

414 Immunization of pigs against chicken (c)GnRH-II and lamprey (l)GnRH-III: Effects on gonadotropin secretion and testicular function. A. Bowen^{*1}, S. Khan², L. Berghman³, J. Kirby⁴, and J. Vizcarra¹, ¹Texas Tech University, Lubbock, ²Clark Atlanta University, Atlanta, GA, ³Texas A&M University, College Station, ⁴University of Arkansas, Fayetteville.

The objective of this experiment was to evaluate the effects of active immunization against two GnRH isoforms on gonadotropin secretion and testicular function in pigs. Synthetic cGnRH-II and lGnRH-III peptides, where the common pGlu-His-Trp-Ser sequence at the N-terminal was suppressed, were conjugated to BSA. Forty-eight male piglets were randomly assigned to 4 treatments. Pigs on treatment 1 were actively immunized against cGnRH-II, while pigs on treatment 2 were actively immunized against lGnRH-III. Pigs on treatment 3 were actively immunized against the carrier protein (BSA), and pigs on treatment 4 were castrated and actively immunized against BSA. The BSA conjugate was emulsified in Freund's incomplete adjuvant and diethylaminoethyl-dextran. The primary immunization was given at 13 weeks of age (WOA), with booster immunizations given at 16, 19, and 23 WOA. Body weight and plasma samples were collected weekly beginning at 11 WOA. Treatments did not affect BW during the experimental period. Titers were significantly increased in animals immunized against cGnRH-II and lGnRH-III ($P < 0.01$). Cross-reactivity of the antisera to mammalian GnRH or between cGnRH-II and lGnRH-III was minimal. At 26 WOA, pigs ($n = 3/\text{trt}$) were randomly selected, and serum samples were collected at 10 min intervals for 10 h. Concentrations of LH ($P < 0.01$), FSH ($P = 0.137$), and FSH pulse frequency and amplitude ($P < 0.10$) appeared to be differentially regulated in immunized animals. At the end of the experiment, intact pigs were exsanguinated. Testes were immediately removed; Leydig cells were isolated and treated with 0, 1, or 10 ng/ml of LH. There was a LH x GnRH treatment effect on testosterone concentrations ($P < 0.01$), indicating that Leydig cells were sensitive to the immunization protocol and LH doses. Taken together, these data suggest that gonadotropin secretion is differentially regulated in pigs immunized against GnRH isoforms. Additionally, immunization against cGnRH-II and lGnRH-III significantly reduced the ability of Leydig cells to respond to LH challenges.

Key Words: GnRH, LH, FSH

415 Application of glycerol as an optical clearing agent to enhance photonic transference and detection of *Salmonella typhimurium* through pig skin. K. Moulton^{*1}, F. Lovell¹, E. Williams¹, P. Ryan¹, A. Karsi¹, M. Lawrence¹, D. Lay², E. Jansen³, and S. Willard¹, ¹Mississippi State University, Mississippi State, ²USDA-ARS Livestock Behavior Research Unit, West Lafayette, IN, ³Vanderbilt University, Nashville, TN.

The objective of this investigation was to evaluate glycerol (GLY) and GLY+DMSO (dimethyl sulfoxide) as agents to optically clear pig skin and increase photonic transference and detection of photon emitting *Salmonella typhimurium* (*S. typh*-lux; transformed with plasmid pAKnlux1), in a laboratory model for *Salmonella* detection in swine. Shoulder pig skin obtained after harvest and hair removal was further processed to remove the subcutaneous fat, and skin measured for thickness. A 96-well plate containing *S. typh*-lux was imaged for 5 min using a photon counting camera (Berthold/Nightowl) as a control reference. Skin (3 mm thick) was then placed over the plate containing *S. typh*-lux and imaged for 5 min. The skin was then treated with varying ratios

