**378 Intermittent feeding strategies of ractopamine hydrochloride on growth performance and carcass characteristics of feedlot steers.** M. G. Dib*[1], G. E. Erickson[1], T. J. Klopfenstein[1], J. R. Benton[1], W. A. Griffin[1], J. J. Sindt[2], and W. T. Choat[2], [1]*University of Nebraska*, *Lincoln,* [2]*Elanco Animal Health*, *Greenfield, IN*.

The objective of this experiment was to evaluate intermittent feeding of ractopamine hydrochloride (OPT) on growth performance and carcass characteristics. Crossbred steers (n = 320; initial BW = 480 + 12 kg) were used in a randomized complete block design with 4 treatments, 8 pens/treatment, and 2 weight blocks. Treatments consisted of no OPT (NEGCON), OPT fed continuously during the last 35 d prior slaughter (POSCON), OPT fed for 7 d followed by 4 d of withdrawal (4-dINT) and OPT fed for 7 d followed by 7 d of withdrawal (7-dINT). All treatments receiving OPT (POSCON, 4-dINT and 7-dINT) received OPT for a total of 35 d but on different days. Before the experiment, each steer was weighed on 2 consecutive days after feed restriction (decrease of 1 kg/d of DM) for 3 d in an attempt to minimize variation due to gut fill. Pens of animals were weighed weekly, with a 4% shrink, throughout the 63 d of the experiment before slaughter. Steers were slaughtered on the same day after 165 d on feed, and 63 d of treatment. Data were analyzed using a mixed model analysis with treatment and block included in the model as fixed variables and pen as the experimental unit. Final BW increased ($P < 0.04$) by 6 kg for steers fed OPT compared with NEGCON when measured on a live basis. Final BW on a carcass-adjusted basis and HCW were not impacted by treatment ($P > 0.18$). Feed intake was 0.3 kg greater ($P < 0.05$) for 7-dINT compared with the other treatments. Gain based on live BW was greater for OPT compared with NEGCON, which tended ($P = 0.09$) to increase G:F for steers fed OPT compared with NEGCON. Carcass performance or traits were not affected ($P > 0.18$) by feeding OPT compared with NEGCON except for calculated USDA Yield grade. No differences were observed for ADG, G:F, or carcass traits between POSCON, 4-dINT, and 7-dINT in this study. Further research may be necessary to determine the response to re-stimulation of β-receptors in cattle.

**Key Words:** beef cattle, performance, ractopamine hydrochloride

**379 Effectiveness of ractopamine when fed as a top dress in beef steers.** K. L. Neuhold*[1], P. T. Grubb[1], J. J. Wagner[1], T. E. Engle[1], R. K. Peel[1], and A. L. Schroeder[2], [1]*Colorado State University*, *Fort Collins,* [2]*Elanco Animal Health*, *Greenfield, IN*.

A clinical trial was conducted to investigate the effectiveness of ractopamine (RAC) as a top dress (TD) pellet during the final 42 d of feeding. Crossbred yearling steers (n = 144) were selected for the study. Steers were housed in 9 animals per pen with 8 pens per treatment. Treatments consisted of a steam-flaked corn based feedlot diet plus 0.9 kg per animal per d of TD containing 1) no RAC (Control) or 2) 400 mg/animal/d of RAC (400-RAC). Steers were fed 3 times daily. Top dress was applied evenly over the top of the total mixed ration immediately after the second feeding. Initial steer weights (526.8 kg) were similar ($P > 0.94$) between treatments. Final steer weight ($P < 0.03$) and average daily gain ($P < 0.02$) were greater for 400-RAC when compared with control (615.8 vs 605.2 ± 6.3 kg and 2.1 vs 1.86 ± 0.13 kg/day, respectively). Steers consuming 400-RAC had lower daily DMI ($P < 0.04$) compared with control (10.9 vs 11.4 ± 0.32 kg/animal/day). Gain to feed ratio was greater ($P < 0.001$) in steers fed 400-RAC (0.194 vs 0.164 ± 0.46). Dressing percentages ($P > 0.96$) were similar across treatments resulting in greater hot carcass weights ($P < 0.002$) for 400-RAC supplemented steers (373.5 vs 367.4 ± 2.3 kg). There were no differences between treatment groups for 12th rib fat depth ($P > 0.54$) and KPH ($P > 0.69$). Steers receiving 400-RAC had increased ($P < 0.007$) longissimus muscle area than controls (96.39 vs 91.03 ± 0.19 $cm^2$). Longissimus muscle area expressed per unit hot carcass weight was greater ($P < 0.04$) for 400-Rac steers compared with control steers indicating that RAC increased carcass muscling. Yield grades tended ($P < 0.19$) to be lower RAC-400 steers compared with controls (2.34 vs 2.52 ± 0.08). No differences in marbling score or carcass quality grade were observed between treatments. These data indicate that feeding RAC in a TD application for the final 42 d of the finishing period will increase rate of gain, final weight, hot carcass weight and gain to feed ratio while maintaining carcass quality.

