**W252 Replacing grain and silage with wheat distiller grains affects feeding behavior of finishing beef cattle.** W. Z. Yang*[1], T. A. McAllister[1], J. J. McKinnon[2], and K. A. Beauchemin[1], *[1]Agriculture and Agri-Food Canada, Research Centre, Lethbridge, AB, Canada, [2]Department of Animal & Poultry Science, University of Saskatchewan, Saskatoon, SK, Canada.*

A study was conducted to evaluate DMI and feeding behavior of feedlot beef steers fed diets that varied in the proportion of wheat dried distillers grains with solubles (DDGS), with DDGS replacing barley grain or silage. Eighty crossbred steers (486 ± 28 kg) were randomly allotted to 8 pens (2 pens per treatment). The pens were fitted with the GrowSafe system and the steers were tagged with transponders enabling continuous recording of feeding behavior of individual steers, including frequency and duration of visits to the feed bunk and individual feed intake. Steers were fed 1 of 4 diets: control, low (25DDGS), medium (30DDGS), and high (35DDGS) wheat DDGS (DM basis). The control diet consisted of 15% barley silage, 85% barley grain concentrate; the 3 DDGS diets were formulated by substituting 20% barley grain and 5, 10 and 15% silage, respectively, with 25, 30 and 35% wheat DDGS such that the 35DDGS diet contained no silage. In comparison to control, calves fed 25DDGS had greater ($P < 0.01$) DMI (9.5 vs. 11.3 kg/d) and feeding time (84 vs. 112 min/d), but feeding rate (115 vs. 108 g/min), meal frequency (9.3 vs. 10.8, meal/d), and meal length (9.9 vs. 10.9 min/meal) were not different. With increasing substitution of wheat DDGS for silage, DMI (11.3 to 10.7 kg/d; $P < 0.05$), feeding time (112 to 89 min/d; $P < 0.01$), and meal length (10.9 to 8.3 min/meal; $P < 0.01$) linearly decreased, but feeding rate (108 to 134 g/min) and meal frequency (10.8 to 15.4 meal/d) linearly increased ($P < 0.01$). The results indicate that feeding a diet containing moderate levels of wheat DDGS with adequate silage increased DMI but longer feeding time was required. In contrast, when diets contained minimal (i.e., 5%) or no silage, steers increased feeding rate and meal frequency to consume more feed.

**Key words:** feeding behavior, feedlot beef cattle, wheat DDGS

**W253 Inclusion of anti-phospholipase A2 antibody (aPLA2) to backgrounding diet enhanced feed efficiency in growing beef calves.** V. R. G. Mercadante*, K. M. Bischoff, T. E. Black, G. H. L. Marquezini, N. DiLorenzo, and G. C. Lamb, *North Florida Research and Education Center, University of Florida, Marianna.*

We determined whether supplementation of anti-phospholipase A2 antibody (aPLA2; BIG BEEF, Aova Technologies, Madison, WI) for growing beef cattle would alter voluntary DM feed intake and feed efficiency of growing calves. Individual performance and daily DMI was measured on 70 crossbred weaned calves (53 steers and 17 heifers) during a 70-d period using a GrowSafe system (GrowSafe Systems Ltd., Alberta, Canada) at the University of Florida NFREC Feed Efficiency Facility. All calves where submitted to a 21-d period of adaptation to facilities and diets. Calves were fed a growing forage-based TMR diet (0.97 Mcal NEg/kg DM, 14.7% CP) to support growth rates of 1 kg/d (NRC, 1996). Calves were blocked by weight and sex and then assigned to pens to receive either no additional supplement (Control, n = 35) or receive a supplement that delivered aPLA2 at an inclusion rate of 0.6% of the dietary DM (BIG BEEF, n = 35). Body weight (BW) was recorded at 14-d intervals over the 70-d period. Linear regression of BW against day on test was used to establish ADG. Initial BW (245.5 ± 5.3 kg and 246.2 ± 5.3 kg for Control and BIG BEEF, respectively; $P = 0.93$), final BW (318.6 ± 5.8 kg and 317.7 ± 5.8 kg for Control and BIG BEEF, respectively; $P = 0.91$), and ADG (1.01 ± 0.03 kg and 1.01 ± 0.03 kg for Control and BIG BEEF, respectively; $P = 0.99$) were similar between treatments. However, daily DMI was greater ($P < 0.0001$) for Control (8.47 ± 0.19 kg) than BIG BEEF (7.87 ± 0.19 kg). In addition, G:F tended ($P = 0.10$) to be greater for BIG BEEF (0.1294 ± 0.004) than Control (0.1206 ± 0.004) and residual feed intake was greater ($P < 0.01$) for Control (0.624 ± 0.291 kg/d) than BIG BEEF calves (−0.624 ± 0.291 kg/d).We conclude that the supplementation of anti-phospholipase A2 (BIG BEEF) for growing beef cattle decreased daily DMI while maintain ADG, therefore, improving feed efficiency.

**Key words:** beef cattle, feed efficiency, phospholipase A2

**W254 Productive performance during fattening phase of Nelore fed diets with two concentrate levels.** G. S. Firmino*[1], I. S. Silva[1], F. A. Barbosa[2], S. L. S. Cabral Filho[1], J. F. B. Guedes[1], G. A. Carneiro[1], F. F. Gouveia[1], and J. F. A. Oliveira[1], *[1]University of Brasília - UnB, Brasília, DF, Brazil, [2]Federal University of Minas Gerais - UFMG, Belo Horizonte, MG, Brazil.*

The experiment evaluated the performance of feedlot cattle divided into 2 experimental groups and submitted to 2 diets during 90 d. The herd consisted of 30 bulls aged 22 mo, with an initial average body weight (IBW) of 350.25 kg, which were divided into 2 groups of 15 animals per treatment. The experimental groups were: DIE70 - concentrate (corn grain, sunflower meal, soybean hulls, urea and mineral) and corn silage at a ratio of 70:30 on dry matter and DIE85 - concentrate (corn grain, sunflower meal, soybean hulls, urea and mineral) and corn silage in proportion of 85:15 on a DM basis. The experiment was conducted in a completely randomized design with 2 treatments and 15 repetitions (n = 30). The average initial body weight (IBW), final body weight (FBW), average daily gain (ADG) and hot carcass yield (HCY) were compared by Duncan test with significance level of $P < 0.05$. There was no statistical difference ($P > 0.05$) between IBW with averages of 344.86 kg and 351.61 kg and also between the FBW, 444.66 kg and 441.77 kg for the treatments DIE70 and DIE85 respectively. The ADG and HCY among treatments DIE70 and DIE85 did not differ; the values were 1.16 kg for DIE70 and 1.04 kg for DIE85, and 57.26% for DIE70 and 57.04% for DIE85. In this study, the 85% concentrate diet did not improve animal performance compared with diets containing 70% of concentrate.

**Key words:** performance, carcass, beef cattle feedlot

**W255 Effect of maternal feed efficiency as growing heifers and lactating cows on feed intake and performance of their suckling offspring.** K. M. Bischoff*[1], T. E. Black[1], V. R. G. Mercadante[1], G. H. L. Marquezini[1], C. C. Chase[2], S. W. Coleman[2], and G. C. Lamb[1], *[1]North Florida Research and Education Center, University of Florida, Marianna, [2]USDA-ARS, SubTropical Agricultural Research Station, Brooksville, FL.*

We determined whether suckling calf DMI and performance was associated with feed efficiency, feed intake, and performance of their dam as a growing heifer or lactating cow. Feed efficiency was established in

74 growing heifers that subsequently gave birth to their second calf as 3-yr old cows. For the heifer and cow phases, females had a 14-d acclimation period before initiating a 70-d feed efficiency test period. Individual daily feed intakes were recorded using the GrowSafe System (GrowSafe Systems Ltd., Alberta, Canada) to determine average DMI. A forage-based diet consisting of 86.7% Tifton 85 Bermudagrass silage, 12.4% dried distillers grains plus soluble, 0.7% range mineral, and 0.2% salt was fed ad libitum to cow-calf pairs. Cows were milked on d 14 (lactation d 28 ± 7) and d 70 (lactation d 84 ± 7) of the test to determine individual energy corrected milk (ECM). Average DMI of calves was determined by the sum of DMI of feedstuffs and the DMI of ECM from suckling. Weights of calves were collected on d 0 and 70. During the 70-d test calves had ADG of 0.51 kg/d and consumed 0.44 kg/d of feed and 3.98 kg/d ECM (0.52 kg/d on a DM basis). The correlation between total DMI of calf and residual feed intake (RFI) of dam during lactation ($P = 0.88$, r = 0.0191) or RFI of dam as a heifer were similar ($P = 0.97$, r = 0.004). In addition, there was no correlation between DMI of the dam as a lactating cow ($P = 0.172$, r = 0.160) or as a heifer ($P = 0.34$, r = 0.112) to the total DMI of the calf. The gain:feed (G:F) of the calf was not correlated to dam RFI as a cow ($P = 0.30$ r = −0.125) or heifer ($P = 0.74$ r = 0.039). There was no correlation in DMI from feed consumed to DMI from ECM ($P = 0.50$, r = 0.080). However, there was a correlation between G:F and DMI of feed of the calf ($P < 0.001$, r = 0.424); however, there was no correlation between DMI of ECM consumed and the G:F of calves ($P = 0.04$, r = −0.238). We conclude that DMI and performance of suckling calves is not related to feed efficiency, feed intake, and performance of their dam as a growing heifer or lactating cow.