of GLY, DMSO and PBS in a dose- and time-dependent manner and the plate imaged again for 5 min. The percent of photonic emissions (skin / no skin control x 100 was calculated and used for statistical analysis ($n=8$). Treatment for 4 h with 50% GLY-PBS and 50:30:20% GLY:DMSO:PBS increased ($P < 0.05$) photonic emissions ($4.9 \pm 0.8\%$ and $6.5 \pm 0.9\%$, respectively) compared to untreated skin ($0.24 \pm 0.05\%$), 100% PBS ($0.20 \pm 0.03\%$) or 30:70% DMSO:PBS ($0.50 \pm 0.08\%$). Altering the ratios of DMSO (10, 20, 30, 40, and 50%) in the presence of 50% GLY demonstrated that DMSO at 20 and 40% ($13.8 \pm 1.2\%$ and $14.4 \pm 1.1\%$, respectively) increased ($P < 0.05$) photonic emissions compared to 10% DMSO ($10.8 \pm 1.3\%$) and 50% GLY:PBS alone (10.4 ± 1.0). Treatment of skin with 50% GLY and 50:30% GLY:DMSO did not differ ($P > 0.10$) in photonic emissions at 30 min, 1, 2, 4, or 8 h post-treatment; and both treatment groups exhibited greater ($P < 0.05$) photonic emissions than no treatment, DMSO alone, or PBS at 2, 4, and 8 h. These data indicate that GLY and GLY+DMSO may be used as effective optical clearing agents on pig skin when treated for 4 or 8 h to allow for an increased detection of emitted photons from *S. typh*-lux through the skin. [USDA-NRI grant # 2003-35201-13841; USDA-ARS funded Biophotonic Initiative # 58-6402-3-0120]

Key Words: Biophotonics, *Salmonella*, Glycerol

416 Factors affecting days open and days to first breeding in Iranian Holsteins. A. Heravi Moussavi^{*1}, M. Danesh Mesgaran¹, and R. Noorbakhsh², ¹Ferdowsi University, Mashhad, Khorasan, Iran, ²Institute of Standards and Industrial Research, Mashhad, Khorasan, Iran.

Effects of several factors on days open (DO) and days to first breeding (DFB) in Iranian Holstein cows were evaluated. Data covered 10 years from 1994 to 2003. The period of evaluation was from 40 to 180 d after calving. After editing, the data set had 6000 and 6500 cows for days open and days to first breeding, respectively. Data were analyzed by mixed models. The model included lactation number, calving season, calving year, first 100 d cumulative milk production, sex of calf and postpartum health situation. The result showed that DO and DFB were impacted by year ($P < 0.001$). While DO (109.5 ± 6.9 vs. 114.4 ± 6.9 d, respectively for years 1994 to 1998 and 1999 to 2003) was increased ($P < 0.001$), DFB (75.6 ± 3.5 vs. 70.7 ± 3.6 d, respectively for years 1994 to 1998 and 1999 to 2003) was decreased during the recent years ($P < 0.001$). First 100 d cumulative milk yield (2904 ± 38 , 3050 ± 33 , 3162 ± 33 , 3217 ± 33 , 3132 ± 34 , 3346 ± 32 , 3427 ± 34 , 3487 ± 35 , 3244 ± 35 , 3472 ± 35 kg, respectively for years 1994 to 2003) was different among the years ($P < 0.001$) and had impact on DO ($r = 0.08$; $P = 0.018$) and DFB ($r = -0.02$; $P < 0.001$). DO was not affected by season but DFB (75.8 ± 1.3 , 67.0 ± 1.4 , 72.7 ± 1.4 and 79.1 ± 1.5 d, respectively for spring, summer, autumn and winter) was affected by season ($P < 0.001$). DO and DFB were increased due to metabolic and/or reproductive disorders ($P < 0.001$). Sex of calf had no effect on DFB but impacted DO as cows with male calves had greater ($P < 0.01$) DO than cows with female calves (103.1 ± 1.4 and 98.7 ± 1.4 d, respectively). DFB (75.4 ± 3.6 , 68.9 ± 3.5 , 70.6 ± 3.5 , 71.3 ± 3.6 , 75.7 ± 3.7 , 75.5 ± 3.7 , 78.8 ± 3.7 d, respectively for lactation number from 1 to 7 and higher) was impacted by lactation number ($P < 0.001$). DO was similar among different lactation numbers. In conclusion, DO was affected by year, postpartum disease, sex of calf, and milk yield, whereas DFB was affected by year, season, postpartum disease, lactation number and milk yield.