**Key Words:** steers, ractopamine, top dress

**380 Effects of prepartum rumen-protected choline supplementation on performance of beef cows and calves.** L. A. Pacheco*[1], J. R. Jaeger[2], L. R. Hibbard[1], M. J. Macek[1], N. A. Sproul[1], G. J. Eckerle[1], E. A. Bailey[1], J. W. Bolte[2], and K. C. Olson[1], [1]*Kansas State University*, *Manhattan,* [2]*Western Kansas Agricultural Research Center*, *Hays*.

The objective of our study was to evaluate the effect of prepartum ruminally-protected choline (RPC) supplementation on cow and calf performance. Angus crossbred cows and heifers (n = 403; average initial weight = 533.2 ± 4.0 kg) grazing native range were blocked by weight and parity and assigned randomly to 1 of 2 treatments: a 40% CP soy-corn supplement (CON) or a 40% CP soy-corn supplement containing RPC. Treatments were applied during a 60 d period that immediately preceded the earliest predicted calving date; each cow was fed 2.38 kg/hd/d of CON or RPC 6 × per week. The feeding rate of choline averaged 4.5 g/cow/d. Body weight, BCS, and ultrasonically measured longissimus muscle characteristics of cows and BW of calves were recorded at intervals from January to October. Changes in cow BW, BCS, backfat thickness, and intramuscular fat between the outset of the trial and pregnancy diagnosis were similar ($P \geq 0.25$) between treatments. Cows fed RPC tended to lose more ($P = 0.10$) longissimus muscle depth between the outset of the trial and pregnancy diagnosis. Conversely, BW of cows fed RPC tended to be greater ($P = 0.07$) at pregnancy diagnosis than that of cows fed CON. Calf BW at birth, at pregnancy diagnosis, and at weaning were not different ($P \geq 0.39$) between treatments; however, ADG from pregnancy diagnosis to weaning tended ($P = 0.06$) to be greater for calves of RPC-fed dams than for calves of CON-fed dams. Within parity class, timed-AI pregnancy and overall pregnancy were not affected ($P \geq 0.14$) by treatment. Under the conditions of our study, prepartum RPC supplementation had minimal effects on performance of beef cows and calves.

**Key Words:** beef cows, choline, supplementation

**381 Evaluation of ractopamine fed in a top dress feed on growth and standard carcass characteristics of crossbred cattle.** A. L. Schroeder*[1], T. H. TerHune[2], M. Edmonds[3], R. P. Lemenager[4], S. L. Lake[4], F. K. Mckeith[5], and J. J. Wagner[6], [1]*Elanco Animal Health*, *Greenfield, IN*, [2]*HMS Veterinary Development*, *Tulare, CA*, [3]*Johnson Research*, *Parma, ID*, [4]*Purdue University*, *West Lafayette, IN,* [5]*University of Illinois*, *Urbana*, [6]*SECRC-Colorado State University*, *Lamar*.

Ractopamine (RAC) was originally approved for feeding continuously to cattle during the last 28 to 42 d of the finishing period. Growth per-

