, although High RFI cattle had 0.26 cm more subcutaneous rib fat than Low RFI ($P = 0.01$). High RFI cattle also had more rib fat at the start of restricted feed trial. RFI groups did not differ in estimated heat energy (HE) or maintenance requirement (NEm; $P > 0.10$). Heifers had lower HE than steers ($P < 0.01$). All cattle had lower ADG, RE, NEm and HE in response to limited feed. Overall HE was reduced from 0.26 Mcal/kg$^{0.75}$ on ad libitum feeding to 0.16 Mcal/kg$^{0.75}$ on the restricted level of intake. The difference in HE from ad libitum to restricted feeding was −47 and −28% in High and Low RFI cattle, respectively ($P < 0.01$). Estimated NEm requirement was reduced from 0.095 to 0.073 Mcal/kg$^{0.75}$ overall, with a difference of −39% and +14% ($P < 0.01$) in High and Low RFI cattle, respectively. Estimated NEm requirement changed by −32% and +7% ($P = 0.004$) in heifers and steers, respectively. These results indicate that when limited, both High and Low RFI cattle lower their maintenance requirement and heat production to similar levels, although High RFI cattle had higher HE and NEm during ad libitum

Table 0249.

Table 1. Performance and net energy of RFI groups in response to diet restriction.

	RFI		Sex			P value		
Trait	High	Low	H	S	SD	RFI	Sex	RFI x Sex
Initial BW, kg	454.4	440.2	443.2	456.2	49.2	0.42	0.31	0.80
Final BW, kg	507.2	487.9	487.3	507.8	57.0	0.35	0.32	0.73
ADG, kg/d	1.015	0.917	0.940	0.993	0.210	0.87	0.49	0.51
DMI, kg/d	5.98	6.10	5.50	6.57	0.463	0.49	< 0.001	0.92
Gain:feed	0.171	0.152	0.171	0.152	0.035	0.14	0.15	0.63
RFI, kg/d	-0.242	-0.121	-0.717	0.354	0.464	0.47	< 0.001	0.94
Ribeye area, cm^2	80.19	80.54	76.79	83.94	7.74	0.90	0.014	0.41
12^{th}-13^{th} rib fat, cm	1.26	0.97	1.18	1.05	0.212	0.001	0.099	0.069
Fat gain, kg/d	0.37	0.28	0.32	0.33	0.18	0.15	0.79	0.15
Protein gain, kg/d	0.12	0.12	0.12	0.13	0.04	0.92	0.60	0.59
Fat:protein in gain	3.33	2.23	2.91	2.65	2.34	0.08	0.66	0.10
RE, Mcal/d	4.16	3.32	3.64	3.84	1.60	0.13	0.73	0.16
RE, Mcal/$kg^{0.75}$	0.043	0.036	0.039	0.040	0.014	0.16	0.85	0.11
HE, Mcal/d	13.68	14.86	12.76	15.78	2.38	0.07	< 0.001	0.25
HE, Mcal/$kg^{0.75}$	0.147	0.163	0.141	0.169	0.028	0.13	0.007	0.37
NEm, Mcal/$kg^{0.75}$	0.065	0.081	0.063	0.082	0.03	0.10	0.063	0.20

feeding. Furthermore, heifers may be better equipped than steers to adapt maintenance requirement and heat production in response to limited feed.

Key Words: efficiency, net energy, residual feed intake

0250 Effects of the EPNIX® beef program on feedlot performance in diets containing no Monensin or Tylosin. V. B. Holder[*1], J. S. Jennings[2], and R. S. Swingle[3], *[1]Alltech Inc., Nicholasville, KY, [2]Texas A&M AgriLife Research and Extension Center, Amarillo, [3]Cactus Feeders, Amarillo, TX.*

This study was conducted to compare growth performance, health and carcass characteristics of beef steers fed diets containing EPNIX® products (Alltech Inc., EPNIX) with steers fed control (CON) diets formulated using conventional sources of trace minerals and common feed additives. One thousand six hundred eighty crossbred steers (Initial BW = 347.9 ± 23.7 kg) were used in a randomized complete block design with 2 treatments (CON and EPNIX) and 12 pens per treatment. Pen was the experimental unit. CON diets contained trace minerals from mostly inorganic sources plus monensin and tylosin. EPNIX diets contained organic trace minerals, yeast and bacterial preparations, but not monensin or tylosin. Both treatments were fed diets containing ractopamine hydrochloride at the end of the feeding period. EPNIX products tended to increase DM intake (9.95 vs. 10.12 kg/d, $P = 0.086$), but there were no differences between treatments in final BW, ADG or feed efficiency ($P \geq 0.145$). Carcasses from steers on the EPNIX treatment were 6.4 kg heavier (409.7 vs. 416.1, $P = 0.015$) than CON steers and dressed yield was 0.5 units higher (64.4 vs. 64.9%, $P < 0.001$). Final BW adjusted to a common dressed yield was higher for EPNIX steers ($P \leq 0.038$), as was carcass-adjusted ADG ($P \leq 0.033$). Carcass adjusted feed efficiency did not differ between treatments. Differences in health parameters between treatments were not remarkable. Marbling score and quality grade distributions were not remarkably different between treatments ($P \geq 0.019$). Calculated yield grade was lower (leaner) for EPNIX than CON carcasses (3.30 vs. 3.15, $P = 0.049$) due to heavier carcass weight and larger LM muscle area (92.5 vs. 96.3 in^2, $P < 0.001$). Liver abscess prevalence was higher for steers on EPNIX relative to CON (13.6 vs. 26.5%, $P < 0.001$), but measures of liver abscess severity did not differ between treatments. Differences in meat quality parameters were not remarkable. These results demonstrate that cattle may be fed successfully with EPNIX® products fed in lieu of monensin and tylosin, although liver abscess prevalence would be a concern. The increased dressed yield and heavier carcass weights for steers on the EPNIX treatment suggests a possible role of EPNIX products to improve carcass weight transfer.

Key Words: antibiotics, carcass

0251 Natural dry matter intake fluctuation impacts performance, feeding behavior and rumen morphometrics of feedlot cattle: 10 yr of data assessment. G. D. Cruz[*1], I. C. Pereira[2], D. D. Millen[3], M. D. Arrigoni[2], C. L. Martins[2], and C. F. Costa[2], *[1]Cargill Animal Nutrition, Elk River, MN, [2]São Paulo State University (UNESP), Botucatu, Brazil, [3]São Paulo State University (UNESP), Dracena, Brazil.*

This study aimed to evaluate the impact of natural DMI fluctuation on performance, carcass characteristics, feeding behavior,

blood metabolic profile and rumen morphometrics of feedlot cattle. All 10 experiments used for this analysis were conducted at the feedlot research station (São Paulo State University, Botucatu, Brazil campus) from 2006 to 2015. Data were collected from 838 yearling bulls fed high-concentrate diets in group pens (3 or 4 animals per pen; $n = 238$ pens). Pens were considered the experimental unit for this study. Daily DMI fluctuation was calculated for each pen as the difference in intake between consecutive days. Daily DMI fluctuation was expressed as variation according to the following formula: DMI fluctuation in kilograms/DMI of the previous day in kilograms × 100. The final data from each pen represented the average daily DMI fluctuation for the entire feeding period. Based on the overall median of DMI fluctuation of 5.62%, cattle were classified into two groups: high- or low-fluctuation. All data analysis was performed in R using a mixed model approach where pens and years were random variables and fluctuation group was considered as fixed. The low and high fluctuation groups presented a DMI fluctuation average of 4.79% and 6.74%, respectively. Low fluctuation group performed better than high fluctuation one, with greater ADG (1.45 kg vs. 1.39 kg; $P = 0.05$), DMI (9.16 kg vs. 8.89 kg; $P = 0.06$), total weight gain (143 kg vs. 137 kg; $P = 0.08$), LM area daily gain (0.18 cm^2 vs. 0.16 cm^2; $P = 0.03$), and lower shear force (4.71 kg vs. 5.41 kg; $P = 0.03$). In terms of feeding behavior, low fluctuation group spent more time ruminating (341 min vs. 322 min; $P = 0.04$), less time resting (893 min vs. 917 min; $P = 0.06$) and visited the water trough less often (6.6 visits vs. 7.4 visits; $P = 0.04$). No effects of DMI fluctuation was observed ($P > 0.10$) on blood metabolic profile, rumenites incidence and rumen morphometrics. This multiannual evaluation illustrates the severe impact of an apparent small DMI intake fluctuation on feedlot performance and raises even more awareness to bunk management and proper nutrition.