**Key words:** calf performance, dry matter intake, feed efficiency

**W256 Temperament evaluation of Nelore (*Bos indicus*) cattle in Brazilian commercial cow-calf operations.** M. Meneghetti*[2], R. F. Cooke[1], B. I. Cappellozza[1], D. W. Bohnert[1], and T. C. Losi[3], *[1]Oregon State University–Eastern Oregon Agricultural Research Center, Burns, [2]Pfizer Animal Health, São Paulo, SP, Brazil, [3]Lageado Consultoria Agropecuária, Mineiros, GO, Brazil.*

Temperament impacts several production parameters in beef cattle, including growth and reproduction. Excitable temperament is frequently detected in *Bos indicus* breeds such as Nelore, which represents the majority of the beef cattle in Brazil – country that holds the largest commercial cattle herd, and is the main exporter and second main producer of beef in the world. However, there is a lack of research studies characterizing temperament of Nelore cattle. Therefore, efforts to determine incidence of excitable temperament and its effects on productivity of Nelore cattle will benefit not only beef production in Brazil, but also availability of beef in many parts of the planet. The objective of the present study was to evaluate temperament in Nelore brood cows, assess the incidence of aggressive cattle in commercial ranches, and correlate temperament measurements with production traits. A total of 855 lactating, multiparous Nelore cows, from 4 different commercial cow-calf ranches (ranch 1, n = 231; ranch 2, n = 195; ranch 3, n = 236; ranch 4, n = 193) were evaluate for BCS, chute core (CS; 1 to 5 scale), and exit velocity (EV; m/s using infrared sensors) when processed for AI. Based on EV and CS (±1 SD from the mean), cows were classified as docile, moderate, or aggressive. Across all ranches, CS and EV were correlated ($P < 0.01$, r = 0.47). A ranch effect was detected ($P = 0.05$) because the correlation coefficient between CS and EV different among ranches (0.47, 0.65, 0.45, and 0.72 for ranches 1, 2, 3, and 4, respectively), which is likely due to differences in the design of the handling facilities. No significant correlations were detected among CS or EV with BCS ($P > 0.11$). Across all ranches, 12% of cows were classified as docile, 74% were classified as moderate, and 14% were classified as aggressive. In conclusion, temperament did not influence BCS of Nelore beef cows at the beginning of the breeding season. However, additional efforts to determine if temperament affects other production parameters in Nelore beef cows are warranted due to the reduced proportion of docile cattle in commercial cow-calf ranches in Brazil.

**Key words:** Nelore, temperament, productivity

**W257 Influence of propionate salt levels on young cow reproductive performance.** J. A. Walker*, G. A. Perry, and K. C. Olson, *South Dakota State University, Brookings.*

A supplementation study was conducted to evaluate level of propionate salt on young cow performance. Two- and 3-yr-old cows (n = 60) were allocated to one of 3 treatments at calving. Propionate salt was incorporated in a protein supplement (30% CP, 73% TDN) at a rate of 0, 80 or 160 g/d of propionate salt. Cows were individually supplemented twice weekly at 1.14 kg/d. Cows had access to pasture and hay (6.9% CP, 59.7% TDN). Blood was collected weekly to determine postpartum interval (≤1 ng $P_4$/ml). Weights and BCS were assigned at calving, end of supplementation, start of breeding season, and weaning. No differences in cow weight ($P = 0.11$) and BCS ($P = 0.17$) were found between treatments. Cow weight changed through the study ($P < 0.01$, 418, 443, 468 and 475 kg for calving, end of supplementation, start of breeding season and weaning, respectively). Cow ADG had a treatment by period interaction ($P < 0.05$): ADG displayed a quadratic response ($P < 0.05$) to levels of propionate salt during the supplementation period with 80 g displaying the highest ADG, but no response during the end of supplementation to breeding or breeding to weaning periods. Cow BCS changed through the study ($P < 0.01$, 4.46, 4.87, 4.90 and 4.73 for calving, end of supplementation, start of breeding season and weaning, respectively). Cows BCS increased during supplementation ($P < 0.01$, 0.42) and decreased from breeding to weaning (−0.17). Calf weight was not different ($P = 0.38$) between treatments. Calf weight increased through the study ($P < 0.01$, 36.1, 101.3 and 197 kg at birth, start of breeding season, and weaning, respectively). Pregnancy rates did not differ between treatments ($P = 0.24$). Pregnancy rates differed by cow age ($P < 0.01$, 77% and 100% for 2- and 3-year-olds, respectively). Cows initiating estrous cycles before the breeding season were greater ($P < 0.05$) for 160 g (47.6%) compared with 0 g (15.6%) and tended to be greater than 80 g ($P < 0.10$, 20.0%). Based on ultrasonography, 3-year-old cows conceived earlier ($P < 0.01$, 183.7 d) than the 2 year cows (207.0 d). Propionate salt did not influence cow weight or BCS; however, propionate salt did influence reproductive performance.

**Key words:** propionate salt, young beef cows

**W258 Methane emission potential and nutritional composition of four *Panicum* sp. forage genotypes in the Brazilian Cerrado region.** L. Bezerra da Silva*[1], S. L. S. Cabral Filho[1], R. Guimarães Júnior[2], A. L. Abdalla[3], A. K. B. Ramos[2], and F. D. Fernandes[2], *[1]Universidade de Brasília, Brasília, Distrito Federal, Brasil, [2]Embrapa Cerrados, Planaltina, Distrito Federal, Brasil, [3]Universidade de São Paulo, Piracicaba, São Paulo, Brasil.*

Four genotypes of *Panicum* sp. were evaluated, namely 2 accessions called PM34 and PM46, as well as 2 commercial cultivars, *Panicum maximum* 'Massai' and *Panicum maximum* 'Mombaça'. The purpose of the evaluation was to evaluate nutritional features, and to assess methane emission potential ensuing from the respective chemical composition characteristics of each genotype. The experiments were conducted both at an EMBRAPA unit called Cerrados, which is located in Planaltina town, Federal District (DF) and at the Animal Nutrition Laboratory on the Federal University of Brasília – UnB, within the period from September 2007 to May 2010. The genotypes' methane emission potential was assessed by applying the semi-automated in vitro gas production technique combined with the gas chromatography method concerning methane gas production at 8, 12 and 24 h post-inoculation. The split plot and split block experiment design with 3 repetitions was the experimental approach employed in laboratory analyses. Tukey's test at 5% probability level was applied to compare the means obtained and the data analysis was performed by using the SAS software (2000 version). The dry matter rate was 24.88%, and the neutral detergent fiber (NDF), non-fiber carbohydrate and NDF-nitrogen rates were respectively 67.85%, 11.34%, and 52.58%. Significant differences ($P < 0,05$) were found among the analyzed cultivars in respect to cumulative gas production (CGP), dry matter digestibility (DMD), amount of methane gas produced ($ACH_4$), as well as the amount of methane gas produced by each gram of dry matter digested ($CH_4GDMD$). It was observed that $CH_4GDMD$ was negatively related to the level of non-fiber carbohydrates (−0.9063) and positively related to the percentage of nitrogen linked to the neutral detergent fiber (NDF) in the genotypes analyzed (0.9925). In conclusion, a higher methane emission potential was observed for the genotype PM34 after 24 h fermentation, which presented a higher $CH_4GDMD$ rate (32.37 mL/g) combined with a lower DMD rate (35.92%) ($P < 0.05$).