formance and standard carcass characteristic effects of feeding RAC one time daily at: 1) 0 mg or 2) 400 mg/h/d (RAC400) in a top dress (TD) feed during the last 42 d was evaluated in 560 steers at 4 sites. A randomized complete block design was used at each site. Eight replicates (blocks) per site resulted in 32 experimental units (8–10 steers/pen, depending on location) per treatment. Cattle were fed either 2 or 3 times daily with RAC TD fed on top of existing feed in the bunk after the first or second feeding (depending on feeding frequency) in 0.45 or 0.9 kg of TD feed per head per day. Initial weights were similar ($P \geq 0.72$) between treatments. Final weight ($P \leq 0.02$) and average daily gain ($P \leq 0.006$) was increased for the RAC400 treatment compared with control (613.0 vs. 603.3 ± 9.75 kg and 1.91 vs. 1.68 ± 0.19 kg per day, respectively). Dry matter intake (DMI) was not different ($P \geq 0.15$) between treatments (11.21 for control and 10.96 ± 0.20 kg for RAC400, respectively). Gain to feed ratio was greater ($P \leq 0.006$) and DMI to gain ratio was improved ($P \leq 0.02$) for RAC400 compared with control animals (0.174 vs. 0.150 ± 0.016) and 5.28 vs. 6.03 ± 0.15, respectively). Dressing percentages were similar ($P \geq 0.78$) resulting in heavier hot carcass weights ($P \leq 0.008$) for the RAC400 treatment compared with controls (366.8 vs. 360.4 ± 13.4 kg). No differences existed in 12th rib fat ($P \geq 0.30$) and KPH ($P \geq 0.58$). RAC400 supplemented animals had larger longissimus muscle area ($P < 0.008$) than controls (91.1 vs. 87.3 ± 2.89 $cm^2$, respectively). Yield grade was improved ($P < 0.02$) for RAC400 carcasses compared with control carcasses (2.47 vs. 2.66 ± 0.13, respectively). Marbling score and quality grades were similar ($P \geq 0.10$) between treatments. The data demonstrate RAC fed in a TD feed for the last 42 d of the finishing period will increase average daily gain, live weight, HCW, LM area and yield grade without adversely affecting marbling score and carcass quality.

**Key Words:** cattle, top dress, ractopamine

**382 Ractopamine hydrochloride did not affect growth or fermentation of ruminal bacteria in pure culture.** C. E. Walker*, J. M. Heidenreich, and J. S. Drouillard, *Kansas State University*, *Manhattan.*

Catecholamines have been observed to enhance pure culture bacterial growth in vitro. In this research, effects of the synthetic catecholamine ractopamine hydrochloride (RAC) on bacterial growth were evaluated in vitro. Representative strains of bacterial species commonly found in the rumens of high-concentrate fed cattle, particularly species involved in proteolysis, were evaluated. Pure cultures of *Butyrivibrio fibrisolvens*, *Clostridium aminophilum*, *Clostridium sticklandii*, *Fusobacterium necrophorum*, *Megasphaera elsdenii*, *Prevotella ruminicola*, *Selenomonas ruminantium*, and *Streptococcus bovis* were obtained from the American Type Culture Collection. Cultures were grown in Hobson M2 media and incubated at 39°C. Treatments were 0 mg (Control) or 2.26 mg RAC/L added to culture tubes immediately before inoculation with bacterial cultures. Bacterial growth was evaluated as changes in optical density at 650 nm using a spectrophotometer. Change in pH and redox potential for each tube were determined after incubation was complete. Cultures were then centrifuged and the resulting pellet was dried at 105°C to determine impact of RAC on bacterial cell yield. To measure the impact of RAC on fermentation, concentrations of VFA and lactate were analyzed using gas chromatography, and ammonia and α-amino N were analyzed colorimetrically by an auto analyzer. The Mixed models procedure of SAS was used with fixed effects of RAC, bacterial strain, and time to assess changes in optical density. A mixed model including effects of RAC and strain was used to evaluate effects on fermentative end products. RAC did not affect pure culture growth, culture pH, redox potential, or bacterial cell yield ($P > 0.10$). Additionally, RAC did not affect concentrations of VFA, lactate, ammonia, or amino acid in vitro ($P > 0.10$). Growth or fermentative end products of pure cultures containing select strains of ruminal bacteria were not affected by the presence of ractopamine hydrochloride.

**Key Words:** ractopamine hydrochloride, ruminal bacteria, fermentation

**383 Accelerated step-up regimen with 44 mg/kg monensin.** C. E. Walker*, G.L Parsons, K. A. Miller, L. K. Thompson, J. J. Higgins, and J. S. Drouillard, *Kansas State University*, *Manhattan*.