Key Words: feedlot, intake fluctuation, performance

0252 Effect of total replacement of trace minerals with Bioplex® proteinated minerals on the health and performance of lightweight, high-risk feedlot cattle.

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This study was conducted to compare growth performance, health and carcass characteristics of lightweight beef steers fed diets containing traditional trace mineral supplementation (CON) with steers fed diets containing only proteinated forms of Zn, Cu, Co and Mn (BIOPLEX). Eight hundred one lightweight crossbred beef steers (Initial BW = 139 ± 4.3 kg) were used in a randomized complete block design with 2 treatments (CON and BIOPLEX) and 12 pens per treatment. Pen was the experimental unit. CON diets contained trace minerals from mostly inorganic sources. BIOPLEX diets were reformulated to replace all supplementary sources of Zn, Cu, Co, and Mn with proteinated forms of these minerals (Bioplex®, Alltech Inc.). Diets were formulated to provide equal total mineral concentrations in the ration. There were no significant differences between treatments in dry matter intake, gain or feed efficiency. Numerical improvements in both average daily gain and dressing percentage resulted in a tendency for increased hot carcass weight in BIOPLEX diets (357.2 vs. 366.0 kg, $P = 0.10$). Morbidity was not affected by treatment but mortality was reduced by 57% on the BIOPLEX treatment (4.78 vs. 2.05%, $P = 0.03$), driven by a 69% reduction in mortality due to respiratory causes (3.28 vs. 1.02%, $P = 0.016$). Carcass composition, quality and yield grades were unaffected by treatment. In this study, total replacement of the trace minerals Zn, Cu, Co and Mn with proteinated forms reduced mortality from respiratory disease and tended to improve carcass weight. Total replacement with proteinated forms of trace minerals may play a role in supporting the production and health of high risk, light weight feedlot cattle.

Key Words: carcass, chelate, respiratory

0253 The effect of frequency of supplementing rumen protected unsaturated fatty acids on blood serum fatty acid profiles in beef heifers and lactating cows.

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The objective of this study was to determine frequency of supplementation of rumen protected fat (RPF; ESSENTIOM) influences circulating serum fatty acids (FA) in beef heifers and lactating cows. In experiment 1, 12 early gestation beef heifers were supplemented 0.5 kg corn gluten feed (CGF) daily during a 2-wk adaptation period. During the last 3 d of adaptation, blood samples were collected immediately before supplementation, then 8 and 16 h post-supplementation daily. Each heifer was then randomly assigned to one of 3 supplementation frequency treatments of RPF (3, 5, or 7 d/wk) for 3 wk in a Latin square design with 3 periods, with each treatment receiving the same amount of RPF and CGF per wk (1 and 2.7 kg respectively). Blood samples were collected during the final 3 d of each supplementation period as in adaptation period. In experiment 2, 18 Angus crossbred cows in early lactation were supplemented 4.54 kg CGF weekly either at 3, 5, or 7 d/wk during a 2-wk adaptation period. Blood samples were collected during the last 3 d of adaptation as in experiment 1. For the subsequent 3 wk, RPF was added to the CGF supplement so that each supplementation frequency received 1.59 kg/wk of RPF. Blood samples were collected during the last 3 d of supplementation as in experiment 1. Serum FA profiles on a random subsample of 8 heifers in experiment 1

and all animals in experiment 2 were determined via GC and values were analyzed using the MIXED procedure of SAS. In experiment 1, serum concentrations of C18:2 and total FA were increased during supplementation compared with during adaptation (trt*time, $P \leq 0.04$). However, there were no differences between supplementation frequencies within a day*time period. In experiment 2, serum concentrations of C18:2 and total FA were increased with RPF supplementation compared with adaptation (trt*time, $P \leq 0.01$). There was a tendency ($P < 0.1$) for the 7 d/wk frequency to have greater concentration of C18:2 and total FA for some of the first 24 h of the sampling period compared with the other 2 frequencies in experiment 2. These results demonstrate that supplementation of RPF during early gestation or lactation increased serum FA profiles of beef heifers and cows. However, these increases in serum FA may be altered dependent on the frequency of RPF supplementation in lactating cows but not heifers.

Key Words: rumen protected fat, serum fatty acids, supplementation frequency

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0254 Economic viability of supplementation during the rainy season for growing water buffaloes.

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The aim of this study was to evaluate the economic viability of the use of supplementation during rainy season for growing water buffaloes. Twenty buffaloes [Murrah water buffalo, non-castrated males; 10 ± 1 mo of age; 206 ± 29 kg initial body weight (BW)] in growing phase on rotational stocking system (*Urochloa brizantha* cv. Xaraés; 3.36 ha) were used. Animals were randomly assigned by BW and divided into two treatments to receive supplementation (0.6% BW; corn, urea and mineral salt; $n = 10$) or not (control; $n = 10$). Body weight was measured at the beginning and the end of the rainy season (180 d of experiment) to determining total gain (TG) and average daily gain (ADG). Economic viability was demonstrated by the items: cost/steer, cost/kg gain, income/steer, profit/steer, and profitability per hectare. Data were analyzed with PROC MIXED in SAS. No treatment effects ($P = 0.64$) were detected for initial BW (202.45 vs. 208.75 kg for supplement and control treatments, respectively). Supplement treatment had greater final BW ($P = 0.03$), TG ($P < 0.01$), ADG ($P < 0.01$), cost/steer ($P = 0.03$), income/steer ($P < 0.01$) and profit/steer ($P < 0.01$) than control treatment (338.63 vs. 301.86 kg for final BW; 136.18 vs. 93.11 kg for TG; 0.76 vs. 0.52 kg for ADG; \$225.77 vs. \$196.83 for total cost/steer; \$317.42 vs. \$217.03 for income/steer; \$91.65 vs. \$20.20 for profit/steer, for supplement and control treatments, respectively). Supplement treatment showed lower cost/kg gain ($P = 0.01$) than control treatment (\$3.10 vs. \$4.06, respectively). For profitability per ha, supplement treatment had higher value ($P < 0.01$) than control treatment (\$1221.58 vs. \$267.39, respectively). For stocking density, supplement treatment tended ($P = 0.06$) to have higher rate than control treatment [6.77 vs. 5.47 AU/ha (1 AU = 450 kg of BW), respectively]. In conclusion, supplementation strategy during the rainy season is a viable and profitable option for water buffaloes in growing phase. Supported by FAPESP #2014/06446–3.

Key Words: economic viability, supplementation, water buffalo.

0255 Subclinical ketosis prevalence in Nellore beef cows during the breeding season in Brazil did not affect pregnancy rate.

