

Production, Management and the Environment II

T330 Influence of egg holding time on hatchability of Hubbard broiler eggs. Modupe Orunmuyi*¹ and Chidiebere Livinus Akanwa², ¹Federal University, Oye-Ekiti, Ikole-Ekiti, Ekiti State, Nigeria, ²Ahmadu Bello University, Zaria, Kaduna State, Nigeria.

In a study to determine the influence of egg storage time on hatchability in Zaria, northern guinea savannah of Nigeria, 1,634 Hubbard broiler breeder eggs stored for 1 to 7 d at 16°C were set in 8 batches when the birds were 42–49 weeks of age to determine the maximum egg holding time. Birds were raised on deep litter at a mating ratio of 1 rooster to 6 hens in a pedigree hatching involving 12 sire families. Data collected were subjected to ANOVA (GLM PROCEDURE) using SAS 2008. There were significant ($P < 0.05$) differences in all parameters studied namely; set weight, transfer weight, fertility%, hatchability of all eggs set (%hatch), hatchability of fertile eggs (% hatchability) and chick weight except egg weight at collection. Average initial egg weight before storage ranged from 68.08 to 69.57g. The range of values for set weight, transfer weight, %fertility, %hatch, %hatchability and chick weight at hatch were 64.88–68.08g, 55.19–58.87g, 54.63–70.92%, 26.50–39.81%, 41.58–62.92% and 41.13–44.77% respectively. Set weight was highest at 1 d storage and lowest at 7 d storage. Transfer weights were similar from 1 d to 5 and were different from d 6 and 7. Although fertility % was lowest for 1 d storage, it was not significantly different from d 3 and 7. Percentage hatch was lowest for 7 d storage (26.50%) while % hatchability was highest for 1 d storage (62.92%). Chick weight at hatch was similar on all days except d 4. Fertility % was lowest (54.63 ± 0.06%) for eggs stored for 7 d. Eggs meant for hatching may not be stored for more than 5 d in this environment.

Key Words: Hubbard broiler, egg storage, hatchability

T331 Performance of dual-purpose cows supplemented with two sources of energy in subtropical conditions. Isela Salvador-Loreto¹, Benito Albarran-Portillo*¹, Fernando Vicente-Mainar², Isela G. Salas-Reyes¹, Carlos M. Arriaga-Jordan¹, and Julieta G. Estrada-Flores¹, ¹Universidad Autonoma del Estado de Mexico, Toluca, Mexico, Mexico, ²Servicio Regional de Investigación y Desarrollo Agroalimentario, Villaviciosa, Asturias, España.

The aim of this study was to assess the performance of lactating dual purpose cows (milk and calves), supplemented with 2 sources of energy: molasses (Mo) or ground corn (Gc) during the dry season under subtropical conditions in Mexico. In the subtropical regions of Mexico, during the dry season there is a lack of quality and quantity of fodders to support lactating cows and their suckling calves under grazing systems. Therefore, farmers supplement their cows to maintain milk production and calves weight gain. Supplements are based on cracked corn, cob and husk (CCH), soybean meal and urea (70 g/cow/d). The CCH processing method reduced ruminal starch digestibility, limiting the potential energy cows could obtain from the supplement. Treatments (TX) consisted of molasses or ground corn at 6% inclusion in CCH supplement (5 kg of DM cow/d). Response variables were recorded every 2 weeks, considered as experimental periods (EP). Milk, milk components, body weight, calves weight and body condition score, were subjected to a mixed model procedure from SAS 9.0 for a complete randomized experimental design. Cow was defined as a random effect. There were no significant differences among response variables due to TX (milk yield 7.1 vs 7.0 kg/cow/d, molasses and ground corn TX, respectively), but there were differences ($P < 0.05$) for EP on milk yields which increased

by the end of the experiment with milk yields of 6.5 and 8.6 (kg/cow/d, EP 1 and 5, respectively). There were no differences on animal response variables when molasses or ground corn at 6% inclusion were added to supplements as an extra source of energy.