Crossbred steers (n = 720; initial BW = 453 kg) were used to evaluate effects of monensin concentration and step-up regimen on feedlot performance and carcass traits in a randomized complete block experiment with a 2 × 2 factorial treatment arrangement. Factor 1 consisted of 33 or 44 mg/kg monensin (MON) fed for the entire 153 d trial; and factor 2 was length of the step-up period (10 or 21 d). Cattle from wheat pastures were received into the feedlot and fed chopped hay and salt for 2 wk. On d 1 of the study, cattle were stratified by BW and allotted to pens of 15 cattle each, with 12 pens/treatment. Starting d 1, a 3-diet (60, 77, and 93% concentrate) step-up system was used in which cattle were fed ad libitum 60% concentrate am (0900 h) and pm (1300 h) for step 1; 60% concentrate am and 77% concentrate pm for step 2; 77% concentrate am/pm for step 3; 77% concentrate am and 93% concentrate pm for step 4; and 94% concentrate am/pm for the final finishing diet. Diet changes were implemented on d 6, 11, 16, and 21 for the traditional regimen, and on d 4, 6, 8, and 10 for the accelerated regimen. BW were determined on d 0, 50, and before shipping to a commercial abattoir on d 153. There were no interactions between level of MON and step-up regimen ($P > 0.10$) and no effects of step-up regimen on performance or carcass traits ($P > 0.10$), but steers on the accelerated regimen consumed less roughage ($P < 0.05$). Increasing MON from 33 to 44 mg/kg decreased DMI during the first 50 d ($P < 0.01$) and the entire 153-d study period ($P < 0.01$), and improved gain efficiency by 8% for the first 50 d ($P < 0.10$) and by 3% for the 153-d trial ($P < 0.05$). Yield grades were lower for steers fed 44 mg/kg MON compared with steers fed 33 mg/kg MON ($P < 0.05$), but other carcass traits were not affected ($P > 0.10$). Steers can be transitioned to high-concentrate diets in 10 d without compromising performance, and less roughage is used. Steers fed 44 mg/kg MON were more efficient than steers fed 33 mg/kg MON.

**Key Words:** step-up, monensin, roughage

**384 Effects of Zilmax on blood metabolites in finishing cattle.** C. L. Van Bibber*, G. L. Parsans, K. A. Miller, L. K. Thompson, and J. S. Drouillard, *Kansas State University*, *Manhattan*.

Effects of Zilmax (Z) on blood metabolites and carcass traits were evaluated in crossbred finishing steers (n = 18) that were stratified by BW and randomly assigned, within strata (block), to control (C) or Z treatments. Cattle were fed once daily ad libitum in individual feeding pens (9 pens/treatment). Z was fed 23 d and withdrawn 3 d before harvest. Blood samples and measures of BW were taken on d 0, 7, 14, and 21. Metabolites were analyzed as repeated measures using Proc Mixed, with fixed effects of treatment, day, and treatment × day, and random effects of block and block × treatment. Performance and carcass traits were analyzed with treatment as fixed effect, and block and block × treatment as random effects. Concentrations of β-hydroxybutyrate (BHB), glucose, and lactate were determined in whole blood, and NEFA, urea nitrogen (PUN), and long-chain fatty acids (LCFA) were analyzed in plasma. Adipose tissue samples were analyzed for LCFA profiles. Feeding Z decreased DMI by 8% ($P < 0.10$), but did not impact BW gain or efficiency ($P > 0.10$). Feeding Z resulted in greater HCW and LM

area ($P < 0.10$), numerically decreased marbling score and yield grade, but did not influence other carcass traits ($P > 0.10$). Z increased plasma concentrations of elaidic, vaccenic, and docosapentaenoic acids ($P < 0.10$), but adipose tissue concentrations of LCFA were unaffected ($P > 0.10$), suggesting no preferential oxidation of specific fatty acids. Blood metabolites for d 0 and 21 of the study are shown in the table.

Table 1. Effects of Zilmax on Blood Metabolites

| Item, mM | C d0 | Z d0 | C d21 | Zd21 | SEM |
|---|---|---|---|---|---|
| Glucose‡ | 3.32 | 3.39 | 3.48 | 3.09 | 0.24 |
| Lactate | 2.83 | 2.80 | 2.16 | 1.54 | 0.48 |
| NEFA | 126 | 175 | 140 | 174 | 36 |
| BHB | 0,01 | 0.08 | 0.02 | 0.06 | 0.83 |
| PUN† ‡ | 4.15 | 3.74 | 4.44 | 3.26 | 0.24 |

The symbols † and ‡ denote effects of Z and Z × d interaction, respectively ($P < 0.10$).