Key Words: Reproductive Efficiency, Days Open, Days to First Breeding

Production, Management and the Environment: Nutrition, Management, and Environment

417 Assessment of dairy farm management practices through internet connections. G. Licitra^{*1,2}, J. D. Ferguson³, G. Azzaro¹, M. Caccamo¹, and A. Cappa⁴, ¹CoRFiLaC, Regione Siciliana, Ragusa, Italy, ²D.A.C.P.A., University of Catania, Catania, Italy, ³University of Pennsylvania, Kennett Square, ⁴APA, Vicenza, Italy.

A major challenge in the dairy industry is transfer of information and technol-

ogy to dairy farms. Extension systems have been reduced in size due to costs to maintain extensive systems. This reduces the ability to deliver technical assistance to many local dairy farms. The internet provides an opportunity to integrate farm records on health, reproduction, production, and costs. In addition digital video and photos can be used to form a visual data base of cows and farm facilities. Experts can then visit the farm virtually and have access to data to help troubleshoot and evaluate farm management. The system can be used to

support, educate and train local service providers and dairy farm managers. In addition video imaging could provide diagnostic support for potential high risk diseases such as foot and mouth disease where reduction in movement of people and animals is critical to control measures. This project will describe the components of a web based system developed by CoRFiLaC in collaboration with APA in Vicenza, Italy. In brief the system incorporates records on cow production, reproduction, and genetics from the herd record system, ration specification from CPM DAIRY^R, forage analysis and their automatic insertion in the feedbank used by CPM DAIRY^R, health records for each cow (input from the producer), milk laboratory information, microbiology data on milk cultures, cost of production spreadsheet, and video images of cows and facilities. Data can be accessed through password protected portals by the producer and identified consultants.

Key Words: Management, Records, Dairy Cattle

418 Evaluation of models to predict phosphorus (P) excretion of dairy cattle fed a range of P concentrations during different stages of the dry period and lactation. Z. H. Myers and D. K. Beede*, *Michigan State University, East Lansing.*

Objective was to evaluate published models to predict P excretion using data from a new set of balance trials with 73 pregnant, non-lactating nulli- and multiparous Holstein animals, and 140 lactating primi- and multiparous Holstein cows at 97, 183 and 294 average DIM, with different cows at each stage. Three datasets were constructed: full dataset (FD) with all animals, lactating cow dataset (LD), and non-lactating animal dataset (ND). Dietary P% was 0.19, 0.28, and 0.38 for non-lactating animals and 0.27, 0.36, 0.42, 0.46, and 0.52 for lactating cows. Total range in P excretion in FD was 12.1 to 108.7 g/animal per d. Eight published models were evaluated from accuracy, bias, and precision using the new datasets. Excretion of P was most appropriately predicted by Model 1: (g/d) = (intake P - milk P, g/d); and, Model 2: (g/d) = 0.741 x (intake P - milk P, g/d) + 5.92. In contrast, the least appropriate model was that of the ASAE Standards (1996). To further evaluate Model 1 measured P excretion from the new datasets was regressed on the difference of intake P - milk P. New P excretion model for FD was: (g/d) = 1.19 ± 0.059 x (intake P - milk P, g/d) + (1.43 ± 2.670, g/d); linear (P < 0.01; R² = 0.68); y-intercept was different from zero (P < 0.05), but slope was not different from one (P > 0.05). New P excretion model for LD was: (g/d) = 1.22 ± 0.055 x (intake P - milk P, g/d) - (2.11 ± 2.747, g/d); linear (P < 0.01; R² = 0.80); y-intercept of regression equation was not different from zero (P > 0.05), but slope was different from one (P < 0.05). New P excretion prediction for ND was: (g/d) = 1.26 ± 0.160 x (intake P - milk P, g/d) + (2.05 ± 6.148, g/d); linear (P < 0.01; R² = 0.46); y-intercept was not different from zero and slope was not different from one (P > 0.05). These models should be evaluated for accuracy, precision, and bias with other independent datasets.