**Key words:** bovine, semi-automated in vitro gas production technique, greenhouse-effect gases

**W259 Methodology for estimating intermuscular, subcutaneous, and intramuscular fat in primal cuts.** M. J. McPhee*[1,2], J. P. Siddell[1,2], B. J. Walmsley[1,2], W. H. Johns[1,2], and P. L. Greenwood[1,2], *[1]Cooperative Research Centre for Beef Genetic Technologies, Armidale, NSW, Australia, [2]Industry and Investment NSW, Armidale, NSW, Australia.*

In this study 6 whole beef rumps (3.67 to 5.05 kg) were purchased to evaluate the accuracy of estimating subcutaneous (SUB) and intermuscular (INTER) fat content from computer-aided tomography (CT)-scanned images. A full dissection by 2 operators of SUB and INTER fat was used to evaluate the accuracy of the CT prediction. The rumps were scanned using a Picker Ultra Z Spiral CT scanner (Philips Medical Imaging Australia, Sydney NSW) in the Meat Science CT unit at the University of New England Meat, Armidale. Voltage and current were set at 130 kV and 100 mAs, respectively. A pitch of 1.5, field of view of 480 mm, slice thickness of 5mm and distance between slices of 15mm were used. One hundred and 10 axial slices from 6 primal cuts were created. Total fat and lean in each rump were calculated using image analysis software. Boundaries for fat and lean were set at 10 to 128 and 129 to 210 gray scale units, respectively, with an image diameter of 487mm. INTER fat was removed from each slice using an elliptical tool in ImageJ (public domain software). Images only containing SUB fat were then analyzed to estimate the amount of SUB fat (kg). INTER fat (total fat – SUB fat) was calculated by difference. The SUB and INTER fat dissections were weighed and vacuum packed. Bags were then scanned to determine the amount of fat and lean in each dissected fat depot. The ratio of SUB and INTER fat to the dissected weight (kg) was used to account for any associated errors. The linear relationships between scanned (y) vs. dissected (x) fat for total, sub, and inter fat were $y = 1.0x + 0.02$ (SE = 0.22; $AdjR^2 = 0.98$), $y = 0.92x + 0.01$ (SE = 0.01; $AdjR^2 = 0.99$), and $y = 0.98x + 0.07$ (SE = 0.02; $AdjR^2 = 0.83$), respectively. These results demonstrate that fat deposition in beef primal cuts from scanned data are feasible and can be done with a high degree of accuracy. The amount of intramuscular fat has also been estimated from the scanned images of a Beef Cooperative Research Centre serial slaughter investigating marbling and fat distribution in Angus, Hereford, and Wagyu × Angus steers after SUB and INTER fat has been removed from each slice using the elliptical tool in ImageJ.

**Key words:** beef cattle, fat deposition

**W260 The influence of two levels of concentrate on the performance characteristics and carcass yield in Nellore cattle in *Brachiaria brizantha* compared to Marandu pastures.** G. A. Carneiro*[1], F. A. Barbosa[2], S. L. S. Cabral Filho[1], R. V. Oliveira[1], G. S. Firmino[1], C. E. Souza[1], F. F. Gouveia[1], and J. F. A. Oliveira[1], *[1]University of Brasilia, Brasilia, DF, Brazil, [2]Federal University of Minas Gerais, Minas gerais, MG, Brazil.*

The aim of the study was to evaluate the effects of 2 levels of concentrate on the performance characteristics and carcass yield in cattle in *Brachiaria Brizantha* compared with Marandu pastures. The experimental period went from August 2010 to January 2011. The animals used were 30, 22 mo-old Nellore steers with average initial body weight of 330.42 kg, divided into 2 treatments: SCONF 1 – average daily intake of the concentrate (corn, sunflower bran, soybean hulls, urea and minerals) offered at 0.91% the average body weight (ABW; dry matter - DM); SCONF 2 – average daily intake of the concentrate (corn, sunflower bran, soybean hulls, urea and minerals) offered at 1.42% the ABW in DM. The experiment was conducted in a randomized block design with 2 treatments and 3 replications. The Duncan test was used with 5% significance for comparison of treatments for performance and animal's carcass yield. The average final BW obtained was 477.94 kg, therefore there was no statistical difference in the average daily gain (ADG) and in the carcass yield between treatments SCONF 1 and SCONF 2 (ADG 0.867 kg/head/day for both treatments, and carcass yield of 56.00% for SCONF 1 and 56.03% for SCONF 2 ;$P > 0.05$). The 1.42% daily intake in DM of the concentrate did not improve weight gain and carcass yield compared with the daily intake of 0.91% in DM.

**Key words:** beef cattle, weight gain, grass

**W261 Two methods to estimate milk yield in beef cattle grazing systems.** A. C. Espasandin*, A. Casal, V. Gutierrez, M. Cadenazzi, and M. Carriquiry, *School of Agronomy, UdelaR, Uruguay.*

The objective of this work was to compare 2 different methods to estimate milk yield (MY) of a beef cattle herd at the Experimental Station Bernardo Rosengurtt, School of Agronomy, Uruguay. Hereford, Angus and F1-crosbred (n = 24) primiparous cows were used to estimate MY, once a month from birth to weaning, with Weight-suckle-weight (WSW) and Milking Machine (MM). All cows grazed native

pasture (2300 kg MS/ha of forage allowance). Two groups were created, each group with one method to estimate milk yield, and then the method was inverted. In WSW method calves were weighted before and after suckling (weight losses by urine and feces were registered previously). Difference between pre and post-suckling weights was recorded as estimated milk production of the dam. In MM method, cows were milked in the morning and afternoon, after receiving oxytocin. Milk was weighted in the afternoon. Estimations of MY, adjusted to 24 h, were analyzed with a repeated measures model including of sex of calves, month of lactation, group, cow breed, calf breed as fixed effects, postpartum days as a covariate, and the cow(breed) as random effect. To compare the 2 methods (WSW or MM), the effect was included in the previous model. Reproducibility of the 2 methods was studied by the Gage r&R (repeteability&Reproducibility) variance components. The MY estimated along lactation period was different between the 2 methodologies, WSW method estimates more MY than MM method. The Effect of method was significant ($P < 0.03$). The r&R coefficients range 83% (r = 0.72 and R = 0.41) suggesting low correlations. MM method estimates the potential capacity of the cow to produce a quantity of milk in a delimited period. Whereas, WSW method estimates milk consumption of calves but it is not an accurate method to estimate the real milk production of the dams. Standard errors analysis for the 2 methods show different variation associated to the estimated mean. The mean variation coefficient was 6% and 18% in MM and WSW method, respectively. Based on variability observed in this experiment, MM method is a more accurate method to estimate milk production in beef cattle systems.

**Key words:** beef cattle, Gage r&R, milk yield

**W262 Comparison of spring and fall calving beef herds grazing endophyte-infected tall fescue.** B. T. Campbell*[1], W. M. Backus[1], M. C. Dixon[2], R. J. Carlisle[2], and J. C. Waller[1], *[1]The University of Tennessee, Knoxville, [2]Research and Education Center at Ames Plantation, Grand Junction, TN.*

Twenty years of production records for spring and fall calving cows were obtained from the Research and Education Center at Ames Plantation. The cow herds were under the same management for the years contained in the study and all cows were strictly culled for reproductive failure and low performance. The cows primarily graze tall fescue (*Lolium arundinaceum* Schreb.) with the wild-type endophyte (*Neotyphodium coenophialum*) that induces the signs of tall fescue toxicosis. The spring herd was comprised of 551 cows and 1548 calves and the fall herd was comprised of 463 cows and 1834 calves respectively. The average age of cows in the spring herd was 4 years old, ranging from 2 to 11; and the average age of cows in the fall herd was 5 years old ranging from 2 to 12 respectively. Data were analyzed for calving interval, number of calves born, birth weight of calves, weaning weight of calves, adjusted 205-d weaning weight, average daily gain (ADG) from birth to weaning, and weight/day of age. The data were analyzed using a randomized block design in SAS 9.2. The spring calving herd had a shorter calving interval by an average of 10 d ($P < 0.05$), and produced fewer calves per cow ($P < 0.05$). The fall calving herd averaged 4 calves per cow while the spring calving herd only averaged 3. Calves born in the spring had higher birth weights than those born in the fall ($P < 0.03$), and spring born calves had higher ($P < 0.001$) adjusted 205-d weaning weights than fall born calves. The calves born in the spring had an ADG from birth to weaning of 1.03 kg/day while the calves born in the fall averaged 0.98kg/day. Fall born calves were lighter at birth than spring born claves and had lower weaning weights than spring born calves. However, spring calving cows had a higher replacement rate than fall calving cows. Higher replacement rates in the spring calving herd could be the result tall fescue toxicosis, a problem during the breeding season of spring calving cows. In contrast fall calving cows are bred during winter when tall fescue is dormant and tall fescue toxicosis is not a problem.