**Key Words:** zilpaterol hydrochloride, plasma urea nitrogen, glucose

**385 Intake and digestion of cotton co-product and distillers grain blocks fed as a cattle hay replacement.** G. M. Hill* and D. J. Renney, *University of Georgia*, *Tifton*.

A new compressed block product (CPM, 0.34% S; A. G. Daniel Co., Eastman, GA) that contained cotton gin trash (59%), distillers dried grains with solubles (DDG, 0.66% S), wheat middlings, a molasses product and minerals, was formulated to replace hay in cow diets. Brangus and Angus crossbred steers (n = 30; age 2 yr; initial BW 453.6 ± 33.9 kg) selected to mimic beef cow intake, were ranked by BW, randomly assigned to treatments, and individually-fed diets for 18 d. Supplements (SUP) were fed with or without free-choice coarsely ground hay (H; Tifton 85; DM, CP, NDF, TDN, %: 87, 9.3, 77, 52). Treatments were: hay only (HAY); H with whole cottonseed (WCS) fed at 0.5% BW daily (HWCS), H with DDG (HDG); H with CPM (HCPM); or free-choice CPM (CPMFC). The DM, CP, NDF, crude fat, TDN (% DM), respectively, were: WCS, 91.4, 23.4, 53.5, 18.1, 71; DDG, 86.7, 31.6, 31.7, 82; CPM, 89.3, 16.4, 56.6, 5.2, 48. Chromic oxide was fed (10 g/steer, d 9 to d 18), and fecal samples (11/steer, d 14 to d 18) were analyzed to determine apparent digestion. Hay DMI was highest (Table 1; $P < 0.01$) for HAY, HWCS, and HDG, and lowest for HCPM. Steers had more than double total DMI for HCPM and CPMFC ($P < 0.01$) compared with other treatments. The OM digestibility was highest ($P < 0.02$) for HCPM, and CP digestibility was highest ($P < 0.01$) for HCPM, intermediate for HWCS, HDG, and CPMFC, and lowest for HAY. Digestibility of ADF and NDF were highest for HAY ($P < 0.01$); but NDF digestibility was lowest for CPMFC ($P < 0.01$), and similar for HWCS, HDG, and HCPM. The CPM treatments demonstrated adequate OM digestibility, but feeding CPM increased DMI compared with traditional cow wintering diets.

Table 1.

| Item | HAY | HWCS | HDG | HCPM | CPMFC | SE | P < |
|---|---|---|---|---|---|---|---|
| Hay DMI, kg | 6.68 | 5.30 | 5.15 | 1.98 | 0.00 | 0.23 | 0.01 |
| SUP DMI, kg | 0.00 | 1.88 | 1.49 | 13.09 | 15.61 | | |
| Total DMI, kg | 6.77 | 7.20 | 6.67 | 15.51 | 15.64 | 0.37 | 0.01 |
| Apparent digestion, % | | | | | | | |
| OM | 70.58 | 69.13 | 70.29 | 74.03 | 72.25 | 1.00 | 0.02 |
| CP | 63.66 | 69.78 | 70.84 | 73.33 | 71.15 | 1.06 | 0.01 |
| ADF | 69.91 | 57.91 | 57.55 | 61.68 | 57.81 | 1.41 | 0.01 |
| NDF | 70.66 | 66.57 | 66.89 | 65.70 | 62.66 | 1.32 | 0.01 |

**Key Words:** steer, cottonseed, digestion

**386 Late gestation supplementation of beef cows: Effects on cow and calf performance.** D. W. Bohnert*[1], R. Mills[1], L. A. Stalker[3], A. Nyman[1], and S. J. Falck[2], [1]*Oregon State University*, *Burns*, [2]*ARS-USDA*, *Burns, OR*, [3]*University of Nebraska*, *North Platte*.