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Ketosis is a metabolic disease that affects the cattle production, therefore causes significant effects on the animal's metabolism and consequently decrease of animal production. Animals with negative energy balance may be committed by ketosis, with the subclinical form as the most common manifestation. The aim of this study was to evaluate the prevalence of subclinical ketosis (SK) in Nellore beef cows during the breeding season. Ninety-six females, 50 multiparous, and 46 primiparous, housed in a rural company in the state of Minas Gerais, Brazil, were evaluated between January and May of 2015. All cows were managed on a pasture system, composed of *Brachiaria brizantha*, with free access to water and mineral supplementation. For all animals, a protocol for estrus synchronization was performed, resulting in all animals being inseminated on the same day. Before insemination, blood levels of β-hydroxybutyrate (BHBA) were recorded by sampling a drop of blood from the tip of the tail, and adding the sample to a Optium Xceed portable device (Abbott Diabetes Care, Doncaster, Australia) for measurement of BHBA. Animals with BHBA concentration above 1200 mmol/L in the blood were classified as with SK. Visual inspection was also done to assess body condition score (BCS), using a scale of 1 to 5 as recommended by Spitzer (1986). After 60 d from the artificial insemination, animals were tested for pregnancy status. Prevalence of subclinical ketosis was on average 34% (33/96), being 32.61% (15/46) in primiparous and 36% (18/50) in multiparous. There was no effect of SK on the pregnancy rate ($P > 0.05$) for both primiparous and multiparous cows. The overall pregnancy rate was 35.41% (34/96), being 36.36% (12/33) in animals with SK and 34.93% (22/63) without SK ($P > 0.05$). In primiparous cows, the pregnancy rate was 10.8% (5/15) in animals with SK and 19.5% (9/31) in animals without SK, but in multiparous, the pregnancy rate was 14.0% (7/18) in animals with SK and 26.0% (13/32) without SK. There was an effect of the BCS on

the occurrence of SK ($P < 0.001$), in which animals with BCS above 3 had 21.42% (6/28) of SK and animals with BCS below 3 had 39.70% (27/68). In conclusion, the prevalence of SK observed in Nellore beef cows in Brazil was high, but did not affect pregnancy rate. As expected, animals with lower BCS had higher prevalence of SK.

Key Words: subclinical ketosis, pregnancy rate, Nellore cows

0256 Effects of breeding system of origin (natural service or artificial insemination) on pregnancy rates, distribution of calving, and calf weaning weights of commercial beef cow herds in North Dakota.

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Objectives of this study were to compare pregnancy rates, calving distribution, and calf weaning weights of commercial beef cows exposed to two different breeding systems. Producers recruited ($n = 10$) had never implemented estrus synchronization and AI into their reproductive management plan. Within each herd, cows were randomly assigned to one of two breeding system treatments: (1) only exposed to natural service herd bulls (NS; $n = 1{,}122$) or (2) exposed to ovulation synchronization and fixed-time AI followed by natural service bulls (TAI, fixed-time AI; $n = 1284$). Production, performance and profit outcomes were evaluated within/across herds for each breeding system. Females exposed to TAI were exposed to 7-d CO-Synch + CIDR protocol with fixed-time AI at 60–66 h after CIDR removal. Clean-up bulls were placed in breeding pastures 1 d after AI and remained with females until the end of the producer defined breeding season. Presence of a viable fetus was determined at least 45 d after the conclusion of the breeding season. At parturition, birth date was recorded. No differences ($P = 0.54$) were observed in the proportion of females pregnant at the end of the breeding season between NS (93.1%) and TAI (93.2%) treatments. Cows in the TAI treatment calved 7.8 d earlier ($P < 0.001$) in the calving season compared with NS cows. A greater proportion ($P < 0.01$) of TAI cows (44.8%) gave birth in the first 21 d of the calving season compared with NS cows (26.0%). From d 22 to 42 a greater proportion ($P < 0.01$) NS cows (41.6%) gave birth compared with TAI cows (28.2%), and a greater proportion of NS cows (23.7%) gave birth from d 42 to the end of the calving season compared with TAI cows (17.2%). A treatment x calving group interaction was present for weaning weight. Greater ($P < 0.01$) weaning weights were observed for calves born from TAI cows in the first 21 d of the calving season (269.3 ± 1.82 kg) compared with NS born calves (257.6 ± 2.65 kg). Weaning weights of calves born to TAI and NS cows in the second 21 d and from d 42 to the end of the calving season were similar ($P = 0.17$). Use of TAI in commercial beef herds increased the number of calves born earlier in the calving season and increased the weaning weights of calves.

Key Words: AI, beef cattle, breeding systems, natural service

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0257 Resynchronization for sequential timed artificial insemination.

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Increasing the number of pregnancies resulting from AI has a positive impact on the profitability of a beef cattle operation. However, subsequent AI after timed insemination is currently limited by distribution of return to estrus for non-pregnant females precluding a second timed insemination. The objective of this study was to determine if resynchronization in beef cattle for a second timed AI, without knowledge of individual female pregnancy status to the first timed insemination, is a viable management tool. Beef cows ($n = 140$) and heifers ($n = 45$) were allotted to 2 study groups: (1) single synchronization and timed AI (SS; $n = 67$ cows, 22 heifers) and (2) consecutive synchronization and timed inseminations (RS; $n = 73$ cows, 23 heifers). Both groups were simultaneously subjected to the 7-d CO-Synch + CIDR protocol for the initial timed insemination. Briefly, CIDR®s were inserted on d −9 with an injection of GnRH. On d −2, CIDRs were removed and an injection of $PGF_2\alpha$ was administered. Timed AI and an injection of GnRH occurred on d 0. For RS, CIDR®s from the first synchronization protocol were re-inserted on d 14. The CIDR®s were removed on d 21 and estrus detection patches were applied. All cattle with activated estrus detection patches were re-inseminated 72 h after CIDR removal (d 24). Pregnancy was determined via trans-rectal ultrasonography on d 54 to identify cows that conceived to the first or second insemination (based on fetal size) or failed to conceive. Interactions of parity, AI technician, or sire with treatment on pregnancy rate were not detected. Pregnancy rate to the first timed AI did not differ ($P = .49$) between SS and RS groups (66% (59/89) and 61% (59/96), respectively). Re-synchronization yielded 15 additional AI pregnancies, resulting in overall RS AI pregnancy rate of 77% (74/96). Overall pregnancy rate to AI tended ($P = 0.10$) to be greater in the RS than SS group (77% vs. 66%, respectively). This method of resynchronization for a second timed AI may be a useful management tool to increase pregnancy rates during a breeding season. Additionally, it would accommodate scheduling AI technicians where they might not otherwise be available to breed on natural return to estrus. Further analysis of the economic viability of this particular

approach is warranted.

Key Words: beef cattle, estrous synchronization, timed AI

0258 Impact of diet on the behavior of limit-fed beef cows in drylots. C. L. Daigle*[1], J. R. Baber[1], J. E. Sawyer[2], and T. A. Wickersham[1], *[1]Texas A&M University, College Station, [2]Department of Animal Science, Texas A&M University, College Station.*

Providing cattle with opportunities to interact with their environment while in feedlots may impact time allocation and influence space use. Mid- to late-gestation cows ($n = 96$) were stratified by body weight, BCS, age, and days in gestation and randomly assigned to one of 12 pens (8 cattle/pen; 4 pens/treatment). Each pen was randomly assigned to one of three treatments: HAY (cattle had ad libitum access to Bermudagrass hay), HC (limit-fed concentrate in the morning and forage 12 h later), and TMR (limit-fed a total mixed ration once in the morning). Limit-fed treatments, HC and TMR, were fed a diet of wheat straw (35%), cracked corn (29%), dried distillers' grains (27%), and premix (9%) formulated to contain 1.58 Mcal NE_m/kg and fed to deliver 80% of NRC predicted NE_m requirements. After cattle had been exposed to these treatments for 105 d, behavioral observations recorded the number of cattle performing each posture (stand, lie, walk) and behavior (feed, drink, ruminate, rest), as well as the number of cattle within 1 m of the feed bunk using 10-min instantaneous scans. A Generalized Linear Mixed model (PROC MIXED) evaluated the impact of treatment on cattle posture and behavior. Least squared means with a Tukey-Kramer adjustment identified differences among the 3 treatments. Treatment did not impact the number of cattle standing, walking, lying, or drinking ($P > 0.05$). More cattle were observed feeding in HAY ($t_9 \leq 13.7$, $P < 0.01$) compared with HC and TMR (2.76 vs. 0.18 and 0.39). More cattle rested in HC and TMR ($t_9 > -12.7$, $P < 0.01$) than HAY (5.72 and 5.63 vs. 3.20). More cattle ruminated in HAY than TMR (1.18 vs. 0.64; $t_9 = 3.2$; $P = 0.03$), and HC tended to ruminate more than TMR (0.98 vs. 0.64; $P = 0.09$). More cattle were observed resting in HC and TMR than in HAY (6.02 and 6.17 vs. 3.45; $t_9 \leq -12.6$, $P < 0.01$), and HAY spent more time less than 1 m of the feeder than cattle in HC or TMR (3.46 vs. 1.23 and 1.05; $t_9 \leq 3.5$, $P < 0.05$). Cattle provided with hay ad libitum rested less and engaged in more feeding and ruminating. By spending more time at the feeder, hay-fed cattle may use pen space more intensely than others which could impact pen management.