Key Words: P Excretion, Dairy Cows

419 Effect of stall surface on the prevalence and severity of hock lesions in dairy cows housed in free stall barns. M. I. Endres, L. A. Espejo*, and J. A. Salfer, *University of Minnesota, St. Paul.*

A total of 5,538 cows in 50 randomly selected dairy farms in Minnesota were scored for hock lesions using a standardized scoring system in a scale of 0 to 3 with 0 = no signs of hair loss or swelling on either hock region (no lesion), 1 = evidence of hair loss (mild lesion), 2 = one or more swollen hocks but no evidence of hair loss (moderate to severe lesion), 3 = one or more swollen hocks with evidence of hair loss (severe lesion). Free stall surface was either deep-bedded sand or rubber-filled mattresses. Thirty-four percent of the dairies used sand and 66% used mattresses. In each dairy, cows in one or more high producing pens were scored. On the average, 90% of cows in each group were scored. Number of cows per group varied from 34 to 304 with an average group size of 118. Number of milking cows in each herd varied from 104 to 1,250 with an average milking herd size of 423 cows. Lactation number, days in milk, and milk production per cow in the scored group averaged 2.6, 169.7 days, and 38.6

kg/d, respectively. Fifty-eight percent of the cows scored had hock lesions. Stall surface affected (P ≤ 0.001) the prevalence of hock lesions with 29.4% of cows in sand barns having lesions compared to 71.3% of cows in mattress barns. Severity of lesions was also greater (P ≤ 0.001) for cows in mattress herds than cows in sand herds. For the statistical analysis of severity of lesions, scores 2 and 3 were combined. In mattress herds, the percent of cows with hock lesion score of 1 was 57.2% and 2 or 3 was 14.1%. In sand herds, the percent of cows with hock lesion score of 1 was 27.6% and 2 or 3 was 1.8%. The effect of lactation number (age) and DIM (stage of lactation) on the prevalence and severity of hock lesions was also investigated. Both prevalence and severity increased with age and DIM (P ≤ 0.05). There was no relationship (P ≥ 0.05) between daily milk production and either prevalence or severity of lesions. In conclusion, the prevalence and severity of hock lesions were greater on dairy farms using mattress stalls than on dairy farms using sand-bedded stalls.

Key Words: Hock Lesion, Stall Surface, Dairy Cows

420 Effects of winter feeding systems on cow performance, feeding site soil nutrients and pasture growth. H. Lardner*¹, P. Jungnitsch², J. Schoenau², and T. Highmoor¹, ¹Western Beef Development Centre, Saskatoon, Saskatchewan, Canada, ²University of Saskatchewan, Saskatoon, Saskatchewan, Canada.

An experiment was conducted to determine the effect of winter feeding systems on beef cow performance, feed site soil nitrogen (N) and phosphorous (P) levels and pasture production (DMY) the following summer. The study site was a Russian wild ryegrass (*Psathyrostachys juncea*) pasture situated on an Orthic Black soil. Crossbred pregnant beef cows (n = 96) (range 594 to 663 kg) were allocated to one of three replicate (n = 2) wintering systems. Feeding systems included (1) field bale grazing (BG), round straw + grass-legume hay bales fed *ad libitum* every 3 d; (2) field bale process feeding (BP), round straw + grass-legume hay bales processed and windrow fed *ad libitum* every 3 d; and (3) drylot feeding (DF), round straw + barley greenfeed bales processed bunk fed in drylot daily. Cows were weighed at start, every 30 d and end of feed period. Body condition scores [(5-point scale (1 = thin, 5 = fat)] were taken at start and end of each feeding period. Fresh (FM) and composted (CM) manure from the DF system was fall applied on replicated (n = 4) plot areas. In the spring, 15 cm soil samples (n = 20) were taken from each feeding site, manure treatment and control (CO) area. DMY was estimated by sampling (n = 45) feeding site, manure treatment and control areas using 0.25 m² quadrats. Cow body weight (P = 0.56) and condition (P = 0.17) over 2 yr was not affected by feeding systems. While soil N levels were similar between CO, FM and CM sites, N levels were higher (P < 0.05) on both BG and BP sites (127 and 181 kg ha⁻¹, respectively). Phosphorous was lower (P < 0.05) on BG and FM sites (24.1 and 23.5 kg ha⁻¹, respectively) compared to CO area (28.4 kg ha⁻¹). Pasture DMY was greater (P < 0.05) from the BP and BG sites (6990 and 5506 kg ha⁻¹, respectively) than from the FM, CM or CO sites measured the following summer. Results indicate that benefits from nutrients deposited on feeding sites can be managed to increase pasture fertility and production.