Key Words: supplement, molasses, ground corn

T332 Evaluation of the feedlot performance, carcass yield, and production costs of finishing beef cattle supplemented with β -agonists. Silvia Larios-Cueto, Gilberto Aranda-Osorio*, Rodolfo Ramirez-Valverde, Hermilo Suarez-Dominguez, and Jose M. Monzon-Armenta, Universidad Autonoma Chapingo, Chapingo, Texcoco, Mexico.

The objective of this study was to evaluate the effect of β -agonists (zilpaterol and ractopamine hydrochloride) supplementation on finishing beef cattle performance and carcass quality. These agonists are approved in Mexico. There were used 507 commercial crossbred (*Bos taurus* × *Bos indicus*) young bulls, initially weighing 446.3 ± 9.0 kg, from the tropical region (Veracruz State), and allotted to 3 pens (19 each) of the Experimental Feedlot Facility of the University of Chapingo (Mexico State a temperate region), each pen was randomly assigned to the following treatments: 1) Control (no supplement added), 2) Ractopamine (0.91 mg/kg of body weight (BW) per day) and 3) Zilpaterol (0.15 mg/kg of BW per day). All animals received the same finishing diet, which has the following calculated nutritional composition: 14.48% CP; 1.79 and 1.16 Mcal/kg of NEm and NEg, respectively, 11.16% CF, and 2.2 Ca:P. At the moment that cattle arrived to the feedlot they received a prophylactic management (identified, weighed, vaccinated, dewormed, vitaminized and implanted). The β -agonists were supplemented at least 35 d at the end of the finishing period. The variables evaluated were: dry matter intake (DMI), average daily gain (ADG), feed:gain (F:G), gain:feed (G:F), hot carcass yield (HCY), trimmed carcass fat (TCF) and benefit/cost (B/C) ratio. Data were analyzed under a completely randomized design with the GLM procedure of SAS, and to compare means the Tukey Test was performed. The only variable that was not statistically analyzed was DMI because it was calculated collectively. Cattle performed very similarly and no differences ($P > 0.05$) were found among treatments, the mean values being 11.88 kg/animal per day for DMI, 1.80 kg for ADG, 7.35 kg for F:G, 143 g/kg for G:F, 57.7% for HCY and 2.2% for TCF. Although, the B/C ratio was better for ractopamine treatment (1.13 vs. 1.05 for control and zilpaterol, respectively). Under the conditions of this study, the supplementation of β -agonists (ractopamine or zilpaterol hydrochloride) during the finishing period of young bulls showed a tendency to increase animal performance and carcass traits, but only ractopamine demonstrated to be profitable.

Key Words: bullock, ractopamine, zilpaterol

T333 Physiological responses in Santa Ines ewes submitted to stressful conditions of management. Monalisa de Melo Stradiotto*^{1,2}, Alice Deléo Rodrigues^{1,2}, and João Alberto Negrão^{1,2}, ¹University of Sao Paulo–USP, Pirassumunga, SP, Brazil, ²University of Sao Paulo State–UNESP, Jaboticabal, SP, Brazil.

Literature data suggest that although there is a great variability of stress responses, animals maintain a pattern of response to different stressful factors. In this context, the objective of this experiment was to verify the different physiological responses of Santa Ines ewes to management