**Key words:** fescue, calving season, production

**W263 Influence of winter and spring pasture allowance on growth and reproductive performance on beef replacement heifers.** B. L. Bailey*, K. M. Krause, and T. C. Griggs, *West Virginia University, Morgantown.*

The objective of this study was to compare heifer growth and reproductive performance following 2 pasture allowances during the winter and following spring grazing season. Three 5-ha fields were selected as blocks in a randomized complete block design for application of grazing treatments. All fields had been in long-term hay and/or pasture production and contained cool-season grass-legume mixtures (orchardgrass, tall fescue, smooth bromegrass, quackgrass, red and white clovers). Seventy-two spring born heifers of primarily Angus background and 247 kg mean body weight (BW) were allocated to grazing treatments (12 hd/replicate of a treatment) for the entire developmental period November 12, 2009 - May 24, 2010 (194 d). The treatments consisted of daily herbage dry matter (DM) allocation of 3.5 (LOW) or 7.0 (HIGH) % of BW. The winter grazing period began November 12 and ended December 20. During the winter feeding period (December 21 - April 19) haylage (6.2 kg DM/hd/d) was fed and supplementation of soybean hulls (1.8 kg DM/hd/d) occurred January 20 - April 19. Spring grazing began April 20 and ended May 24. BWs were determined every 2 weeks and blood samples were taken on d 13, 41, 71, 109, 139, 155, 169, and 180. Heifers were subjected to a 58 d breeding season. Average daily gains (ADG) for the entire developmental period were 0.56 vs. 0.63 kg/d ($P = 0.12$) for LOW vs. HIGH heifers. During the winter grazing period ADG were 0.37 vs. 0.63 kg/d ($P < 0.05$) for LOW vs. HIGH heifers. For the winter feeding period ADG were 0.34 vs. 0.39 kg/d ($P = 0.31$) and for the spring grazing period 1.43 vs. 1.36 kg/d ($P = 0.38$) for LOW vs. HIGH heifers. Proportion of heifers who had reached puberty, and BW at the onset of the breeding season did not differ between treatments (60% vs. 60%, $P = 1.0$; and 357 vs. 369 kg; $P = 0.12$, for LOW vs. HIGH). Pregnancy rates did not differ (LOW: 74%, HIGH: 81%). We interpret these results to indicate that delaying the majority of weight gain until late in heifer development may decrease costs of winter feeding without detrimental effects on reproductive performance.

**Key words:** beef heifers, grazing, reproductive performance

**W264 Cow and calf separation to improve reproductive performance of first-calf Nellore beef cows under tropical conditions.** P. G. M. A. Martins*[1,2], C. A. A. Torres[1], A. B. Mancio[1], W. F. Souza[1], G. C. Lamb[3], and J. D. Arthington[2], *[1]Universidade Federal de Viçosa, Departamento de Zootecnia, Viçosa, Minas Gerais, Brazil, [2]University of Florida, Range Cattle Research and Education Center, Ona, [3]University of Florida, North Florida Research and Education Center, Marianna.*

Our objectives were to compare the effects of an early Nellore-calf weaning, to cows kept with their calves and a 72-h calf withdrawal on measures of performance of first-calf beef cows. Seventy-six primipa-

rous, Nellore cow-calf pairs were randomly allotted to 3 treatments: EW (early weaned); TW (temporary weaned for 72 h); and CON (control – cows remained with their calves throughout the study). Treatments were initiated at the start of a 90-d breeding season, starting on November 2009. Cow and calf BW, and cow BCS were determined at d 0, 30, 63 and 90 of the study. Blood samples were collected over 90 d, 10 d apart for determination of progesterone concentrations. Resumption of cyclicity was defined as the first sampling day when progesterone concentrations were ≥1.5 ng/mL for 2 consecutive sampling dates. Pregnancy was diagnosed by transrectal ultrasonography on d 63 and 53 d after the end of the breeding season. Cow and calf BW did not differ at the beginning of the breeding season ($P > 0.10$; BW = 365 ± 28.3 and 106 ± 14.5, respectively), as well as cow BCS. However, at the end of the breeding season, cow BW was greater for EW cows, compared with TW and CON ($P < 0.10$; BW = 440 ± 35.4; 404 ± 33.4; 398 ± 30.3, respectively). Cow BCS was also greater for EW cows, compared with TW and CON cows ($P < 0.10$; average BCS = 4.5; 3.8; 3.8, respectively; SEM = 0.10). For calf measures, TW and CON calves had greater BW, compared with EW since December, reflecting on BW at the normal weaning time ($P < 0.10$; BW = 164 ± 19.1; 201 ± 23.7; 196 ± 20.2 for EW, TW, and CON calves, respectively). By d 10 of the breeding season (corresponding to aproximately120 d postpartum), more ($P < 0.05$) EW cows were cycling than TW and CON cows. Pregnancy rate was 84.0 and 96.0% for EW, 60.0 and 84.0% for TW, and 46.2 and 80.8% for CON during and after the breeding season, respectively. In the first year of the study, early calf weaning improved cow pregnancy rate, BW and BCS, but resulted in impaired BW gain of EW calves.

**Key words:** body condition score, progesterone, weaning

**W265 Relationships between performance and residual feed intake in Bonsmara heifers when confinement fed or on pasture.** L. M. Wiley*[1,2], T. D. A. Forbes[1], A. N. Hafla[2], C. M. Hensarling[1], B. G. Warrington[1], and G. E. Carstens[2], *[1]Texas AgriLife Research, Uvalde, [2]Texas A&M University, College Station.*

Over 2 years, Bonsmara heifers (n = 60 and 55/yr, yr 1 BW 264 ± 6.1, yr 2 BW 281 ± 5.1) were individually fed a forage-based diet (2.07 Mcal ME/kg DM, 13.1 g CP/kg DM) using Calan gates at College Station, TX. Feed intake was recorded daily, animals were weighed weekly for 70 d, and residual feed intake (RFI) was calculated as the difference between actual dry matter intake (DMIc) and expected DMI from linear regression of DMI on ADG and mid-test $BW^{3}0.75$. Heifers were ranked by RFI, and those with the lowest (n = 12, LRFI) and highest (n = 12, HRFI) RFI were transported to Uvalde TX, and placed on pasture. Animals were weighed weekly over a 56 d period, 3 10-d intake measurement trials (2 trials in yr 1) were conducted using n-alkanes. Estimates of forage DMI were calculated daily and averaged within trials. RFI was computed as described above using forage intake estimates. In both yr, estimates of DMI were lower in LRFI than HRFI animals under confinement feeding (8.4 ± 0.78 vs 11.0 ± 1.11, and 8.5 ± 0.23 vs 10.5 ± 0.22 kg DM/d for years 1 and 2 respectively, $P < 0.01$). On pasture, LRFI animals had lower DMI than HRFI (8.8 ± 0.77 vs 9.1 ± 0.91 and 7.7 ± 0.11 vs 7.9 ± 0.16 kg DM/d, for yr 1 and 2 respectively) but the differences were not significant ($P > 0.1$) Estimates of ADG were not different between LRFI and HRFI within feeding situations or yr. In the confinement trials, F:G was correlated ($P < 0.01$) with ADG (−0.53 and −0.83 for yr 1 and 2. respectively) but not with DMI. During the pasture trials, F:G was correlated ($P < 0.001$) with ADG (−0.88 and −0.88 for yr 1 and 2, respectively) but not with forage DMI. In both yr, RFI during the confinement trials was not correlated with ADG, but was correlated ($P < 0.001$) with DMI and F:G. Forage RFI in yr 1 was not correlated with ADG or FCR, but was correlated with forage DMI, while in yr 2 RFI was correlated with DMI and F:G but not ADG. There were no correlations between RFI measured during the confinement and pasture trials. These data suggest that daily variation in forage DMI prevents accurate forage RFI estimation if using a limited number of estimates of DMI