Key Words: Winter Feeding System, Soil Nutrients, Pasture Yield

421 Effects of feeding varying concentrations of dry distillers grains with solubles to finishing steers on performance and odorant emissions. C. Benson*, K. Tjardes, and C. Wright, *South Dakota State University, Brookings.*

Distillers grains are becoming more prevalent as a feedstuff, with dried distillers grains plus solubles (DDGS) being the predominant form. This trial was designed to determine if feeding increasing concentrations of DDGS affects finishing steer performance and odor emissions. One hundred ninety-nine steers (wt = 386 ± 8 kg) were blocked by source, stratified by weight, and allotted to 16 dirt floor pens (14.7 m x 34.7 m). The pens were then randomly assigned to one of four dietary treatments. The control diet (CON) contained 82% cracked corn, 10% alfalfa hay, 4% molasses, 3.2% supplement, and 0.8% urea. In the

remaining three diets, all of the urea and some of the cracked corn was removed and replaced with DDGS at 15% (D15), 25% (D25), and 35% (D35) of the diet DM. The diets were balanced to provide similar levels of CP for CON and D15 (13.2 and 13.3% CP, respectively) and a stepwise increase in CP for D25 and D35 (15.4 and 17.6%, respectively). Weights were recorded prior to feeding on d 0 and 105, and every intermediate 28 d. Over the entire trial, DMI was greater ($P < 0.05$) for D25 compared to all other treatments (10.77, 10.94, 11.25, and 10.91 kg/d for CON, D15, D25, and D35, respectively). There were no differences in final weight between treatments, but D35 steers tended to have a higher dressing percent ($P < 0.10$), which resulted in D35 having greater carcass weights ($P < 0.05$; 358.9, 362.8, 359.5, and 375.2 kg for CON, D15, D25, and D35, respectively). No differences were detected between treatments for marbling, backfat, ribeye area, or yield grade. Air samples were collected via wind tunnel at 3 locations per pen over a 3-d period prior to animal introduction and on d 78-80. Hydrogen sulfide levels were greatest ($P < 0.05$) in pens containing cattle consuming the D35 treatment compared pens with cattle consuming the remaining treatments. Odor was analyzed using dynamic, triangular, forced choice olfactometry. No differences in odor characteristics were detected between treatments.

Key Words: Distillers Grains, Hydrogen Sulfide, Odor

422 Factors influencing ammonia emissions from beef cattle feedlots using forced-air wind tunnels. D. Sherwood*, G. Erickson, T. Klopfenstein, and D. Schulte, *University of Nebraska*.

Ammonia emissions transport N into the air, but the factors that slow down or speed up this transport and actual emission amounts for beef feedlots are not well known. Open chamber wind tunnels were used to measure ammonia emissions from the surface of 12 open feedlot pens during two feeding trials where N mass balance was conducted evaluating diets. No diet effects were observed and will not be presented. The pens were identical between the two trials having the same treatment and number of animals. Ammonia emissions were measured weekly during the last six weeks of each feeding period (March 25 - April 29, 2004 and July 23 - August 27, 2004 from 9 AM to approximately 2 PM) using wind tunnels and a .2 M sulfuric acid trap for 30 minutes in each pen. The total volume of the wind tunnel is 0.064 m³ with air flow of 0.024 m³/s. One inch core samples were taken from the feedlot surface at all four corners of the tunnel to be analyzed for pH, N concentration and DM. At the beginning of each 30 minute measurement a surface temperature and soil temperature taken 2 inches below the surface were recorded. N loss averaged 42.5 g/d/steer across the spring and summer collection periods. In the spring period, N loss averaged 28.6 g/d/steer with pen surface samples averaging 3.85% N, 74.7% DM and 19.5° C. In the summer sampling period, N loss averaged 56.5 g/d/steer with pen surface averaging 4.8% N, 78.6% DM and 25.0° C. Combining all sampling periods, N loss was significantly correlated with N concentration on the pen surface ($r = 0.25$, $P < 0.01$), and soil temperature ($r = 0.20$, $P < 0.02$). No correlation was observed between N loss and pH. Ammonia losses were variable but may be related to N in manure and temperature as observed with N mass balance techniques.

Key Words: Ammonia, Cattle Feedlot, Emissions

423 Assessment of strategies to reduce ammonia, methane, and nitrous oxide emissions from gestating and lactating sows. C. Piñeiro*, G. Montalvo², and M. Bigeriego³, ¹*PigCHAMP Pro Europa, S.A., Segovia, Spain*, ²*Tragsega, S.A., Madrid, Spain*, ³*Spanish Ministry of Agriculture, Fisheries and Food, Spain*.