conditions considered stressful to the animals. For that, 50 Santa Ines ewes were submitted to 3 different impositions of stress (1: weaning, 2: first milking, 3: change of milker). Cortisol levels of experimental ewes were monitored along lactation and after weaning, 60 d after birth. Plasma samples were collected through jugular puncture in 5 times at -20 min (20 min before the stressful stimulus), 0 min (at the moment of the stressful stimulus) and 60, 120 and 300 min after the stimulus. Hormonal analyses were done using immunoenzymatic kits with readings at 450nm in ELISA equipment at the Laboratory of Animal Physiology of FZEA/USP. Hormonal levels were analyzed in subdivided parcels, which means as repeated measures in time, through MIXED procedure. Means were compared by Tukey test with a significance level of 0.05. For the change of milker stimulus, it were observed greater values in cortisol levels in 0, 60 and 120 min after stress imposition ($31.557 \text{ ng/mL} \pm 26.153$; $30.106 \text{ ng/mL} \pm 18.138$ and $23.989 \text{ ng/mL} \pm 15.982$, respectively; $P = 0.0069$), statistically different from the other times of measurement. In the stress of the first milking, it were observed greater values of cortisol levels 60 min after milking ($48.274 \text{ ng/mL} \pm 60.07$; $P = 0.001$) and almost 5 h later, the basal levels were reestablished. Therefore, the pattern of cortisol release in the first milking and weaning differed where in the last, it remained elevated until 300min after stress imposition ($40.334 \text{ ng/mL} \pm 59.971$), showing that this type of stress can influence the productive life of Santa Ines ewes.

Key Words: cortisol, milking, stress

T334 Goal structure and reasons for selecting a goat enterprise by US meat goat producers. Narayan P. Nyaupane*², Jeffrey M. Gillespie¹, and Kenneth W. McMillin¹, ¹Louisiana State University, Agricultural Center, Baton Rouge, LA, ²The Samuel Roberts Noble Foundation Inc., Ardmore, OK.

The US meat goat industry has expanded rapidly in recent years; however, the US continues to rely on goat meat imports due to a rise in demand associated with increased immigration. US meat goat industry leaders need to know the current direction and drivers of production so that necessary measures can be taken for establishing a sustainable and competitive industry. We seek to determine US meat goat producers' goal structure and their perceived reasons of farming. Survey data from 584 US meat goat producers was used for this study. Using the fuzzy pair-wise comparison method, the hierarchy of 7 major goals that a meat goat producer could have were determined and ordinary least squares regressions were conducted to analyze the factors affecting producer goal structure. To determine the producer's reasons of farming, the following question was asked with a list of 14 possible reasons in a 5 point Likert-scale: "To what extent do you agree or disagree that your selection of a goat enterprise as opposed to other agricultural enterprises is because of the following reasons"? Ordered probit regressions were conducted for factors affecting reasons of farming. Results show that *Maximize Profit* was the primary goal of US meat goat producers with the mean score of 0.51, followed by *Have Family Involved in Agriculture* (0.50), *Avoid Years of Loss/Low Profit* (0.49) and *Have Time for Other Activities* (0.48), *Increase Net Worth* (0.46), *Control Weeds/Vegetation* (0.40), and *Increase Farm Size* (0.33). Means of producer agreements showed that the most frequently cited reasons for producers selecting goat enterprise were: *I enjoy working with goats* (4.59), *goat production fits well into my land management plan* (4.30), *I can raise goats on a relatively small acreage* (4.25), and *goat grazing preferences are different from other species* (4.17). Regression results show that producer demographics, farm characteristics, regional variables, and other economic indicators affect producer goal structure and enterprise selection.

Key Words: goat, goal structure, reasons for farming

T336 The production performance of egg layers in different rearing systems. Bilgehan Yılmaz Dikmen*, Aydin Ipek, Ümrân Sahan, and Arda Sözcü, *Department of Animal Science, Faculty of Agriculture, University of Uludağ Bursa, Turkey.*