Key Words: behavior, diet, drylot

0259 Newborn beef calves benefit from supplementation of vitamins D and E. C. D. Nelson[1], M. Poindexter*[2], J. L. Powell[2], J. V. Yelich[2], S. L. Bird[3], and R. L. Stuart[4], *[1]University of Florida, Gainesville, [2]Department of Animal Sciences, University of Florida, Gainesville, [3]University of Minnesota, Grand Rapids, [4]Stuart Products Inc., Bedford, TX.*

The objective of this study was to determine the effects of injectable vitamins A, D, and E on fat-soluble vitamin status of beef calves. Sixteen Angus calves from a herd in Minnesota and 17 Angus and Brangus calves from a herd in Florida born in March were randomly assigned to receive no treatment or subcutaneous injection of VITAL-E® Newborn (Stuart Products Inc.; 50,000 IU retinyl-palmitate, 50,000 IU vitamin D_3, and 500 IU *RRR*-α-tocopherol/mL of product). Minnesota calves received either no treatment (CON, $n = 8$) or 5 mL subcutaneous injections of VITAL E-Newborn (ADE, $n = 8$) within 24 h of birth and serum samples were collected at 0, 2, 7, 50, and 210 d of age. Florida calves received either no treatment ($n = 7$) or 4 mL of VITAL E-Newborn ($n = 9$) within 24 h of birth and serum samples were collected at 0, 25, 50, and 180 d of age. Serum retinol concentrations were not affected by treatment, but retinyl-palmitate was greater at 2 d of age in the Minnesota ADE vs. CON calves (646 ± 204 vs. 20 ± 1 ng/mL). In contrast, serum 25-hydroxyvitamin D (25(OH)D) concentrations of the Minnesota ADE calves increased from 8.4 ± 1.3 ng/mL at birth to 61.7 ± 3.6 ng/mL at d 7, compared with 5.5 ± 1.3 at birth and 9.8 ± 4.6 at d 7 in CON calves ($P < 0.001$). Serum 25(OH)D of Florida ADE calves increased from 9.9 ± 3.3 ng/mL at birth to 36.2 ± 3.9 ng/mL at d 25, compared with 5.4 ± 3.5 and 19.7 ± 4.8 ng/mL in CON calves ($P < 0.05$). Serum 25(OH)D was still elevated at 50 d of age in ADE calves in both herds ($P < 0.01$; ADE = 38.8 ± 2.3 ng/mL vs. CON = 29.4 ± 2.5 ng/mL), but was the same at weaning near 50 ng/mL. Serum α-tocopherol increased in Minnesota ADE calves from 1.0 ± 0.5 μg/mL at birth to 6.8 ± 0.5 and 5.3 ± 0.5 μg/mL at d 2 and 7, respectively, compared with 0.6 ± 0.5, 1.3 ± 0.5, and 2.4 ± 0.5 μg/mL in Minnesota CON calves at 0, 2, and 7 d of age, respectively ($P < 0.001$). Serum α-tocopherol was similar between Florida ADE and CON calves with averages near 0.8 μg/mL at birth and 2.5 μg/mL at 25 d of age. In conclusion, supplementation of newborn beef calves with VITAL-E Newborn increases serum 25(OH)D and α-tocopherol concentrations and overcomes deficiences in vitamins D and E of the young calf.

Key Words: beef calves, fat-soluble vitamins

0260 Functional SNP in a polygenic disease induced by high-altitude in fattening Angus steers using systems biology approach. A. Cánovas[*1], R. Cockrum[2], D. Brown[3], S. Riddle[3], J. M. Neary[4], T. N. Holt[5], J. F. Medrano[6], A. Islas-Trejo[6], R. M. Enns[7], S. E. Speidel[7], K. Cammack[4], K. R. Stenmark[8], and M. G. Thomas[7], *[1]University of Guelph, ON, Canada, [2]Virginia Polytechnic Institute and State University, Blacksburg, [3]University of Colorado, Denver, [4]Colorado State University, Fort Collins, [5]College of Veterinary Medicine and Biomedical Sciences, Colorado State University, Fort Collins, [6]University of California, Davis, [7]Department of Animal Sciences, Colorado State University, Fort Collins, [8]University of Denver, CO.*

High-altitude (> 1800m) disease is a challenging problem in beef and dairy cattle. The disease is consequential of hypoxia-induced right ventricular (RV) heart failure as per vascular inflammation of the pulmonary artery (PA) and hypertension. The disease has moderate to high heritability ranging from 0.2 to 0.4; however, minimal information exists of the genes involved. The transcriptomes of six tissues (i.e., left and right ventricle, pulmonary artery, aorta, muscle, and lung) were examined in samples harvested from fattening-yearling Angus steers phenotyped to be of low or high pulmonary arterial pressures (LPAP and HPAP; n = 10/group). Tissue specific splice variants were identified in RV (n = 555), aorta (n = 547) and PA (n = 152; $p < 0.01$ FC > 2) between LPAP and HPAP animals. Most of the splice variants are located in key regulators genes with roles in angiogenesis and cardiomyopathy (NFATC1), movement of leukocytes and neutrophils (OLR1, PLAUR), failure of heart (CTGF), hypertrophy of heart ventricle (TREM1, GATA2) and vascularization (SYVN1). Besides, several SNP variants segregated specifically in either the LPAP or HPAP animals. Among them, 139 SNP were located in key regulator genes involved in the adaptation of high altitude disease. These approaches helped identify splice variants corresponding to key regulator genes in a polygenic disease induced by high-altitude in Angus cattle. The identification of functional SNP associated with high-altitude disease by combining structural and functional genomic data will help to develop more robust approaches for genetic selection in beef cattle.

Key Words: beef, health, genomics, systems biology, RNA-sequencing, functional SNP

0261 Factors affecting timing and intensity of calving season of beef cow-calf producers in the Midwest. C. E. Andresen[*1], P. J. Gunn[1], and L. L. Schulz[2], *[1]Department of Animal Science, Iowa State University, Ames, [2]Department of Economics, Iowa State University, Ames.*

Despite demonstrated market incentives to adopt controlled calving seasons, many producers still have herds that calve somewhat broadly throughout the year. We postulate this observed management behavior is related to a variety of factors. Primary data, collected through a coordinated survey effort with U.S. Department of Agriculture's National Agricultural Statistics Service, were used to quantify factors that affect producers' decisions regarding timing and intensity of calving season. Descriptive statistics were generated using the surveymeans procedure of SAS, and the surveyreg procedure was used to conduct a regression analysis. Of the survey respondents, 88% were commercial producers and 12% were seedstock producers or operated a combination seedstock/commercial operation with an overall average of 63 beef cows. Ninety-seven percent, 50%, 33%, and 26% of farms calve in the spring (March, April, May), summer (June, July, August), fall (September, October, November), and winter (December, January, February), respectively. Twenty-two percent observed a calving season exclusively in the spring. Sixty-six percent of respondents indicated calving season was dictated by weather, 34% because of labor availability, and 31% because of tradition. Least often reasons for calving season were market timing (16%), feed availability (8%), and other (4%). Producer-stated reasons for calving season explained 62% of the variation in timing and intensity of calving on an operation, whereas a model of producer demographic and operation characteristics explained 83% of the variation. These results highlight the importance of evaluating producer and operation characteristics in addition to producer input when making recommendations to enhance production efficiency and profitability. Furthermore, understanding the factors which impact calving season provides opportunities for improved Extension and research programming.