During the last decade, the approach to environmental issues related to animal production is changing, including concepts such as emissions to soil, water and air and proper use of energy and water. Latest regulations have been developed under this concept such as the Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control in intensive pig and poultry production. The objective of the directive is to achieve a high level of protec-

tion of the environment as a whole. In the EU Reference Document on Best Available Techniques (BAT) for Intensive Rearing of Poultry and Pigs (BREF) several techniques are proposed for emissions abatement. The Spanish Ministry of Agriculture, Fisheries and Food has implemented a three years plan to evaluate the BAT proposed by the European Commission under Spanish conditions. In these studies, two BAT candidates for gestating sows (weekly slurry removal and manure channel reduction) and one for lactating sows (board on a sloped in the pit) were compared with the BREF reference system (monthly slurry removal and underlying deep collection). The concentration of NH₃, CH₄, and N₂O in the air, and the ventilation rates were semi-continuously measured with an Innova 1312 infrared photo-acoustic system (SIR, S.A., Tres Cantos, Madrid, Spain). In gestating buildings, frequent slurry removal reduced ($P < 0.001$) the average CH₄ and N₂O emissions by 19% and 83%, respectively. However, the average NH₃ emissions increased by 15% ($P < 0.001$) due to the picks of ammonia concentration in the emptied. Manure channel reduction abated ($P < 0.001$) the average NH₃, CH₄, and N₂O emissions by 49%, 28%, and 68%, respectively. In lactating sows, the implementation of a slope in the pit reduced ($P < 0.001$) the average NH₃, CH₄, and N₂O emissions by 32%, 65%, and 43%, respectively. In conclusion, BAT proposed in the BREF for gestating and lactating sows were shown to be effective under Spanish practical conditions.

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Key Words: Gas Emissions, Sows, Best Available Techniques

424 Improving estimates of enteric methane emissions from cattle in Canada. K. Ominski*, D. Boadi, and K. Wittenberg, *University of Manitoba, Winnipeg, Manitoba, Canada*.

Currently, Canadian inventories of methane (CH₄) emissions from enteric fermentation in livestock are estimated using the International Panel on Climatic Change (IPCC) Tier-1 methodology (T1M) which calculates CH₄ emissions for each animal category by multiplying the animal population by the average emissions factor for a given category (IPCC 1997). This methodology is limited as factors such weight, age, gender, and feeding system are assumed similar within each category. Further, it does not include regional differences in animal genetics or feeding/management strategies. According to IPCC (2000), countries that employ IPCC Tier-2 methodology (T2M), which accounts for the above parameters, can improve emission estimates. The objective of this study was to estimate CH₄ emissions of cattle in Canada using IPCC T2M. Estimates were then compared with IPCC T1M and data from Canadian research studies (CRS). Cattle population data was obtained from Statistics Canada to characterize cattle into eight categories for each province. Information regarding cattle performance and feeding practices were obtained from scientific literature and survey data. Calculated CH₄ emissions for 2001 were 173,030.4 t yr⁻¹ (3.6 Mt CO₂ eq) and 763,852.0 t yr⁻¹ (16.0 Mt CO₂ eq) for Canadian dairy and beef cattle, respectively. Tier-1 emission factors (kg CH₄ yr⁻¹) were 6.4 to 25.3% lower than those obtained using T2M. Further, the Tier-2 emission factors were 7.6 to 30.7% lower than values published by CRS. This study suggests that use of T2M reduces some of the uncertainties associated with T1M, however, a discrepancy exists between these values and those reported by CRS. There is a need to further measure methane emissions in production scenarios characteristic of those used in Canada. In addition, further characterization of the Canadian cattle population, and the associated feeding/management strategies are required, on a regular basis, to account for changes in management practices that occur as a consequence of economic viability.

Key Words: Enteric Emissions, Tier-1 Methodology, Tier-2 Methodology

425 Effects of ractopamine on growth performance and carcass characteristics of feedlot steers differing in biological type. S. L. Gruber*¹, J. D. Tatum¹, T. E. Engle¹, M. A. Mitchell¹, S. B. Laudert², A. L. Schroeder², and W. J. Platter², ¹*Colorado State University, Ft. Collins*, ²*Elanco Animal Health, Greenfield, IN*.