Today alternative rearing systems for caged hen egg production has gained importance. The objective of this study was to determine the production performance of laying hens kept in different rearing systems (conventional, enriched cages and free-range system). A total of 480 egg layer strain (*Lohmann Brown*) were weighed and randomly allocated into 3 rearing system ($n = 160$, 4 replicates of 40 hen per group) as conventional cage, enriched cage and free range pen at 17 wk of age. The 3 rearing systems were located on a single farm and experienced identical seasonal temperature fluctuations and photoperiod (16L:8D). Feed and water were given ad libitum until 66 wk of age. Live weight was measured at the beginning and at the end of the study. Egg production as hen day, number of damaged eggs, dirty eggs and mortality were monitored daily. Feed intake and egg weight were recorded on weekly basis. The data were analyzed with using ANOVA, and significant means were separated using Duncan Multiple Range Test. The final live weight of hens were found similar in conventional and enriched cage system (1.95 vs. 1.94 ± 0.03 kg, respectively), but was higher in free-range system (2.09 ± 0.02 kg; $P < 0.001$). The earliest 5% egg production age was found in enriched cage system (138.3 ± 1.75 d; $P < 0.05$). The latest 50% egg production age was found in free-range system (159.25 ± 1.75 d; $P < 0.01$). The highest mean egg production ratio was found in free range rearing system ($89.27 \pm 0.87\%$; $P < 0.05$). The egg mass was higher in free-range system, but was similar in conventional and enriched cage systems (59.76 , 56.80 vs. 56.66 ± 0.34 g/d/hen, respectively; $P < 0.001$). The feed intake was found to be higher in free-range system, but similar between conventional and enriched cage systems (124.58 , 117.06 and 118.06 ± 0.56 g/d/hen, respectively; $P < 0.001$). The damaged egg ratio was low but dirty egg ratio was higher in free-range systems ($0.35 \pm 0.07\%$ vs. $3.30 \pm 0.15\%$, respectively; $P < 0.001$). The mortality ratio was higher in enriched cage system (6.25% ; $P < 0.05$). It was concluded that free-range system has a positive effect on egg production and egg weight, but feed intake and dirty egg ratio were higher than the caged system.

Key Words: rearing system, egg production, egg layer

T337 Effect of a single dose of injectable trace minerals on measurements of performance, innate and humoral immune responses of beef heifers. Luana S. Caramalac*¹, Philippe Moriel², Luis F. A. Artioli², and John D. Arthington³, ¹Mato Grosso do Sul State University, Aquidauana, MS, Brazil, ²North Carolina State University, Waynesville, NC, ³University of Florida, Ona, FL.

Injectable trace minerals (ITM) administered simultaneously to novel antigens of porcine red blood cells (PRBC) affects trace mineral status, innate and humoral immune responses of weaned beef heifers. Angus heifers ($n = 22$; 234 ± 39 kg of BW; 225 ± 19 d of age) were stratified by BW and age, and randomly assigned to receive a 2.5-mL s.c. injection of sterile saline (SAL; 0.9% NaCl), ITM (MultiMin 90; Multimin USA, Inc. Fort Collins, CO; 60, 10, 15 and 5 mg/mL of Zn, Mn, Cu and Se), or a squalene-based oil-in-water adjuvant (ADJ; AddaVax; InvivoGen, Inc. San Diego, CA) that promotes humoral immune response. Thereafter (d 0), heifers were immunologically challenged with a 10-mL i.m. injection of PRBC solution (25% PRBC; 75% sterile PBS), allocated to drylot pens (2 pens/treatment) and limit-fed a fescue hay-based diet at 2.2% of BW for 28 d. Shrunken BW was recorded on d 0 and 28, blood samples collected on d 0, 3, 7, 15, 21 and 28, and liver samples collected on d 14. Body weight on d 28 (263 , 262 and 258 ± 19 kg) and mean

ADG (0.81, 0.98 and 0.96 ± 0.180 kg/d for SAL, MM and ADJ heifers) did not differ among treatments ($P \geq 0.72$). But, treatment effects were detected ($P \leq 0.05$) for concentrations of liver Se, plasma ceruloplasmin (Cp) and serum PRBC titers. Liver Se was greater for MM vs. ADJ and SAL heifers (2.21, 1.36 and 1.45 ± 0.177 mg/kg, respectively), whereas plasma Cp was greater for ADJ vs. SAL (26 vs. 20 ± 1.6 mg/dL; $P = 0.02$), and intermediate for ITM heifers (23 ± 1.6 mg/dL; $P \geq 0.17$). Likewise, serum PRBC titers were greater for ADJ vs. SAL (1.6 vs. 0.7 ± 0.28 log 2 base; $P = 0.02$), and intermediate for ITM heifers (1.1 ± 0.28 log 2 base; $P \geq 0.13$). Treatment x time effect was detected for plasma haptoglobin (Hp) concentrations ($P < 0.0001$), which did not differ from d 0 to 28 ($P \geq 0.18$), but were greater for ADJ vs. SAL and ITM heifers on d 3 (0.71 , 0.05 and 0.07 ± 0.032 mg/mL). Hence, although injectable trace mineral injection enhanced liver Se concentrations, the magnitude of the innate and humoral immune responses to novel antigen were less compared with a water-in-oil adjuvant.