We conducted a 2-yr study to evaluate the influence of cow BCS and dried distillers grains (DDGS) supplementation during late gestation on cow and calf productivity. The experimental design was a 2 × 2 factorial; 2 BCS (4 or 6) and supplemented or not supplemented. Approximately 12.7 kg/cow of low quality meadow hay (6.4% CP) was provided each day and supplemented cows received 1.81 kg/cow of DDGS every Monday and Wednesday and 2.72 kg/cow on Friday. On each supplementation day, supplemented cows were gathered and sorted into pens based on their respective blocking structure. After completing consumption of their allocated supplement, cows were returned to a common pasture. Performance data and binomial data were analyzed as a randomized complete block using PROC MIXED and PROC GLIMMIX in SAS, respectively. Calf birth weight was greater with BCS 6 cows compared with BCS 4 ($P = 0.002$) and for supplemented compared with unsupplemented cows ($P = 0.05$). In addition, weaning weight was greater for BCS 6 compared with BCS 4 ($P = 0.05$) and calf weaning weight and ADG to weaning were greater for the offspring of supplemented compared with unsupplemented cows ($P \leq 0.02$). We noted no differences in post-weaning calf performance or carcass characteristics ($P > 0.10$). However, BCS 6 cows had approximately 10% more live calves at birth and at weaning ($P < 0.001$) compared with BCS 4 cows. Also, pregnancy rate was 91% for BCS 6 compared with 79% for BCS 4 cows ($P = 0.005$). Supplementation during late gestation resulted in an estimated net return of $7/cow if calves were sold at weaning compared with not supplementing. More importantly, because of additional weaned calves, the estimated net return for BCS 6 cows at weaning was $71/cow more than BCS 4. Likewise, with retained ownership, BCS 6 cows yielded a net return of $130/animal more than BCS 4 cows. This research demonstrates the potential consequences of not maintaining cows in good BCS (>5) at calving; greater calf losses, less weaned calves, decreased pregnancy rate, and lower economic return.

**Key Words:** supplementation, fetal programming, protein

**387 Effect of forage energy intake and supplementation on gene expression of adipose tissue in growing beef cattle.** P. A. Lancaster*, E. D. Sharman, G. W. Horn, C. R. Krehbiel, and U. DeSilva, *Oklahoma Agricultural Experiment Station*, *Stillwater*.

Additional benefit to the stocker cattle production phase could be realized by influencing adipose tissue development before finishing. Previous research has indicated that nutritional management can affect fat deposition in growing cattle. Our objective was to evaluate forage energy intake and type of fermentation on gene expression of adipose tissue in growing steers. Angus steer calves (n = 68; 258 ± 29 kg BW) were randomly allotted by BW to 4 treatments: (1) 1.02 kg•hd$^{-1}$•d$^{-1}$ of a 40% CP supplement (CON) to meet their DIP requirement while grazing dormant native range; (2) CON plus corn-based supplement at 1% BW (CORN) while grazing dormant native range; (3) grazing wheat pasture at a high stocking rate to achieve a low ADG (LGWP); and (4) grazing wheat pasture at a low stocking rate to achieve a high ADG (HGWP). Supplements were fed individually 5 d per week. Following winter grazing, 3 steers per treatment were harvested and subcutaneous (SC), perirenal (PR), and intramuscular (IM) adipose tissue collected. Total RNA was extracted and gene expression determined using qRT-PCR. Performance and carcass data are presented in a companion abstract (Sharman et al., 2010). There were no treatment × adipose tissue interactions for any genes evaluated indicating that each

adipose tissue responded similarly to the treatments. mRNA expression of genes involved in triglyceride synthesis (glycerol-3-phosphate dehydrogenase, fatty acid synthase, and diacylglycerol acyltransferase 2) and glucose utilization [ATP citrate lyase (ACLYS) and NADPH malate dehydrogenase (MDH)] were greater ($P < 0.05$) for HGWP and LGWP compared with CON and CORN. ACLYS mRNA expression was greater in SC and PR compared with IM, and MDH mRNA expression was greater in PR compared with SC and IM. Further analyses will evaluate genes related to adipogenesis. These data indicate that greater propionate type of fermentation increased triglyceride synthesis and glucose/lactate utilization for fatty acid synthesis, and SC and PR had increased glucose/lactate utilization compared with IM irrespective of forage energy intake or type of fermentation.

**Key Words:** adipose tissue, gene expression, stocker cattle

**388 Angus and Simmental calves exhibit differential trace mineral metabolism.** S. L. Hansen*, E. L. Richter, and M. E. Drewnoski, *Iowa State University*, *Ames*.