Effects of ractopamine hydrochloride (RAC) supplementation on growth performance and carcass characteristics of feedlot steers differing in biological

type (TYPE) were investigated using British, Continental crossbred, and Brahman crossbred calf-fed steers ($n = 420$). Steers were weighed at re-implantation and sorted into seven weight blocks, each block consisting of two pens (ten steers per pen) per TYPE. Pens within a block \times TYPE subclass were randomly assigned to one of two RAC treatments ($0 \text{ mg}\cdot\text{hd}^{-1}\cdot\text{d}^{-1}$ vs. $200 \text{ mg}\cdot\text{hd}^{-1}\cdot\text{d}^{-1}$) fed during the final 28 days of the finishing period. The TYPE \times RAC interaction did not affect ($P > 0.05$) any of the growth performance and carcass traits evaluated in this study. Feeding RAC improved ($P < 0.001$) ADG (1.50 vs. $1.73 \pm 0.03 \text{ kg}$) and G:F (0.142 vs. 0.167 ± 0.003), but did not impact ($P > 0.05$) DMI of steers. Dressing percentage, adjusted fat thickness, KPH fat percentage, and yield grade were not affected by RAC supplementation. Carcasses of steers fed RAC had heavier ($P < 0.05$) hot carcass weights (359 vs. $365 \pm 1.4 \text{ kg}$), larger ($P < 0.05$) LM areas (81.9 vs. $83.9 \pm 0.71 \text{ cm}^2$), and tended ($P = 0.07$) to have lower mean marbling scores (Slight⁸⁷ vs. Slight⁷⁷ ± 3.5) than carcasses of control steers. Brahman crossbred cattle had the lowest DMI and produced carcasses that were the lightest and had the lowest mean marbling score ($P < 0.05$). British cattle produced carcasses with the highest ($P < 0.05$) mean marbling score. Continental crossbred steers had the heaviest live weights, highest dressing percentages, and produced the heaviest carcasses with the largest LM areas ($P < 0.05$). Results from this study suggest that, despite inherent differences in growth performance and carcass characteristics of steers differing in biological type, diverse biological types would be expected to respond similarly to supplementation of ractopamine hydrochloride at $200 \text{ mg}\cdot\text{hd}^{-1}\cdot\text{d}^{-1}$.

Key Words: Beef, Ractopamine, Breed

426 Effects of ractopamine hydrochloride (Optaflexx) on feedlot heifers. M. Quinn*, J. Drouillard, E. Loe, B. Depenbusch, A. Webb, and M. Corrigan, *Kansas State University, Manhattan*.

An experiment was conducted to determine the effects of ractopamine HCl (Optaflexx) on live performance, carcass quality, and meat characteristics when fed to heifers ($n = 302$, $479 \pm 3 \text{ kg}$ initial BW) during the final 28 days of feedlot finishing. Heifers were fed diets (dry basis) consisting of steam flaked corn (79.6%), ground alfalfa hay (6%), corn steep liquor (6.2%), dry supplement (6%), and a premix (2.2%) that provided 300 mg monensin, 90 mg tylosin, and 0.5 mg melengesterol acetate per heifer daily. Cattle were blocked by weight and assigned to dirt surfaced pens (12 to 13 heifers/pen, 12 pens/treatment). Treatments consisted of 0 or 200 mg per heifer daily of ractopamine HCl. After finishing, heifers were shipped to a commercial abattoir and carcass data were collected following a 24-h chill. Loins were obtained from three animals randomly selected from each pen for determination of Warner-Bratzler shear force values, fatty acid profile, weight loss during cooking, purge loss during retail display, and L*, a*, and b* color measurements. Average daily gain and DMI for the Optaflexx and control cattle were not different ($P > 0.17$), but heifers fed Optaflexx tended ($P = 0.06$) to be more efficient (G:F = 0.183 and 0.167 for Optaflexx and Control groups, respectively). Live weight gain for the Optaflexx heifers was 56.8 kg compared to 54.1 kg during the 28-d period ($P = 0.09$). Treatments did not differ with respect to slaughter weight, hot carcass weight, dressing percent, longissimus muscle area, fat thickness, marbling score, USDA yield grade, or USDA quality grade ($P > 0.19$). Warner-Bratzler shear force values, weight loss during cooking, purge loss during retail display, and fatty acid profiles were similar for the two treatments ($P > 0.2$). Feeding Optaflexx to finishing heifers resulted in modest improvements in live weight gain and gain efficiency, but did not affect carcass characteristics or meat quality.