Key Words: trace minerals, heifer, humoral

T338 Pre-weaning injections of bovine somatotropin enhanced post-weaning growth performance and puberty attainment of beef heifers.

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Effects of injections of bovine somatotropin (bST) to suckling beef heifers on pre- and post-weaning growth performance and puberty achievement. Angus x Brangus heifers ($n = 30$; BW = 140 ± 20 kg; age = 132 ± 15 d) were stratified by BW and age, and randomly assigned to receive s.c. injections of saline (SAL; 5 mL; 0.9% saline) or half-dose of bST (250 mg of sometribove zinc; Posilac, Elanco, Greenfield, IN) on d 0, 14 and 28 (15 heifers/treatment). Then, cow-calf pairs were grazed on 4 bahiagrass pastures (7 to 8 pairs/pasture) from d 0 until weaning (d 126). Unshrunk BW and blood samples were collected on d 0, 14, 28 and 126. From d 126 to 350, heifers were grazed on bahiagrass pastures (1 pasture/treatment) and fed blackstrap molasses-based concentrate at 1.1% BW (DM basis). Unshrunk post-weaning BW was obtained every 28 d, and blood samples every 10 d to determine plasma progesterone (P4) concentrations. Heifers were considered pubertal when 2 consecutive plasma samples had $P4 \geq 1.5$ ng/mL. During the pre-weaning phase, bST injections increased ADG from d 0 to 42 (1.2 vs. 1.1 ± 0.04 kg/d; $P = 0.03$), but not ADG from d 42 to 126 or weaning BW (0.89 vs. 0.84 ± 0.028 kg/d and 266 vs. 261 ± 7 kg; $P \geq 0.28$). Also, bST injections increased pre-weaning mean plasma IGF-1 (97 vs. 85 ± 3.7 ng/mL; $P = 0.02$), and tended to decrease plasma leptin on d 42 (5.2 vs. 5.9 ± 0.24 ng/mL; $P = 0.06$). Pre-weaning bST injections increased post-weaning mean ADG and BW on d 350 (0.30 vs. 0.22 ± 0.02 kg/d and 329 vs. 311 ± 3 kg; $P < 0.01$), tended to increase overall puberty achievement (49 vs. $30 \pm 6.9\%$ of total heifers; $P = 0.06$) and decrease age at puberty (402 vs. 435 ± 13 d; $P = 0.08$), but did not affect BW at puberty (287 vs. 288 ± 7 kg; $P = 0.95$). Hence, 3 half-dose injections of bST administered to suckling beef heifers at 14-d intervals, between 132 and 160 d of age, did not affect body weight at weaning or puberty, but enhanced post-weaning ADG, tended to increase puberty attainment and decrease age at puberty.

Key Words: somatotropin, heifer, puberty

T340 Modeling and simulation for beef cattle stocker-finishing systems analysis.