**Key words:** feed conversion, alkane, gain

**W266 Effect of birth weight, early feed intake, and average daily gain of calves before weaning on their performance after weaning and during first lactation.** C. M. Matuk*[1], M. Chahine[1], A. Bach[2,3], B. Ozer[1], M. E. de Haro Marti[4], J. B. Glaze[1], and T. Fife[1], *[1]University of Idaho, Twin Falls, [2]IRTA, Caldes de Montbui, Spain, [3]ICREA, Barcelona, Spain, [4]University of Idaho, Gooding.*

The effect of birth weight, early feed intake, and average daily gain (ADG) on performance was analyzed in a group of 755 replacement Holstein calves raised on a large commercial dairy operation in southern Idaho. Individual feed intake was recorded 4 times a week during the last 3 wk that calves were individually hutched (56 d of age). Based on their individual feed intake, calves were classified as control (randomly chosen without considering their level of feed intake, CTL, n = 80), ′high eaters′ (highest feeding level quartile, HIGH, n = 200), ′low eaters′ (lowest feeding level quartile, LOW, n = 200) and ′medium eaters′ (the remainder of calves, MED, n = 275). Weight was recorded at birth, and at wk 6, 9 and 12. During data collection, calves were housed at a calf raising facility from birth to approximately 7 mo of age, at a heifer raising facility from 7 mo until heifer reached 247 d of pregnancy and then moved to the dairy where calving occurred. Milk production (305 d mature equivalent, 305ME) records were obtained from the dairy computerized record system for all heifers that calved. Data were analyzed using PROC MIXED and PROC CORR in SAS (SAS Inst. Inc., Cary, NC). Out of the 755 heifers included in the study, 206 were culled (27.3%) and 491 have calved to date (65.0%). Out of the 206 culled heifers, 60 were lost at the calf raising facility (29.1%; 26 sold, 34 dead), 126 at the heifer raising facility (61.2%; 111 sold, 15 dead) and 20 at the dairy (9.7%; 12 sold, 8 dead). Intake classification did not a have a significant effect on cull rate. There was no significant correlation between birth weight and 305ME or between ADG and 305ME. First lactation milk production (305ME) did not differ between feed intake classification and averaged 11553 ± 150 kg for the HIGH group (n = 124), 11483 ± 145 kg for the MED group (n = 123), 11408 ± 174 kg for the LOW group (n = 92) and 11201 ± 255 kg for the CTL group (n = 43). In this study, birth weight, early intake and ADG of calves did not have an effect on their first lactation 305ME milk yield.

**Key words:** calves, 305ME

**W267 Different periods offering chromium oxide ($Cr_2O_3$) as external marker to evaluate the intake of cattle treated with different diets under feedlot.** R. A. Mandarino*[1], F. A. Barbosa[2], I. S. Silva[1], C. F. Lobo[1], S. L. S. Cabral Filho[1], G. A. Carneiro[1], and G. S. Firmino[1], *[1]University of Brasilia, Brasilia, DF, Brazil, [2]Federal University of Minas Gerais, Minas Gerais, MG, Brazil.*

The aim of this study was to evaluate the dry matter intake of cattle using 2 distinct periods of supply of chromium (10 g once daily) as a

marker of consumption of feedlot cattle treated with 3 different diets. The feedlot experiment was conducted from August to November 2009, during 96 d. The herd was composed of 12 zebu cattle with a average age of 23 mo with initial body weight of 364.68 kg. The treatments were the different periods of supply of chromium with 5 d (CR5) and 7 d (CR7) repeated twice in the period of feedlot. The diets were: SIL - corn silage and concentrate (corn grain, soybean meal, soybean hulls, urea and mineral supplement) at a ratio of 25:75 (in dry matter), PEL - exclusive diet of pellets; GRN - diet with whole grain corn and pellets. A randomized scheme in a 2 × 3 factorial divided as follow: CR5SIL, CR5PEL, CR5GRN, CR7SIL, CR7PEL and CR7GRN. The Duncan test at 5% probability level was applied to compare the means obtained. The average final body weight was 471.88 kg. The periods of infusion were not different statistically ($P > 0.05$) for any of the repetitions. The results of dry matter intake showed 2.21%, 2.28%, 1.82%, 2.16%, 1.87% and 1.68% of body weight for CR5SIL, CR7SIL, CR5PEL, CR7PEL, CR5GRN and CR7GRN respectively. All the results showed no interactions either for treatments or the diets ($P > 0.05$) indicating that a shorter period of infusion of chromium can be recommended to reduce the time of this methodology to estimate dry matter intake.

**Key words:** chromium, markers, supplements

**W268 Total and inorganic phosphorus content of an array of feedstuffs.** J. P. Jarrett*[1], M. D. Hanigan[1], R. Ward[2], P. Sirois[3], and K. F. Knowlton[1], *[1]Virginia Polytechnic Institute and State University, Blacksburg, [2]Cumberland Valley Analytical Services, Inc., Maugansville, MD, [3]Dairy One, Ithaca, NY.*

Recent investigations suggest that bioavailability coefficients of phosphorus (P) in various feedstuffs may be inaccurate. Surveys of dairy nutritionists suggest that overfeeding of P in dairy rations may stem from a lack of confidence about forms of P and availability of those forms to ruminants. Quantifying variation of P-containing compounds in feed may help improve estimates of P bioavailability. Seventy-two feed samples were received from 2 commercial labs. Total P (TP), inorganic P (Pi), and the percentage of TP that is inorganic were analyzed using the MEANS procedure of SAS. The effect of geographic region and feed class (forages, concentrates, and by-products) was analyzed with the MIXED procedure of SAS. Total P was greater ($P < 0.05$) in concentrate and by-product feeds than in forages but there was no consistent effect of feed class on Pi quantity ($P > 0.10$). However, Pi as a percent of TP was higher ($P < 0.05$) in forages as compared with concentrates and by-products. Region had no effect on TP and Pi concentration. Data characterizing variation of P-containing compounds in feedstuffs may allow better estimations of P availability and more accurate feeding recommendations.

**Table 1.**

| | Total P (μg/g of DM) | | Inorganic P (μg/g of DM) | | Pi (percent of TP) | |
|---|---|---|---|---|---|---|
| | SD | Mean | SD | Mean | Mean | SD |
| Corn silage | 2177 | 486 | 2191 | 589 | 99.8 | 9.4 |
| Grass hay | 2367 | 1094 | 1752 | 1231 | 65.2 | 28.7 |
| Soybean meal 48% | 8008 | 247 | 565 | 79 | 7.0 | 0.8 |
| Corn gluten | 10116 | 2399 | 6452 | 5085 | 57.3 | 40.2 |
| Whole cottonseed | 6282 | 1204 | 623 | 159 | 10.3 | 3.5 |
| By class[1] | | | | | | |
| Forages | 2421[a] | 553 | 1939 | 476 | 77.4[a] | 6.2 |
| Concentrates | 5308[b] | 580 | 1077 | 499 | 26.9[b] | 6.5 |
| By-products | 6670[b] | 474 | 2085 | 408 | 30.3[b] | 5.3 |

[1]Means within a column with different superscripts are significantly different.