Key Words: beef, calving season, survey

0262 Effects of feeding NaturSafe on performance, carcass characteristics, and liver abscesses in finishing beef heifers at a commercial feedlot. M. F. Scott[*1], K. L. Dorton[1], D. L. Henry[1], C. R. Belknap[1], and B. E. Depenbusch[2], *[1]Diamond V, Cedar Rapids, IA, [2]Innovative Livestock Services Inc., Great Bend, KS.*

With the mandatory implementation of VFD on the horizon, as well as retailer and consumer demands for reduced antibiotic usage, cattle feeders are considering other technologies that can mitigate liver abscesses and maintain growth performance

when standard industry technologies are removed from the diet. In this study, cross-bred heifers (N = 1495; 359 ± 3.4 kg) were utilized in a randomized complete block design at a commercial feedlot to determine the effects of a *Saccharomyces cerevisiae* fermentation product (NaturSafe, Diamond V, Cedar Rapids, IA) on performance, carcass characteristics, and liver abscesses when monensin, tylosin, and direct fed microbials (DFM) were not included in the diet. Upon arrival, heifers were allowed ad libitum access to water and long-stemmed hay. During processing, they received a feedlot tag and growth implant, and were vaccinated and treated for parasites. Heifers were then blocked by arrival BW and randomly assigned to one of 2 treatments (10 pens/treatment, approximately 75 heifers/pen). Treatments consisted of a diet containing: (1) monensin, tylosin, and Bovamine Defend (positive control, PC) or (2) NaturSafe at 18 g/head/d without monensin, tylosin, and the DFM. Diets were fed twice daily with heifers receiving half of the daily dose of treatment in the TMR at each feeding. Pen BW were collected on d 0 and at harvest on d 125 and 146 (5 pens per treatment per day). Feed intake, morbidity and mortality were monitored daily. Cattle were vaccinated and implanted a second time approximately 74 d before harvest. Hot carcass weight, dressing percentage, quality grade, yield grade, percent kidney-pelvic-heart fat percentage, rib fat thickness, rib-eye area, marbling score and liver abscess scores were determined. Performance, carcass characteristics and liver abscess scores were analyzed using the MIXED procedure of SAS with pen as the experimental unit. Performance, carcass characteristics, morbidity and mortality were similar (P > 0.05) between treatments. Heifers fed NaturSafe had a numerically lower (P = 0.11) incidence of liver abscesses compared with PC (14.5% vs. 19.3%, respectively) with fewer (P = 0.02) livers condemned that had less severe (i.e., A-) abscesses (3.3% vs. 6.9%, respectively). Results from this study suggest that NaturSafe has the potential to reduce liver abscesses and maintain growth performance when standard industry technologies like monensin, tylosin, and DFM are removed from conventional production diets.

Key Words: *Saccharomyces cerevisiae*, fermentation product, cattle, performance

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0263 Inclusion of exogenous enzymes in creep feeding rations for nursing beef calves. J. M. Lourenço[*1], B. T. Campbell[2], N. DiLorenzo[3], and R. L. Stewart, Jr.[1], *[1]Department of Animal and Dairy Science, University of Georgia, Athens, [2]DSM Nutritional Products, Parsippany, NJ, [3]University of Florida, North Florida Research and Education Center, Marianna.*

An in vitro experiment was performed to investigate if some exogenous enzymes customarily used in rations of monogastric animals would be effective when included in a creep feed (CF) for nursing beef calves. The chosen enzymes were included in experimental treatments both individually and in combination with other enzymes. The treatments consisted of: (1) Bermuda grass (BER); (2) a mixture of 75% Bermuda grass and 25% CF (BERCF); (3) BERCF enhanced with xylanase (XYL); (4) BERCF enhanced with β-1,3-glucanase (BGLUC); (5) BERCF enhanced with α-amylase (AMYL); (6) BERCF enhanced with a combination of xylanase, β-1,3-glucanase and β-1,4-glucanase (COMB1); or (7) BERCF enhanced with a combination of xylanase, β-1,3-glucanase, β-1,4-glucanase and α-amylase (COMB2). Two rates of inclusion of the enzymes were tested: the dose normally used in rations of monogastrics, and a dose 10 times greater (10x). Five replications per treatment were used. Incubations were performed for 24 h using rumen fluid collected by esophageal tubing from 6-mo-old nursing calves. Analysis of variance was conducted as a completely randomized design using fermentation bottle as the experimental unit with treatments and replications as factors. Digestibility of the ADF portion of the diet was lowest for BER, however, it was greater for BERCF, and it was maximal for BGLUC 10x (P = 0.02). Similarly, IVDMD was lowest for BER and highest for XYL 10x (P = 0.02). Production of acetate, propionate, and butyrate were all lowest for BER (P < 0.01). Total production of VFA was also minimal for BER, and it was greatest for COMB2 10x (P < 0.01). The acetate:propionate ratio was greatest for BER (P = 0.01). No differences were detected regarding molar proportion of propionate, however, molar proportion of butyrate was smallest for BER (P < 0.01). Total gas produced per g of incubated DM, and concentration of methane per L of gas were greatest for AMYL 10 (P < 0.01). Overall, the inclusion of the studied enzymes improved important traits such as IVDMD, ADF digestibility, and production of VFA. This indicates that nursing beef calves may benefit from the use of these enzymes, especially if they are included at rates greater than those found in diets of monogastric animals.

Key Words: creep feeding, exogenous enzymes, in vitro

0264 Body temperature and seminal characteristics in double and normally muscled senepol bulls in the tropics. I. Suero[1], E. Sanoguet[1], H. Sánchez[*1], J. Curbelo[1], A. Casas[1], T. Sonstegard[2], and M. Pagán-Morales[1], *[1]Department of Animal Science, University of Puerto Rico, Mayaguez, [2]Recombinetics Inc., St Paul, MN.*

Double muscled cattle present conformational differences in their carcasses that are highly attractive to the beef industry, including a greater yield of valuable muscles and lower adipose tissue accumulation. However, in the Puerto Rican Senepol cattle, which are highly adapted to the tropics, it is not known if such differences may affect thermoregulation or reproductive performance. Therefore, the present study compared rectal (RT) and scrotal [(ST); determined by infrared thermography at the proximal, medial, and distal regions of

the scrotum] temperatures, as well as sperm concentration, motility, and normality between 8 heterozygous double muscled (HM; MSTN NT821/WT) and 8 normally muscled (NM) Senepol bulls. All animals were homozygous SLICK (PRLR; chr20:39136558GC > G). Bulls were electro-ejaculated at d 55 and d 60 after a previous collection at d 1 (activation of spermatogenesis/sperm removal from epididymis) during a hot (HOT) and a cool (COOL) period with daily mean air temperature values of 30.0 and 28.8°C, respectively. Temperatures were recorded three times/d (0800, 1200, and 1500 h) during 5 d after d 1. Semen was analyzed using a Computer Assisted Sperm Analysis System (CASA) and a GLIMMIX procedure in SAS was used for the correspondent statistical analyzes. The HM bulls presented smaller scrotal circumferences ($P < 0.05$; HM: 36.12 cm vs. NM: 37.72 cm) and higher RT ($P < 0.05$; HM: 38.63°C vs. NM: 38.49°C) than the NM bulls. However, no differences in ST were observed between genotypes in any period ($P > 0.05$). Sperm concentration per cc of semen was lower in HM (460.04 x 10^6) than NM (837.32 x 10^6) in HOT ($P < 0.05$); however, no differences were observed in COOL ($P > 0.05$; 321.20 x 10^6 and 295.92 x 10^6 for HM and NM, respectively), with an imminent reduction in sperm concentration in both groups. In HM, the sperm motility was greater in COOL ($P < 0.05$), while total progressive sperm was greater in COOL for both groups ($P < 0.05$). The latter was also observed for normality ($P < 0.05$). The proportion of coil tail sperm was higher in HOT ($P < 0.05$) and HM showed more proximal cytoplasmic droplets overall in HOT (HM-HOT > NM-HOT > HM-COOL = NM-COOL). These results suggest that greater body temperatures could affect slick-double muscled Senepol cattle in terms of sperm concentration, maturation rate and motility, irrespective of the testicular size.

Key Words: motility, normality, sperm, Senepol

0265 Effects of summer and winter feeding of endophyte infected tall fescue seeds on average daily gain and activity of hepatic cytochrome P450 1A, 2C, 3A, aldo-keto reductase 1C, and uridine 5'-diphospho-glucuronosyltransferase in beef steers.