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The purpose of this study was to present a management model for stocker-finishing cattle systems through modeling and simulation results from intervening the different levels of intensification, serving as a Decision Support System (DSS) for ranchers. Model was developed and operated in Microsoft Excel spreadsheets, with data collected in the field and literature reviews. The system allows to individually manipulated the animal feeding in the herd throughout the production cycle. This approach will measure the results quantitatively, through the existing stocking rate, and qualitative, through the daily weight gain from each diet administered to animals. DDS spreadsheets support the individual management for up to 500 animals in a period of analysis of maximum 53 mo. The model is operated in a single spreadsheet, divided into 3 components: Feeding Systems; Animal Performance; and Summary & Economic Analysis, being all levels interconnected. Model validation was simulated based on the Pasture-Based System (PBS) within 2 situations: Pasture/Feedlot-Based System for Finishing Cattle (FBSF) and Pasture/Feedlot-Based System for Stocker Cattle (FBSS). There was an increase in productivity for FBSF and FBSS (321 and 314 kg/hectare/year, respectively) and a decrease in slaughter age (21 and 23 mo, respectively) compared with PBS, 274 kg/hectare/year and 26 mo ($P < 0.05$). In the economic analysis, PBS (119.23 US\$) showed higher annual gross margin per hectare, followed by FBSF (79.65 US\$) and FBSS (57.25 US\$) ($P < 0.05$). The model provides an overview of integrated management, showing major results during herd's feeding, purchase and selling prices, and animal performance of stocker-finishing systems in beef cattle production. The intensification observed in our study decreases the economic return in the evaluated system. Intensification is not indicated regarding biological and economic parameters used in this simulation. Scenario studies simulating purchase and selling prices, costs and another management interventions are necessary to better support the decision making process.

Key Words: intervention assessment, decision-making, beef-cattle production

T341 Performance and profitability on beef cattle in intensive tropical pasture in Amazon biome.

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To avoid deforestation in the Amazon rainforest is necessary to increase productivity and profitability in beef cattle. So the aim of this study was to evaluate economic efficiency and productivity of 5 intensive pasture systems (IPS) on beef cattle production in Mato Grosso, Amazon biome, January 2013 to December 2014, part of the Livestock Low Carbon Integrated Project-ICV. Production and economic data were collected using control software (Prodap Professional GP) and analyzed by electronic spreadsheets (Microsoft Excel). The total of IPS was 177.7 ha (ha) and 1,877 cattle. The average of pasture was 35.5 ha/farm and 125 animals/IPS. The IPS was established with *Panicum maximum* 'Mombaça', with limestone, potassium chloride, triple phosphate and urea as soil analysis. During the rainy season were placed urea according stocking rate. The systems was developed exclusively on a grazing system with a base herd comprised of Zebu (Nelore) and crossbred *Bos taurus* x *Bos*

indicus cattle. The zootechnical and economic indexes were compared in 3 periods, April–September 2013, October–2013 to March 2014, April–September 2013, by Duncan test, besides Person correlations, with significance level of 5%. During rainy season, October–2013 to March 2014, stocking rates (5.15 animals/ha), live weight/ha (1,553 kg), body weight produced (404 kg/ha) and total operating costs (US\$ 248.18/ha) were higher than other periods ($P < 0.05$). There was no statistical difference to net margin of 155.49 US\$/ha ($P > 0.05$). High correlations were found (0.76) between body weight produced (kg/ha) and total operating costs (US\$/ha) ($P < 0.05$). High correlations were found (0.898) between body weight produced (kg/ha) and net margin (US\$/ha) ($P < 0.05$) indicating that higher productivity is related to higher net margin, despite the higher cost per area. The period had influence on production of beef cattle and on costs in intensive pasture system, but the net margin indicated that the activity of beef cattle in Amazon biome can be profitable and had high correlation with animal production.

Key Words: cost, productivity, sustainability

T342 Carcass quality of grain-finished first-calf heifers. Jose A. Arce*¹, Shawn L. Archibeque¹, Jason K. Ahola¹, Richard K. Peel¹, Dale R. Woerner¹, Jack C. Whittier², and George E. Seidel³, ¹Department of Animal Sciences, Colorado State University, Fort Collins, CO ²Department of Animal Science and Panhandle Research and Extension Center, University of Nebraska, Scottsbluff, NE, ³Department of Biomedical Sciences, Colorado State University, Fort Collins, CO.