**Key words:** bioavailability, inorganic phosphorus, total phosphorus

**W269 Protein-energy mineral supplementation of Nellore bulls in the growing phase at *Brachiaria brizantha* 'Marandu' during the rainy season.** C. F. Lobo*[1], F. A. Barbosa[2], R. A. Mandarino[1], G. A. Carneiro[1], and S. L. S. Cabral Filho1[1], *[1]University of Brasilia, Brasilia, DF, Brazil, [2]Federal University of Minas Gerais, Minas Gerais, MG, Brazil.*

This experiment was designed to evaluate the effects of 2 types of protein-energy-mineral supplementation and mineral supplementation on the performance of Nellore bulls in the growing phase, during the rainy season, from December to April, in *Brachiaria brizantha* 'Marandu'. A total of 60 Nellore bulls were used, with average initial BW of 227 kg. The treatments were: MS – control, complete mineral supplement; SUP1 – protein-energy mineral supplement with slow release urea, with an average daily intake of 0.36% BW; SUP2 – protein-energy mineral supplement with conventional urea, with an average daily intake of 0.36% BW. The experiment was conducted in a randomized block design with 3 treatments and 4 replications. The Duncan test was used to evaluate animal performance. There was a difference ($P < 0.06$) between SUP1 and MS, with ADG of 0.585 and 0.477 kg/h/d, respectively. The gain obtained with SUP1 in comparison to MS promoted additional gains during the rainy season. There was no difference ($P > 0.06$) in ADG between MS and SUP2, with gains of: 0.477 and 0.496 kg/h/d, respectively. There was no difference ($P > 0.06$) between supplements SUP1 and SUP2, and their ADG equal to 0.585 and 0.496 kg/h/d. There was no significant yield difference between SUP1 and SUP2. As for MS, SUP1 was superior and SUP2 was equivalent, indicating the viability of using SUP1 in the rainy season.

**Key words:** grass, performance, protein

**W270 Requirements for continuous ammonia-$NH_3$ sampling when using relaxed eddy accumulation from concentrated animal feeding operations.** C. D. Gambino*[1], J. M. Ham[2], E. Allwine[1], P. O'Keeffe[1], S. N. Pressley[1], B. K. Lamb[1], and K. A. Johnson[1], *[1]Washington State University, Pullman, [2]Colorado State University, Fort Collins.*

Improved understanding of requirements for measuring ammonia ($NH_3$) volatilization from concentrated animal feeding operations (CAFO) is needed to design mitigation strategies and better acquire

national $NH_3$ emission inventories currently required by the United States Environmental Protection Agency. Real time $NH_3$ concentrations at feedlots can be difficult to measure because ambient temperature, relative humidity (RH), dust interference, and sampling line length can negatively impact the sample stream to the $NH_3$ analyzer. The compounding effect of these variables increases the potential for imprecise measurements. A review of the literature measuring $NH_3$ concentrations from feedlots indicates that the necessary concentration range for an $NH_3$ analyzer to be useful in conjunction with an REA approach to flux measurements must satisfy detection from 194 - 1766 ppbv. One commercial $NH_3$ analyzer that shows promise to be used for feedlot $NH_3$ measurements is the Picarro G1103 analyzer for $NH_3$ and $H_2O$. The objective of this work was to test the robustness of the Picarro for use in feedlot $NH_3$ measurements. Laboratory tests were conducted to determine potential interferences to the continuous analyzer's detection sensitivity. A Picarro $NH_3$ analyzer drew samples from the up or down canister every 30 s. Laboratory tests on the adapted system moved to establish an ideal square wave for analyzer response time. Picarro $NH_3$ analyzer response time was determined for line loss associated with temperature fluctuations of −20°C - 80°C, concentration differences of 100 ppbv-2500 ppbv, RH ranges from 0% - 100%, and dust interference within the optical cell. Lines, as well as up- and down-eddy canisters were maintained at desired temperatures using heat tape and incubators, respectively. Test concentrations matched extremes found during summer campaigns of 194 - 1766 ppbv- $NH_3$, corresponding to fluxes 68 - 128 ug- $NH_3$ $m^{-2}$ $s^{-1}$. The validation and optimization of the REA-Picarro continuous sampling system provides an option for long sampling periods to improve characterization of $NH_3$ losses from feedlots.

**Key words:** ammonia, REA, measurement

**W271 Effects of weaning strategy on growth and stress in beef calves.** M. E. Howe*, L. B. Krebs, and E. G. Brown, *Stephen F. Austin State University, Nacogdoches, TX.*

The market demands alternative strategies to traditional weaning that will lead to more pounds of product produced and less stress in the weaned calf. To compare alternative strategies with traditional abrupt weaning, 39 crossbred calves and their cows were used to evaluate stress and performance. Cows and calves were assigned to 4 treatment groups based on calf body weight and parity of the cow. Treatments include anti-suckling device (day −4 to 0) followed by fenceline (day 0 to 42; n = 10); anti-suckling device followed by abrupt removal from cow (day 0 to 42; n = 10); no anti-suckling device (day −4 to 0) followed by fenceline (day 0 to 42; n = 10); and no anti-suckling device followed by abrupt removal from cow (day 0 to 42; n = 9). All calves remained with their cows when anti-suckling devices were fitted to the calf. At weaning (day 0), anti-suckling devices were removed. Calves were placed in a pasture adjacent to their cows for fenceline weaning and abrupt calves were moved to a remote location away from their cows at weaning. Cows and calves were weighed on d −4,-2, 0, 2, 4, 14, 28, and 42. Body condition scores (BCS) were determined on cows on d −4, 0, 14, 28, and 42. Blood samples were collected from cows and calves on d −4, 0 and 4 to determine complete blood count. Data was analyzed using Proc GLM of SAS. ADG and BCS was not significantly different ($P = 0.05$) among treatment groups for the cows or calves. There was no difference ($P > 0.06$) in lymphocytes or neutrophils for calves pre-weaning (d −4) or post-weaning (d 4). Results from this study suggest that alternative weaning strategies did not result in an increase in performance of the calves compared to traditional weaning.

**Key words:** stress, weaning

**W272 Whole herd enteric methane emission estimates in three contrasting dairy systems.** S. Utsumi*[1], D. Beede[1], S. Zimmerman[2], and P. Zimmerman[2], *[1]Michigan State University, East Lansing, [2]C-Lock Technology Inc., Rapid City, SD.*

Effects of contrasting feeding systems (FS) on diurnal patterns of enteric methane (CH4) emissions per cow, footprint per unit of milk, and frequency of milking of a herd of Holstein cows (n = 61) managed with an automatic milking system (AMS) was quantified in this pilot study. Feeding systems were: pasture grazing (GRASS); total mixed ration (TMR); and, pasture grazing plus TMR (pTMR) lasting 17, 34, and 84 d, respectively. Voluntary milking with one single-stall AMS was applied at variable rates of 4 to 2 milkings/day based on days in milk and milk yield (MY). Cows received in addition to basal diets in the FS, 1 kg of concentrate per 4 kg of milk. The mass flux (MF) of eructed and expired $CH_4$ during individual milkings (n = 12,584) was estimated with the Greenfeed system (C-Lock Technology Inc., Rapid City, SD), using detected changes in $CH_4$ concentration, air flow and known amounts of gas tracer. Repeated measures analysis of hourly $CH_4$ fluxes and ANOVA and Pearson correlation of calculated daily $CH_4$ fluxes and milking variables were conducted ($P < 0.05$). Hourly $CH_4$ fluxes were affected by a significant FS by hour interaction likely influenced by differences in daily feed intake patterns among FS. Pasture grazing resulted in greater hourly $CH_4$ fluxes during night hours (2100 to 0500 h), whereas hourly $CH_4$ fluxes in pTMR and TMR increased immediately after the TMR feeding at 0500 h. Daily $CH_4$ fluxes did not differ among FS (average = 389 ± 15 g), but GRASS, pTMR and TMR differed in daily milking frequency (2.6, 2.9 and 3.0; SE = 0.1) and MY (22, 25 and 29 kg/cow per d; SE = 1.2). Differences in MY explained the diluted $CH_4$ footprint per unit of milk in TMR compared with GRASS (15 vs. 19 $gCH_4$/kg milk; SE = 1) and the intermediate footprint value for pTMR (17 ± 1 $gCH_4$/kg milk). No correlation between daily $CH_4$ fluxes and MY was detected in the 3 FS. However, significant negative correlations between milk yield and $CH_4$ emissions per unit of milk in GRASS (r = −0.67), pTMR (r = −0.72) and TMR (r = −0.79) highlight the importance of a high milk production as a common strategy to dilute $CH_4$ emissions among dairy systems.