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The objective of this study was to investigate the effects of feeding endophyte-infected tall fescue seeds on ADG (kg/d) and activities of hepatic cytochrome P450 1A, 2C, 3A, aldo-keto reductase 1C, and Uridine 5'-diphospho-glucuronosyltransferase (UGT). Twelve Angus steers of 181 d of age and an average pre-weaning weight of 194.6 kg were blocked by initial BW at weaning. A control (KY32 or E–) and a treatment (KY31 or E+, 20 µg of ergovaline per kg of BW) were randomly assigned to animals within blocks ($n = 6$) by using Calan gates in two trials of 70 (summer 2015) and 56 d (winter 2016). Body weight was recorded on d 0 and every 14 d. Liver biopsies were collected before each trial and on d 3. Proteins in the S9 fractions were extracted into phosphate buffer and diluted to a concentration of 4000 µg/mL. Enzyme activity (RLU/min/mg of protein) was determined by a Promega Multi-Plus plate reader (Madison, WI) after incubation with specific substrates and detection reagents. Statistical analysis was performed by the GLIMMIX and FACTOR procedures of SAS 9.4 (SAS Institute Inc., Cary, NC) with statistical significance being determined at $P \leq 0.05$. In trial 1, E+ steers gained 0.323 kg/d less than E- steers ($P = 0.013$) between d 28 and d 70. Cytochrome 2C activity differed initially ($P = 0.042$) but did not on d 3 ($P = 0.675$). Cytochrome 1A and 3A activities were correlated ($r = 0.621$, $P = 0.042$). In trial 2, no treatment effect on ADG was found ($P = 0.435$). From d 28 to d 56, ADG increased consistently from 0.567 to 1.393 kg/d, whereas ADG remained similar ($P > 0.392$; 0.539 to 0.574 kg/d) in trial 1. Only initial UGT activity was 42% greater in E+ steers in trial 2. Cytochrome 1A and 2C activities were correlated ($r = 0.912$, $P = 0.002$). Other enzyme activities were similar in both trials ($P > 0.180$), and no treatment × d interaction on ADG was found ($P > 0.142$). Principal component analysis indicated that the activities of 1A, 2C, 3A, and 1C explained 65.88 to 66.41% of enzyme activity variances, whereas UGT activities explained the rest of the variances on d 3. Correlation coefficients of these two groups of enzymes with each principal component confirmed that they acted in separate pathways.

Key Words: beef, endophyte, tall fescue

0266 Relationships of neonatal beef calf birth weight and body size measures.

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Research investigating the effects of gestational nutrition or management on fetal development often use birth weight as the primary prenatal growth measure. Weight does not take skeletal size or shape into account and thus may not accurately assess many aspects of fetal growth. Our objective was to determine the relationship of weight and body size measures in neonatal beef calves. Calves were weighed within 16 h postnatal during a fall-calving ($n = 42$, Sim-Angus and Hereford) and spring-calving ($n = 47$, Sim-Angus) season. A flexible tape measure was used to record 5 body size measures for each calf. Crown to rump length (CRL) was defined as the length from poll to tailhead, whereas shoulder to rump length (SRL) was defined as the length from the neck-shoulder junction to tailhead, both following the spine. Heart girth was measured immediately posterior of the front legs and abdominal girth was measured at the umbilicus, both perpendicular to the spine. Cannon circumference was taken at the smallest point of 1 cannon bone. Ponderal index is used in human medicine to

assess body shape or tissue growth relative to skeletal growth. Calf ponderal index was calculated as birth weight (kg)/length $(cm)^3$ using either CRL (PI-CRL) or SRL (PI-SRL). Pearson correlations were determined for weight and body size measures. Birth weight had a weak positive correlation ($P \leq 0.06$) with CRL and SRL, moderate positive correlation ($P < 0.0001$) with heart girth and cannon circumference, and strong positive correlation ($P < 0.0001$) with abdominal girth. This suggests that birth weight is less related with body length than girth in neonatal calves. Birth weight had weak positive relationships ($P < 0.005$) with PI-CRL and PI-SRL, whereas CRL and SRL had strong negative relationships ($P < 0.0001$) with their corresponding ponderal index measures. Abdominal girth had a weak positive correlation with PI-CRL and PI-SRL, but heart girth was not correlated with either. Heart girth had a moderate positive correlation ($P < 0.0001$) with abdominal girth, CRL had a weak positive correlation ($P < 0.003$) with SRL, and PI-CRL had a weak positive correlation with PI-SRL. This suggests that length measures have more variation or potential for error. In summary, birth weight is weakly or moderately related to most body size measures in neonatal calves. Length, girth, and ponderal index measures can help to describe calf size and shape at birth, adding valuable information.

Key Words: calving, fetal growth, neonate

0267 Locomotor activity changes in the final 72 h prepartum in multiparous beef cows. S. M. Bolen[1], B. L. Vander Ley[2], K. N. Niederecker[1], and A. M. Meyer*[1], [1]*Division of Animal Sciences, University of Missouri, Columbia,* [2]*Department of Veterinary Medicine and Surgery, University of Missouri, Columbia.*

The objective of this study was to quantify changes in locomotor activity of multiparous beef cows during the final 72 h prepartum. IceQube activity monitors (IceRobotics, Edinburgh, UK) were placed above the left hind fetlock ($\geq$ 4 d prepartum) of 106 multiparous, spring-calving beef cows over 2 yr. Cows that were moved outside of their normal patterns during the 72 h prepartum were removed from the dataset, resulting in 63 cows to be used for analysis. Cows were housed in 18 × 61 m drylots during calving and allowed ad libitum access to hay or haylage in round bale rings placed in the drylots. Each cow's motion index, standing time, lying time, step count, and number of lying bouts were summed per hour using IceManager 2012 software. Motion index was calculated by the software using a proprietary algorithm. Hour 0 was defined as time of parturition (± 30 min). Data were analyzed by day (d −3 to d −1 prepartum), by 6-h period during the final 24 h prepartum, and by hour during the final 6 h prepartum using MIXED procedures of SAS. Motion index, standing time, step count, and number of lying bouts increased ($P < 0.001$), while lying time decreased ($P < 0.001$) on d −1 compared with d −2 or d −3 relative to parturition. In the 24 h immediately prepartum, the 6 h preceding parturition (−6 to 0 h) had greater ($P < 0.05$) motion index, standing time, step count, and number of lying bouts compared with the other 6-h periods before calving. There was no effect ($P = 0.19$) of 6-h period on lying time during the 24 h before parturition. Motion index increased ($P < 0.05$) from −6 to −4 h and remained steady from −4 h to 0 h. Cows had greater ($P < 0.05$) standing time and less ($P < 0.05$) lying time at 0 h compared with −5 and −6 h before parturition. Step count was greater ($P < 0.05$) from −3 to −1 h compared with −6 to −5 h. Number of lying bouts increased ($P < 0.05$) between −3 and −1 h and decreased ($P < 0.001$) from −1 h until calving. In conclusion, multiparous beef cow activity changes 4 to 6 h before parturition. These data suggest that electronic activity monitors can be used to recognize the earliest signs of parturition in beef cattle.