Single-calf beef production systems require harvesting females after early weaning their first calf; these systems reduce the share of energy destined for maintenance of adult cows. However, pregnancy hormones accelerate bone ossification, which may negatively affect carcass value. The objective of this study was to evaluate preliminary data on estimated lean maturity (LE), bone maturity (BM), overall maturity (OM), marbling (MA) and Warner Bratzler shear force (WBSF) of carcasses from primiparous females approximately 30 mo of age. A set of 53 Angus-based yearling heifers (BW = 352 ± 38.9 kg) were synchronized and inseminated with sexed semen to calve at approximately 24 mo of age; calves were early weaned at 106 ± 21 d postpartum. First calf heifers (n = 42) were taken to a feedlot to be fed acclimating, set up, and finishing diets for 6, 22, and 60 d, respectively. Diets were 12.7, 13.8 and 12.5% CP; and 0.84, 1.15 and 1.39 Mcal·kg⁻¹ NEg, respectively. At harvest, carcasses were scored for LE and BM to estimate OM in which A, B and C maturities corresponded to scores of 100, 200 and 300, respectively. Also MA was evaluated (slight = 300, small = 400, modest = 500 and moderate = 600) and a LM sample was removed for WBSF measurement. Given the large decrease in quality grade with OM ≥ 300 and that according to approximate age few heifers were supposed to fall into that category, carcasses were sorted by OM as <300 or ≥300, and the resulting means for LE, BM, MA and WBSF were compared with a *t*-test. Means ± SD for the 64% of carcasses classified as < 300 OM were: 170 ± 14 LE, 248 ± 29 BM 220 ± 15 OM, 470 ± 80 MA and 4.87 ± 1.10 kg WBSF. Remaining carcasses were classified as ≥ 300 OM with 169 ± 15 LE, 342 ± 37 BM, 301 ± 3 OM, 485 ± 70 MA and 4.98 ± 0.64 kg WBSF. No differences were detected between the 2 maturity groups for LE ($P = 0.76$), MA ($P = 0.53$) or WBSF ($P = 0.67$); meanwhile significant differences were found for BM and OM ($P < 0.001$). Therefore, differences in ossification did not affect characteristics related to meat palatability of carcasses of previously pregnant heifers slaughtered at about 30 months of age.

Key Words: bone ossification, carcass maturity, shear force

T343 Occurrence of mycotoxins in corn samples collected in the United States in 2014. Simone Schaumberger*¹, Paula Kovalsky¹, Michael Sulyok², and Ursula Hofstetter¹, ¹Biomim Holding GmbH, Herzogenburg, Austria, ²University of Natural Resources and Life Sciences, Department IFA Tulln, Vienna, Austria.

Mycotoxin occurrence in agricultural commodities is a worldwide phenomenon and poses a risk to human and animal health. A mycotoxin survey was conducted to raise awareness of the incidence of mycotoxins in cereals intended for animal feed. The focus of this study is to compare the extent of mycotoxin contamination in corn samples from 27 states in the United States in 2014. During harvest 507 corn samples were collected and analyzed for aflatoxins (Afla), zearalenone (ZEN), deoxynivalenol (DON), fumonisins (FUM), T-2 toxin (T-2) and ochratoxin A (OTA). Samples were analyzed using liquid chromatography-tandem mass spectrometry, high performance liquid chromatography and enzyme-linked immunosorbent assay. In total, 87% of samples tested were positive for the major mycotoxins mentioned above and out of those 36% were co-contaminated with more than one mycotoxin. The most frequently occurring mycotoxin was DON with a prevalence of 62% and an average value of 1,441 ppb. DON concentrations exceeding the respective FDA threshold (1,000 ppb; 8%) could be predominantly found in samples deriving from several northern states, California and Florida. FUM occurred in 55% of all samples tested with average value of 4,512 ppb. The FDA threshold for FUM (5,000 ppb) was exceeded in 4% of the samples. Afla and ZEN were detected in about 20% of the samples with average contamination levels of 35 and 484 ppb, respectively. Compared with the other mycotoxins, prevalence of T-2 toxin was low (13%), whereas OTA was not detected at all. Our results demonstrate a significant mycotoxin contamination of US corn harvested in 2014. Overall, the most frequently occurring mycotoxin was DON. FUM ranked second among the 6 mycotoxins analyzed. Owing to the fact that both DON and FUM have the potential to cause subclinical health effects in animals even at comparably low levels in feed (Antonissen et al., 2014), these 2 mycotoxins can be regarded as relevant threat for US livestock productivity. Occurrence of more than one mycotoxin was observed in around one third of the samples. Hence, due to potential additive and synergistic effects, special attention should be paid to co-occurrence of mycotoxins in animal feed (Grenier and Oswald, 2011).