Key Words: Ractopamine, Heifers, Finishing

Ruminant Nutrition: Dairy—Fiber and Digestion

427 Validation of propionate challenge test methodology. B. J. Bradford*, A. D. O'Toole, A. S. Nash, and M. S. Allen, *Michigan State University, East Lansing*.

Two experiments were designed to validate methods used to investigate physiological responses to propionate during propionate challenge tests (PCT). In experiment 1, the dose-reponse to jugular propionate infusion was assessed in a duplicated 4×4 Latin square experiment with 8 lactating dairy cows. Sodium propionate (4.5 M, pH 7.4) was infused in an intrajugular bolus at 0 (saline), 50, 100, or 150 mg/kg bodyweight, and jugular blood was sampled over the following 2 hours. Data for both experiments were analyzed by mixed effects models using autoregressive covariance structures for repeated measures. Peak propionate concentration increased quadratically at an increasing rate as propionate dose increased, while area under the curve (AUC) for plasma glucose increased linearly with increasing propionate dose. Plasma NEFA concentration was elevated by all propionate treatments at 20 and 30 min post-infusion ($P < 0.05$), which may have been caused by a stress response; infusion of 150 mg/kg propionate tended to increase plasma norepinephrine concentration by 53% ($P = 0.09$) relative to pre-infusion values. Experiment 2 was designed to study the impact of short-term fasting on responses to propionate infusion. Eight lactating dairy cows were included in a duplicated 4×4 Latin square design with a 2×2 factorial arrangement of treatments. Sodium propionate (100 mg/kg bodyweight) or saline was infused either prior to feeding (900) or 2 h after feeding (1300). Fed cows consumed $4.4 \pm 1.4 \text{ kg DM}$ prior to the PCT. While fed cows had significantly higher plasma propionate concentration, fed state did not influence post-infusion changes in plasma propionate, glucose, insulin, glucagon, or NEFA concentrations. Liver glycogen concentration decreased significantly after propionate, but not saline, infusion ($P < 0.001$). Short-term differences in fed state do not significantly alter physiological responses to PCT. However, insulin and glucagon release following jugular administration of pro-

propionate are likely super-physiological, and post-infusion lipolysis suggests that stress responses may alter PCT measurements.

Key Words: Propionate Challenge, Dairy Cow, Stress

428 Effects of dietary forage and non-fiber carbohydrate content on B-vitamin intake, duodenal flow, and apparent synthesis in dairy cows. E. Schwab*¹, R. Shaver¹, C. Girard³, C. Schwab², D. Putnam⁴, and N. Whitehouse², ¹University of Wisconsin, Madison, ²University New Hampshire, Durham, ³Dairy and Swine R&D Center, AAC, QC, Canada, ⁴Balchem Encapsulates, New Hampton, NY.

Eight Holstein cows fitted with ruminal and duodenal cannulae were used in a replicated 4×4 Latin square design with a 2×2 factorial treatment arrangement to evaluate effects of dietary forage (F) and NFC concentrations on intake, duodenal flow, and apparent synthesis (AS) of B-vitamins in lactating cows. Each square contained two multiparous and two primiparous cows and periods were 21 d in length. Diets with 35 or 60% (DM basis) F (corn silage, alfalfa hay, and grass hay) were formulated to contain 30 or 40% NFC (DM basis). Dietary concentrates were composed of varying proportions of ground shelled corn, rolled barley, soybean hulls, beet pulp, soybean meal, blood meal, Smartamine-M®, minerals, and vitamins. B-vitamin AS was estimated as the difference between duodenal vitamin flow and vitamin intake. This estimate does not account for potential microbial use or destruction, or ruminal absorption of the vitamins. Increased dietary F increased riboflavin intake and decreased DMI, niacin intake and flow, and biotin intake. Increased dietary NFC increased DMI, niacin AS, and biotin flow and decreased niacin intake. For biotin AS, negative least square means and a SEM of about 75% of means averaged across diets indicate that ruminal microbial synthesis of biotin is minimal and highly variable.