Key Words: activity, movement, parturition

0268 Impact of heifer development system on subsequent ADG and reproduction in two different breeding seasons. S. A. Springman*, H. R. Nielson, and R. N. Funston, *University of Nebraska, West Central Research and Extension Center, North Platte.*

A 4-yr study was conducted to determine the impact of heifer development system on subsequent growth and reproductive performance in 2 breeding seasons. In Exp. 1, March-born, crossbred (5/8 Red Angus, 3/8 Continental; $n = 225$) heifers were stratified by BW and randomly assigned to 1 of 2 post-weaning nutritional treatments (2 pastures·treatment^{-1}·yr^{-1}) from mid-January to mid-April. Heifers were offered ad libitum meadow hay (HAY) and 1.81 kg/d (29% CP, DM) supplement or allowed to graze meadow (MDW) and offered 0.45 kg/d supplement. Heifers were managed as a single herd before and following treatment. Heifers were synchronized with a single PG injection 5 d after being placed with bulls for a 45 d breeding season. HAY heifers had greater ($P = 0.01$) ADG during the treatment period than MDW heifers (0.77 vs. 0.51 ± 0.03 kg/d; HAY, MDW). At pregnancy diagnosis, HAY heifers tended to have greater BW compared with MDW heifers ($P = 0.06$; 377 vs. 367 ± 3 kg; HAY, MDW). Percent of mature BW before the breeding season was greater ($P = 0.02$) for HAY compared with MDW (58% vs. 55% ± 1%; HAY, MDW). Pregnancy rates were similar for HAY and MDW heifers ($P = 0.97$, 88 ± 4%). In Exp. 2, May-born, crossbred (5/8 Red Angus, 3/8 Continental; $n = 258$) heifers were stratified by BW and randomly assigned to HAY or MDW treatments. Similar to Exp. 1, heifers on HAY treatment had greater ($P = 0.01$) ADG during the treatment period (0.63 vs. 0.39 ± 0.03 kg/d; HAY, MDW), resulting in greater pre-breeding BW ($P = 0.02$) for HAY heifers compared with MDW heifers (320 vs. 305 ± 3 kg, respectively). At pregnancy diagnosis, BW was similar ($P = 0.16$) between treatments (368 vs. 356 ± 4 kg; HAY, MDW). Percent of mature BW before

the breeding season was greater (P = 0.02) for HAY (58%) compared with MDW (54%). Pregnancy rates were similar (P = 0.44) between treatments (72 vs. 68 ± 4%; HAY, MDW). Heifer development system did not impact pregnancy rate in the March or May replacement heifers; however, March heifer pregnancy rate was greater (P < 0.01) than May (87 vs. 70 ± 3%). The lower pregnancy rate in May heifers may be due to declining forage quality during the breeding season.

Key Words: beef heifer, calving date, heifer development

0269 Effect of castration method and analgesia on growth performance and carcass traits in feedlot cattle.

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Castration is a painful, yet routine management practice within the U.S. that is known to transiently decrease performance but the method of castration, provision of analgesia, or both may impact growth in feedlot cattle. Our objective was to determine the effect of castration timing (birth vs. feedlot entry), method (surgical vs. banding) and use of the analgesic meloxicam (**MEL**) on performance and carcass traits in feedlot cattle. This study was a randomized complete block design conducted over a 3-yr period. Single-source Angus × Hereford steer (n = 42) and bull (n = 152) calves were randomized at birth to 1 of 5 treatments arranged as a 2 × 2 + 1 factorial: (1) steers castrated near birth (**CON**), (2) bulls surgically castrated without MEL (**SUR**), (3) bulls surgically castrated with MEL (**SUR+MEL**), (4) bulls band castrated without MEL (**BAN**), and (5) bulls band castrated with MEL (**BAN+MEL**). Upon feedlot arrival (d −10), animals were blocked by initial BW (224 ± 4.5 kg) and assigned randomly to treatment pens (n = 6 pens/treatment). Oral MEL was administered at 1 mg/kg BW concurrent with castration on d 0. Individual BW was collected at weaning, d 0, 7, 14, 32, re-implant and on finishing to determine interim and overall ADG. Although BW was not affected by castration method or MEL, there was a tendency (P = 0.10) for CON animals to be heavier at d 32 and re-implant. From d 0 to 7, ADG was reduced for surgical (−0.42 kg/d) compared with band (0.43 kg/d) castration. Conversely, ADG was increased for surgical (1.74 kg/d) vs. band (1.46 kg/d) castration from d 14 to 32. Daily gain was increased for CON compared with castrated for all interim periods ($P \leq$ 0.02) except re-implant to final (P = 0.90). There was also an overall improvement in ADG for CON (P = 0.04) and MEL (P < 0.01), but this was not influenced by method (P = 0.80). The CON had increased marbling score (P = 0.03) compared with castrated; whereas, backfat thickness was increased (P < 0.05) in SUR+M, but did not differ from CON (P = 0.15). Administration of MEL tended (P = 0.08) to increase yield grade. Castration near birth had long-term performance benefits compared with castration on feedlot arrival. Castration, regardless of method, transiently reduced ADG, but MEL administration improved overall ADG for both methods.

Key Words: analgesia, beef cattle, castration

0270 Evaluation of long-acting eprinomectin and a combination of moxidectin/oxfendazole administration post-weaning on immune status by Angus and Angus × Hereford crossbred replacement heifers over a 274-d grazing period.

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Internal parasite burdens have been reported to decrease animal performance and feed efficiency; however, little current research has evaluated the effects of burdens on the immune status in beef cattle. The objective of this study was to evaluate the effects of anthelmintic therapy on the immune status in replacement crossbred beef heifers. Beginning June 2, 2014, 83 fall-born Angus and Angus × Hereford replacement heifers were stratified by d −14 BW and fecal egg counts, and d of age. Heifers were then allocated randomly to 1 of 3 anthelmintic treatments consisting of: (1) control (n = 28; no anthelmintic administered; CON); (2) moxidectin/oxfendazole combination (n = 28; MO); or (3) long-acting eprinomectin (n = 27; LAE) for a 274-d grazing study. Heifers grazed in individual treatment groups on pastures, containing predominantly endophyte-infected tall fescue, for the duration of the project and were supplemented daily at 1% BW with corn gluten. Whole blood was collected via jugular vein on d 0, 14, 28, 84, 154, 168, 182, 234, and 274. On each d complete blood cell differentials were determined using a Cell-Dyn 3700 SL machine. Data were analyzed using the PROC MIXED of SAS for repeated measures. Two orthogonal contrasts were used and included: (1) comparing the mean of CON vs. the mean of treated heifers; and (2) comparing the mean of MO vs. LAE. Concentrations of white blood cells (WBC), lymphocytes, eosinophils, basophils, red blood cells (RBC), and platelets were greater ($P \leq$ 0.02) from CON compared with treated heifers. The neutrophil:lymphocyte ratio (NEU:LYM) was greater (P < 0.01) from treated heifers compared with CON, and basophils were greater (P = 0.01) from MO compared with LAE; however, proportions of neutrophils and monocytes did not differ ($P \geq$ 0.54) among treatments. A d effect was detected (P < 0.01) for WBC, lymphocytes, and monocytes. A treatment × d interaction ($P \leq$ 0.01) was detected for neutrophils, NEU:LYM, eosinophils, basophils, and platelets. A treatment × d tendency (P = 0.08) was detected for RBC, with RBC being highest for all cattle on d 0 and lowest on d 234 for LAE. Based on this study, anthelmintic therapy may positively impact immune status in replacement

beef heifers treated with various anthelmintics.

Key Words: immune status, long-acting eprinomectin, moxidectin/oxfendazole combination

0271 Modeling milk yield and calf performance of beef suckler cows on pasture-based systems.

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Milk production of beef suckler cows is the main factor determining live weight of calves at weaning. However, the milk yield of beef suckler cows in Ireland is declining due to a reduction in the proportion of replacements sourced from the dairy herd and an emphasis on breeding for terminal traits. Correspondingly, calf weaning weights are also declining. Additionally, in suckler beef systems where grass, both grazed and conserved, forms a major part of the feeding system, beef suckler cows have to cope with seasonal changes in feed resource availability over the annual production cycle. The aim of current study was to develop a dynamic model to evaluate how the dynamics of milk production effects on the growth performance of beef suckler calves, within a pasture-based production system. A dynamic Grange Suckler Cow-Calf Model (dGSCCM) was developed that simulates energy partitioning, milk production and calf performance of two contrasting beef suckler cow genotypes; Charolais (C) and Charolais x Holstein-Friesian (CF). The parameter coefficients and equations used in the model were derived from published literature and established databases. The performance of cows and calves were determined by the genetic potential, physiological status, and availability of feed. The milk production profile of both beef suckler cow genotypes were generated through Irish data fitted to the lactation curve of Wood. The average daily milk yield for first and second parity was 7.35 and 8.70 kg for C and 11.12, and 13.10 kg for CF, respectively. Corresponding weaning weights at 240 d of age were 282 kg and 301 kg for C and, 332 kg and 355 kg for CF. Sensitivity analysis was performed by changing milk yield ± 20%. It showed that calf weaning weight is highly sensitive to cow milk production; each additional kg in daily milk yield increased weaning weight by 10.2 kg for CF in second parity to 14.3 kg for C in first parity. The model provides a basis for the evaluation of the growth response of beef suckler calves based on dynamics of milk production of their dams.