To examine the effects of cattle breed on the clearance rate of an injectible mineral 10 Angus and 10 Simmental calves were blocked by breed and initial BW (332 ± 33 kg) and injected with either Multimin90 (MIN) or sterilized saline (CON) at a dose of 1 mL/45 kg BW. The Multimin90 contained 60 mg Zn/mL (as Zn disodium EDTA), 10 mg Mn/mL (as Mn disodium EDTA), 15 mg Cu/mL (as Cu disodium EDTA), and 5 mg Se/mL (as sodium selenite). Calves were weight matched and treatment was balanced within pens (2 head per pen). Calves received a corn-silage based diet and Mn, Cu, Zn, and Se were supplemented at NRC recommended levels. Jugular blood for plasma mineral analysis was collected immediately before injection and at 8 and 10 h post injection, and on d 1, 8 and 15 post injection. Liver biopsies for mineral analysis were collected 3 d before injection and on d 1, 8 and 15 post injection. Plasma concentrations of Mn and Se were greater ($P < 0.001$) at 8 and 10 h and d 1 post injection in MIN calves compared with CON calves. Plasma Se remained elevated ($P < 0.05$) through d 8 in MIN calves vs. CON calves. Regardless of treatment, Simmental calves exhibited lower ($P = 0.05$) plasma Cu at 10 h post injection and tended ($P = 0.07$) to have greater plasma Mn on d 1 compared with Angus calves. Plasma concentrations of Cu, Zn and Mn did not differ due to treatment by d 8. Liver concentrations of Cu and Se were greater ($P < 0.01$) in MIN calves compared with CON calves on d 1, 8 and 15 post injection. Liver Zn concentrations were greater ($P < 0.01$) on d 1 in MIN calves versus CON calves. Liver Mn concentrations were greater ($P < 0.05$) on d 8 in MIN calves compared with CON calves, but did not differ among treatments on d 1 or 15 post injection. Interestingly, Simmental calves exhibited greater ($P < 0.01$) liver Mn concentrations on d 15 compared with Angus calves, regardless of treatment. In summary, these data suggest that Angus cattle clear Mn from the body at a faster rate than Simmental cattle, which may have implications on supplementation strategies.

**Key Words:** cattle, mineral, breed

**389 Effects of polyunsaturated fatty acid (PUFA) supplementation on performance and acute-phase response of transported beef steers.** R. F. Cooke*[1], A. B. Scarpa[1], F. M. Nery[1], F. N. T. Cooke[1], P. Moriel[2], B. W. Hess[2], R. R. Mills[3], and D. W. Bohnert[1], [1]*Oregon State University*, *Burns,* [2]*University of Wyoming*, *Laramie,* [3]*Oregon State University*, *Pendleton*.

The objective was to compare ADG, DMI, and acute-phase response of steers supplemented or not with PUFA for 30 d before shipping to the feedlot. Seventy-two Angus steers weaned at 7 mo of age (d −55) were stratified by BW on d −30 of the study, and randomly allocated to 18 drylot pens (4 steers/pen). Pens were assigned to receive a grain-based supplement (avg. 1.4 kg/steer/d) without (CO) or with 0.15 kg/steer/d of a PUFA source (PF; Megalac-R, Church and Dwight, Princeton, NJ) or a saturated fatty acid source (SF; Megalac, Church and Dwight). Treatment intakes were formulated to be iso-caloric, iso-nitrogenous, and offered daily from d −30 to d 0. Mixed alfalfa-grass hay was offered in amounts to ensure ad libitum access during the same period. On d 0, steers were loaded onto a commercial livestock trailer and transported for approximately 350 km over a 6 h period. However, steers remained in the truck for a total of 24 h before unloaded into a commercial feedlot (d 1), where steers were maintained in a single pen, managed similarly, and received a diet not containing PF or SF. Forage DMI was evaluated daily from d −30 to d −1. Shrunk BW was collected on d −33 and 1 for ADG calculation. Blood samples were collected on d 0, 1, and 3, and analyzed for plasma concentrations of interleukin 1 and 6, tumor necrosis factor (TNF)-α, haptoglobin, ceruloplasmin, cortisol, and fatty acids. No treatment effects were detected for ADG ($P = 0.54$) or F:G ($P = 0.56$). During the study, DMI was often reduced for PF steers compared with CO and SF (treatment × day interaction; $P < 0.01$). Concentrations of PUFA were greater in PF steers compared with CO and SF before and after transportation (treatment × day interaction $P < 0.01$). Following transportation, concentration of TNF-α increased for CO, did not change for SF, but decreased for PF steers (treatment × day interaction, $P < 0.01$). In conclusion, PUFA supplementation during preconditioning had detrimental effects on DMI, but did not impair ADG and reduced plasma concentrations of TNF-α following transportation and feedlot entry.

**Key Words:** polyunsaturated fatty acids, transportation, beef steers