**Key words:** methane, dairy systems, automatic milking

**W273 Withdrawn**

**W274 Effect of feeding frequency and protein supplementation on methane production by Holstein cows.** P. C. Aikman*, J. A. N. Mills, C. K. Reynolds, and L. A. Crompton, *School of Agriculture, Policy and Development, University of Reading, UK.*

Open-circuit calorimetry and IGER Behavior Recorders were used to measure methane production and eating behavior in 4 Holstein cows (259 ± 13 d in milk) receiving one of 4 treatments in a 4 × 4 Latin Square with 5 wk periods. The frequency of feeding and dietary CP concentration varied between treatments. Treatments consisted of an ad libitum fed TMR (37.5% corn silage, 12.5% grass silage, 50% concentrate; CP, OM, NDF and starch concentrations of 146, 937, 428 and 202 g/kg DM respectively) fed twice daily (CONT2), or the same TMR fed ad libitum with added protein (Amino Green, SCA Nutec, Thirsk, UK) to increase CP concentration (177 g/kg DM), fed once

(PS1), twice (PS2) or 4 times (PS4) daily. Data were analyzed using the Mixed procedure of SAS with period and treatment as fixed effects and cow as a random effect. Mean DMI (18.7 ± 0.45 kg/d), milk yield (27.8 ± 0.78 kg/d) and milk fat, protein and lactose concentrations were unaffected ($P > 0.167$) by treatment. Temporal distribution of eating behavior was affected ($P < 0.001$) by treatment (eating behavior occurring between 10.00 and 16.00 was 43.2, 65.5, 50.8, and 23.9% of 24 h total for CONT2, PS1, PS2 and PS4 respectively) but total time spent eating (mean 305 ± 26.5 min/d) was unaffected ($P = 0.798$). Although number of meals/d (mean 12.1 ± 1.2) did not differ ($P = 0.188$), meal length decreased ($P = 0.008$) as feeding frequency increased (27.9, 31.4, 24.3 and 20.2 min for CONT2, PS1, PS2 and PS4 respectively). Total methane production was lowest in PS1 and highest in PS4 (571, 524, 566 and 576 l/d for CONT2, PS1, PS2 and PS4 respectively, $P = 0.048$). Methane production tended ($P = 0.063$) to be lowest in PS1 and PS2 when expressed as MJ/MJ milk (0.256, 0.223, 0.227 and 0.231 for CONT2, PS1, PS2 and PS4 respectively) but there was no treatment effect ($P > 0.233$) when expressed as L/kg DMI (mean = 29.9 ± 1.1) or L/kg milk (mean 21.0 ± 1.0). Increasing dietary CP concentrations or increasing feeding frequency to encourage animals to distribute feed intake more evenly are not effective strategies to decrease methane yield (L/kg DMI) of lactating dairy cows.

**Key words:** protein supplementation, feeding frequency, methane

**W275 Withdrawn**

**W276 Effect of Quebracho-chestnut tannin extracts at two forage levels on dairy cow lactation performance and emission of methane and ammonia.** M. J. Aguerre*[1], M. C. Capozzolo[1], M. A. Wattiaux[1], and J. M. Powell[2], *[1]University of Wisconsin-Madison, Madison, [2]U.S. Dairy Forage Research Center, Madison, WI.*

Our objective was to determine the effects of a tannin mix on lactating cow performance and emission of methane ($CH_4$) and ammonia-nitrogen ($NH_3$-N), and whether any responses were affected by dietary forage to concentrate (F:C) ratio. Sixteen multiparous Holstein cows (626 ± 60 kg BW; 120 ± 28 DIM) were randomly assigned to one of 4 air-flow controlled chambers, constructed to fit 4 cows each. Chambers were assigned to dietary treatments sequences in 4 × 4 Latin square designs with 2x2 factorial arrangements of treatments. Dietary treatments, fed as total mixed rations, included the following F:C ratio: 47:53 and 61:39 (DM basis, alfalfa silage and corn silage in a 1:1 ratio) without or with 0.45% tannin (diet DM). Air samples entering and exiting each chamber were analyzed with a photo-acoustic gas monitor. There was no tannin by F:C ratio interaction for any of the measured variables. Overall, DMI (28.5 kg/d), milk fat yield (1.67 kg/d) and MUN (10.6 mg/dL) were not affected by tannin. However, relative to the control, inclusion of tannin reduced ($P < 0.05$) energy corrected milk yield (ECM; 44.6 vs.43.4 kg/d) and true protein yield (1.32 vs.1.28 kg/d). Increasing F:C ratio reduced ($P < 0.05$) DMI (29.5 vs. 27.5 kg/d), ECM (45.5 vs. 42.2 kg/d), milk true protein (1.37 vs. 1.23 kg/d) and fat yield (1.71 vs. 1.63 kg/d), but did not affect MUN. Emission of $CH_4$ was not affected by tannin (693 g/d), but increased from 15.1 to 17.1 g/kg ECM ($P = 0.03$) relative to control. Although tannin tended to decrease N intake (667 vs. 684, $P = 0.08$), it did not affect $NH_3$-N emission (28.1 g/d). Increasing the F:C ratio tended to increase $CH_4$ emission (672 vs. 714 g/d; $P < 0.08$), increased $CH_4$ per unit of ECM (15.5 vs. 16.7 g/kg, $P < 0.01$), decreased N intake (711 vs. 640 g/d, $P < 0.01$), but increased $NH_3$-N emission per unit of N intake (3.9 vs. 4.6 g/g, $P = 0.04$). In this study, adding tannin to the diet had negative effects on performance and increased $CH_4$ emission per unit of milk by 8%, regardless of the dietary content of forage. In addition, F:C ratio altered manure $NH_3$-N emission and $CH_4$ emission.

**Key words:** methane, ammonia, dairy

**W277 Effect of fiber on greenhouse gas emissions from stored manure.** Q. Huang[1], K. Perano*[2], M. Tenuta[1], C. M. Nyachoti[1], A. Strathe[2], and E. Kebreab[2], *[1]University of Manitoba, Winnipeg, MB, Canada, [2]University of California, Davis, Davis.*

Lagoons from livestock operations emit greenhouse gases (GHG), particularly methane ($CH_4$) and carbon dioxide ($CO_2$). Methane emissions result from anaerobic breakdown of volatile solids in livestock excreta during storage in the lagoon. The purpose of the study was to explore the effects of fiber content in the manure on the amount of GHG emitted from pig manure in an anaerobic digester. Pigs were fed 3 different diets (NDF = 12%, 16%, and 20%) to manipulate the amount of fiber in excreta. Manure from the treatments was collected and stored in anaerobic digesters in triplicate for 139 d. The solids concentration was adjusted weekly to keep it at 3%. Each week, 1 L of manure was added and 0.25 L taken out and analyzed for the solids concentration. The resulting increase in volume of the manure in the digester was 0.75 L/wk. The $CH_4$ and $CO_2$ emitted by the digesters were collected for each digester daily. A first order model was derived describing the concentration of volatile solids (S) as [dS/dt = (inflow*0.03*0.80 – outflow*S–k*S*V)/V], where k is the rate constant and V is volume. The Arrhenius relationship [$CH_4$ = k*S*exp(log(A)–E/R*T)] was used to model rate of formation of $CH_4$ over time. Here A is the Arrhenius constant and E, R and T represent the activation energy, gas constant and temperature, respectively. The parameters k and A were estimated from the time-series using generalized nonlinear least squares. The ANOVA analysis of k and log (A) showed no difference between the 3 treatments ($P = 0.63$). Cumulative emissions over 139 d showed a trend toward higher GHG production as NDF content increases, but it was not statistically significant ($P = 0.55$). Similarly, analysis based on $CO_2$-equivalent emissions did not show a difference between treatments ($P = 0.55$). Part of the reason for lack of detecting a difference between treatments was the high variation of observed emission values within a treatment. Increased replications per treatment are required to overcome within-treatment variation. Alternatively, GHG emissions from stored manure could mostly be a function of total carbon and may not depend on NDF levels.