Key Words: calf live weight, dynamic modeling, lactation curve, pasture-based systems

0272 Dry and wet conditions during the prepartum forage growing season affect offspring feedlot performance and carcass composition in beef cattle.

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We hypothesize that dry and wet conditions during the prepartum forage growing season impact cow nutrient availability during pregnancy, resulting in altered fetal growth and development, and affecting subsequent feedlot performance and carcass composition. Steers (n = 7439) and heifers (n = 2380) finished in southwestern Iowa feedlots through the Tri-County Steer Carcass Futurity Cooperative were used for a retrospective analysis. Cattle were born in the Midwest (Iowa, Missouri, Indiana, Illinois, and Minnesota) in February, March, or April of 2002 to 2013. Feedlot performance and carcass data were measured for each animal. Palmer Drought Severity Index (PDSI) values were obtained for each dam during the prepartum forage growing season (April through October) on a monthly basis. Conditions were classified as dry (mean PDSI value ≤ -2.00), normal (mean PDSI value > -2.00 and < 2.00), or wet (mean PDSI value ≥ 2.00) during this period. Data were analyzed using the MIXED procedure of SAS with PDSI drought classification, birth year, feedlot, and calf sex included as fixed effects. Feedlot delivery BW was greatest ($P < 0.01$) for calves born to dams in the wet class, intermediate ($P < 0.01$) for normal, and least ($P < 0.01$) for dry. Feedlot ADG was greater ($P < 0.01$) for calves from cows in the dry class compared with normal and wet, suggesting compensatory growth. Calves born to dams in the normal class had a greater ($P = 0.02$) number of days on feed than wet. Calculated yield grade was improved ($P < 0.01$) for calves from normal and wet classes compared with dry, partially because calves born to cows in the normal class had greater ($P \leq 0.01$) LM area than dry and wet. Calves born to cows in the dry class had the most ($P < 0.01$) 12th rib fat and marbling, normal were intermediate ($P \leq 0.03$), and calves from wet had the least ($P \leq 0.03$). Despite this, drought classification did not affect ($P \geq 0.39$) final pre-slaughter BW, HCW, or dressing percent. In conclusion, prepartum forage growing season precipitation likely impacts offspring post-weaning growth and carcass characteristics by altering nutrient intake of cows throughout gestation due to grazing during the growing season and consumption of stored forage in winter. More research is necessary to investigate the impacts of dry and wet conditions during specific periods of fetal development on subsequent calf performance.

Key Words: developmental programming, drought, post-weaning

0273 Modeling body condition score at calving by past body condition and forage allowance in grazing beef cow on rangelands. M. Claramunt[*1] and P. Soca[2], [1]*Centro Universitario de la Regiãn Este, Universidad de la Repãblica, Treinta y Tres, Uruguay,* [2]*Facultad de Agronomia. Universidad de la Republica, Paysandu, Uruguay.*

Body condition score at calving affects the length of postpartum anoestrus, probability of pregnancy and the response of temporary suckling restriction and flushing on reproductive performance. Body condition score could be manipulated by forage allowance (FA). Therefore, modeling the effect of FA on BCS could provide valuable information for beef cow managers. The objective was to study the relationships between FA and BCS at middle gestation (BCSm) and calving (BCSc) of primiparous beef cow grazing located in native pastures. We used data from an experiment that evaluated the effect of 2 levels of FA on productivity of primiparous beef cows grazing rangelands. The experiment took place in Facultad de Agronomía, Uruguay. Eighty cows were assigned to a completely randomized experiment of 2 FA in spatial replication on 2 blocks during 2 yr. The annual FA averaged 2.5 and 4 kg DM/kg BW for low (L) and high (H) FA, respectively. Cow BW and forage mass were measured monthly and used to adjust FA using the "put and take" method. The experiment started in autumn −150 d postpartum (dpp) and finished 190 dpp. The BCS at −150 dpp (early gestation [BCSe]) was recorded. The BCS was recorded by a visual scale (1–9 points). We used a seasonal value FA before BCS was recorded (FAm and FAc), calving date in Julian days (CD) and the previous BCS and FA to explain BCSm and BCSc. Models were obtained by multiple regressions and variables were selected by Stepwise. An increase in BCSe and FAm improved BCSm (BCSm = 0.16 + (0.66*BCSe) + (0.43*FAm) + (−0.07*(FAm-2.89)^2); r2 = 0.63; $P < 0.01$; Mean = 5; RMSE = 0.43) and BCSc was increased as a result of the increase in BCSe and BCSm (BCSc = 0.28+ (0.18*BCSe) + (0.62*BCSm) + (0.008*CD; r2 = 0.57; $P < 0.01$; Mean = 4.4; RMSE = 0.2). Models have a good explanation capacity and highlight the effect of prepartum BCS and FA on BCSc. Forage allowance indirectly affected BCSc by its positive effect on BCSm. These models could be employed by beef herd managers to control or predict the BCSc and reproductive performance.

Key Words: body condition score, forage allowance, modeling

0274 Growth Potential of Dhanni cattle under rain-fed conditions of Punjab, Pakistan. G. Bilal[*1], M. Moaeen-ud-Din[1], and A. Zurwan[2], [1]*PMAS-Arid Agriculture University, Rawalpindi, Pakistan,* [2]*PMAS-Arid Agriculture University, Rawalpindi, Pakistan.*

The objective of the present study was to investigate growth potential of Dhanni cattle (a local humped cattle used for light draft) for possible utilization as potential beef cattle in arid or rain fed region of Attock, Punjab, Pakistan. Data on live weight of cattle ($N = 185$: 105 male, 80 females; age ranged from 1 to 375 d) were recorded in the field from 30 registered farmers raising purebred Dhanni cattle. The overall production system consisting of grazing (from 0800 to 1700 daily) with little or no supplementation. Mostly farmers weaned the calves between 6 and 8 mo of lactation probably due to low milk yield of Dhanni cows. Age of cattle was divided into 11 monthly classes with the last class having d 301 to 375. Data were analyzed using PROC MIXED of SAS (University Edition). The model included fixed effects of age at of cattle on test-day and sex; random effects of herd and residual. Males had slight higher weights (73.94 ± 1.81) than females (71.77 ± 1.97), but overall effect of sex was statistically nonsignificant ($P = 0.33$). Estimates of herd and residual variances were 18.15 and 206.35, respectively. Live weight of cattle varied with age ($P < 0.0001$). The least squares estimates of means of live body weight (kg) for monthly age classes 1 (1–30 d), 2 (31 to 60 d) and so on to 11 (301–375 d) were 24.86 ± 2.60, 39.31 ± 3.18, 51.68 ± 4.62, 61.86 ± 2.90, 72.27 ± 3.67, 75.49 ± 3.65, 80.19 ± 3.93, 81.97 ± 5.04, 97.45 ± 4.25, 98.80 ± 6.12 and 117.49 ± 5.41, respectively. Overall, cattle showed a daily growth rate of 268.50g from 1 mo to approximately 12 mo of age. The data shows potential of Dhanni cattle for raising as a beef cattle using current genetic and genomic selection tools.

Key Words: Dhanni cattle, growth potential, field condition

BEEF SPECIES SYMPOSIUM: IMPROVING WELFARE OF BEEF CATTLE

0275 Assessing and improving welfare in cow calf systems. C. B. Tucker*, *University of California, Davis.*

To date, animal welfare assessment, particularly independent audits, have focused on intensive animal agriculture. As public and corporate interest in farm-to-plate animal welfare assurance grows, extensive animal agriculture, such as cow-calf operations, may begin to be audited as well. The extensive nature of cow-calf systems presents both opportunities and challenges from an auditing perspective. Cow-calf operations lend