**Key words:** methane, manure, fiber

**W278 Evaluation of $SF_6$ emission for determination of methane in ruminants.** A. C. Ruggieri*, N. C. Meister, I. P. Carvalho de Carvalho, N. L. Santos, V. Costa e Silva, F. de Oliveira Alari, and K. T. de Resende, *UNESP-Universidade Estadual Paulista, Jaboticabal, São Paulo, Brazil.*

One requirement of using the technique of inert traced gas sulfur hexafluoride ($SF_6$) to measure the emission of methane is the determination of emission rate or permeation of gas through the membrane. The aim of this study was to evaluate 2 different thicknesses of membrane permeation (Teflon), and the influence of the use of the washer. We used a factorial (2x3), with 2 thicknesses of film (0.2mm and 0.3mm) and 3 type of assemble: 1- with washer 5mm bore hole (i.d.); 2- with washer 2.5mm bore hole (i.d.); 3- without washer, totalizing 6 treatments with

10 replication each. The capsules were made of brass with the following measures outside diameter (o.d.) 11.1 mm (7 / 16 inch) and 4.76 mm bore role (i.d.), with nut length (Swagelok), were charged with approximately 500mg of $SF_6$. Compact stick (nylon 6.6) was used to make a washer with 0.8 mm thick. The following capsules were kept at 39°C in the laboratory. They were weighed weekly for 8 consecutive weeks and discarding the first to review the weighing according to the methodology for methane emission from rumen adapted to Brazil. The experimental data were analyzed by SAS statistical software. Analyses of variance were performed using PROC MIXED with repeated measures. The averages of the treatment were compared by Tukey test at 5% probability. The use of film 3 mm resulted in lower emissions ($P < 0.05$) of $SF_6$ over 2 mm. The emission of $SF_6$ capsules with or without washer did not different ($P > 0.05$), and they were higher when compared with the capsules inside area with washer lower in 2 thicknesses of film. However the use of the capsules was higher when the washer was used, whereas use of a capsule with emission from 500 to 2000 ng/min.

**Key words:** membrane permeation, size washer, emission rate

**W279 Effect of dietary protein level on ammonia and greenhouse gas emissions from dairy manure.** C. Lee*[1], A. N. Hristov[1], C. J. Dell[2], G. W. Feyereisen[3], J. Kaye[1], and D. Beegle[1], *[1]Pennsylvania State University, University Park, [2]USDA-ARS-PSWMRU, University Park, PA, [3]USDA-ARS-SWMRU, St. Paul, MN.*

Experiments were conducted to investigate the effect of dietary crude protein (CP) concentration on ammonia ($NH_3$) and greenhouse gas (GHG; $CH_4$, $N_2O$, and $CO_2$) emissions from dairy manure in simulated storage (Exp. 1) and from manure-amended soil in lysimeters (Exp. 2). Twenty 4 lactating Holstein cows were grouped and offered randomly one of the following diets: 16.3% CP (HighCP), or 13.5% CP (LowCP). Feces and urine were separately collected from each cow and manure was prepared by mixing feces and urine in a 1.7:1 ratio. Total N concentration and the proportion of ammonium– and urea–N in total N were greater ($P < 0.001$) for HighCP manure compared with LowCP manure (4.4 vs. 2.8% and 51.6 vs. 30.8%, respectively). In Exp. 1, manure was incubated in laboratory conditions for 122 h. The cumulative $NH_3$ emission from LowCP manure was lower (by 47%, $P < 0.001$) compared with HighCP manure. The emission rates and cumulative emissions of GHG were not affected by type of manure. In Exp. 2, manure was applied to lysimeters (61 × 61 × 61cm; Hagerstown silt loam; fine, mixed, mesic Typic Hapludalf) at 9.5 and 9.1 g N and 1,653 and 2,356 g fresh manure per lysimeter (HighCP and LowCP, respectively). The emission rate of $NH_3$ was 49% greater (1.53 vs. 1.03 mg/$m^2$ per min; $P < 0.001$) for HighCP than for LowCP manure. In contrary, the emission rates of $CH_4$ and $CO_2$ were greater ($P < 0.001$ and 0.01, respectively) for LowCP compared with HighCP manure, which was explained by the increased manure application rate with LowCP (to achieve similar N application rate). Emissions of $N_2O$ were not affected by treatment. In conclusion, LowCP manure significantly decreased $NH_3$ emission in simulated storage conditions and from manure-amended soil and increased, due to greater application rate, $CH_4$ and $CO_2$ emissions from manure-amended soil compared with HighCP manure.

**Key words:** dietary protein, gas emission, dairy manure

**W280 Use of an activity monitoring system as part of the Cal Poly dairy breeding protocol.** T. Nutcher* and S. Henderson, *Department of Dairy Science, California Polytechnic State University, San Luis Obispo.*

Dairy herd reproductive efficiencies have dropped in the past 40 years. Increased milk production, and genetic pull toward more milk production, has led to reproductive rates declining. An advanced breeding program is needed to become more efficient in this area and many options exist such as synchronization programs, pedometers, and other electronic detection aids. The objective of this study was to determine the effectiveness of an activity monitoring system, Heatime by MICRO Dairy Logic, as an integral part of the Cal Poly Dairy breeding protocol. Once installed, the program was kept up to date with the herd, including: pen moves, fresh events, bred events, dry-off events, and collar movements. This was done at least 4 times per week to ensure current information. Pregnancy checks were done every other week to obtain results of previous bred events and were then entered into the system. Pregnancy rates derived by this data were compared with the previous history of the herd. The results of this study yielded a well functioning breeding program. The system continuously monitored activity, stored records, and generated user defined reports with activity and rumination graphs. The system used this data to flag cows to be bred, checked for sickness, or pregnancy checked. Concerns arose with the system being abandoned once the Senior Project was complete. These have been resolved as seen by the breeders and herdsmen having adapted to the new technology smoothly, and using it as an integral part of their management protocol. The system has been established and in use for 5 mo. The pregnancy rates before the system averaged 14.3% compared with the system at 22.5%, which increased the pregnancy rate to a combined 15.3% (12/26/09 – 11/06/10). In conclusion, the Heatime system has shown to be an effective addition to the Cal Poly breeding program; however, further observation is needed to determine effectiveness and consistency over the long-term.

**Key words:** activity, rumination, estrus

**W281 Seasonal and diel changes of air emissions from cross-ventilated dairy freestall barns in Midwestern United States.** F. Y. Ayadi*[1], E. L. Cortus[1], L. D. Jacobsen[2], B. P. Hetchler[2], and A. J. Heber[3], *[1]South Dakota State University, Brookings, [2]University of Minnesota, St. Paul, [3]Purdue University, West Lafayette, IN.*

A design feature of the National Air Emissions Monitoring Study was to investigate climate and facility management influence on gaseous and particulate matter (PM) emissions. One monitored site consisted of 2 mechanically cross-ventilated freestall dairy barns in Wisconsin with capacities of approx. 275 and 375 cows. In yr 1, pens were flushed 3 times daily with recycled lagoon effluent; in yr 2, barn floors were scraped with a tractor. The objective of this analysis was to determine variations in ammonia ($NH_3$), hydrogen sulfide ($H_2S$), carbon dioxide ($CO_2$), and $PM_{10}$ attributed to season and time of day over a 2-yr period. Because change in manure removal method had a significant effect on emissions, season and time of day effects were evaluated separately for each yr. Seasons were defined as spring (March–May), summer (June–Aug), fall (Sept-Nov), and winter (Dec-Feb). Time of day influence was evaluated using averages from day (9 a.m.-4 p.m.) and night (10 p.m.-5 a.m.) periods. Yearly ave. values for $NH_3$ emission were 3.4 g/$m^2$/d (SE = 0.01) and ranged between 3.5 and 4.4 g/$m^2$/d during day and 2.8–3.4 g/$m^2$/d during night. All $NH_3$ emissions were significantly lower at night ($P < 0.05$). Mean $H_2S$ emission (646 mg/$m^2$/d, SE = 8.3) during yr 1 was significantly higher than during yr 2 (37.4 mg/$m^2$/d, SE = 0.5) and showed only minor variations related to season. However, in yr 2, $H_2S$ emissions showed significant differ-

ences based on season; $H_2S$ emissions were highest in summer (63.2 mg/m$^2$/d, SE = 1.1) and lowest in winter (16.7 mg/m$^2$/d, SE = 0.2). Differences between years for $H_2S$ were most likely related to the different manure removal systems; a time of day effect on $H_2S$ emissions was not evident. Conversely, $PM_{10}$ emission was significantly lower in yr 1 (121 mg/m$^2$/d, SE = 3.3) than in yr 2 (187 mg/m$^2$/d, SE = 3.7 mg/m$^2$/d) and was significantly higher during the day, most likely as a result of different scraping systems. Emission rates for $CO_2$ varied due to season and were highest in the winter (1.5–2.1 kg/m$^2$/d, SE = 0.01). This study demonstrated that season influenced $H_2S$, and $PM_{10}$ emissions and time of day affected $NH_3$ and $PM_{10}$ emission.

**Key words:** manure, cross-ventilated barn, emission