Key Words: mycotoxin, survey, corn

T344 Antibiotic resistance gene abundance in feces of calves fed pirlimycin-containing whole milk. Tiffany Casteel*, Heather Littier, Partha Ray, Amy Pruden, and Katharine Knowlton, Virginia Tech, Blacksburg, VA.

Non-saleable (waste) milk containing antibiotics is commonly fed to dairy calves. Effects of ingestion of antibiotics at an early age on the gut microbiome and the development of antibiotic resistance genes (ARG) in the naïve gut are unknown. Pirlimycin, a lincosamide active against gram-positive bacteria, is commonly used as mastitis therapy. Lincosamides are considered highly important in human medicine, with applications in *S. aureus* and *C. difficile* infections. Resistance to pirlimycin is emerging and is of concern for both animal and human health. The objective was to determine the effect of early antibiotic exposure on the abundance of ARG in feces of milk-fed calves. Eight female Holstein calves were assigned to pasteurized whole milk (control; n = 4) or milk containing 0.2 mg/L of pirlimycin (treatment; n = 4). Calves were enrolled after receiving 2 colostrum feedings, were blocked by age, and paired by block. Calves were fed 5.68 L of pasteurized whole milk, treatment or control, divided into 2 daily feedings, from d 1 to d 50 of age. After weaning at the age of 50 d, calves were fed *ad libitum*

non-medicated starter grain. Fecal samples were collected weekly until 85 d of age and freeze-dried. DNA was extracted from all samples using QiaAmp Fast DNA Stool Mini Kit and qPCR was used to quantify the abundance (gene copies/g of wet feces) of *TetW* and 16S rRNA. Data were analyzed using PROC GLIMMIX in SAS. Differences were declared significant at $P < 0.10$, and trends at $P < 0.15$. Abundance of 16S rRNA was not different between control and pirlimycin-fed calves (mean = 9.81 log gene copies/g wet feces). Abundance of *TetW* tended to be higher (9.51 log gene copies/g wet feces; $P = 0.13$) in pirlimycin-fed calves compared with control calves. The relative abundance of *TetW* (0.49 gene copies/16S rRNA) in feces of calves was not influenced by treatment. Feeding pirlimycin-containing non-saleable milk to growing calves may increase environmental loading of *TetW*. Additional research is needed on effects on other ARG and on the post-excretion fate of these genes following application of manure from calves fed waste milk.

Key Words: antibiotic resistance, waste milk, dairy calf

T345 Endocrine profiles during early gestation are affected by breed: Suffolk versus Cheviot dams. Ana Meikle*¹, Milena Sequeira¹, L. M. Fermin², Sarah Pain², Paul Kenyon², and H. T. Blair², ¹Veterinary Faculty, Montevideo, Uruguay, ²University of Massey, New Zealand.

Previous studies have shown that Cheviot embryos are shorter than Suffolk embryos at d 19 of gestation, even when uterine capacity is not a limiting factor for embryo growth, evidence of the role the maternal uterine environment plays in embryo development. We determined if there were differences in the circulating concentrations of progesterone (P4), IGF-1, insulin and adiponectin between Cheviot and Suffolk dams during early gestation. Ewes (Cheviot, n = 8 and Suffolk, n = 6; 58.6 vs. 78.2 kg live weight, $P < 0.05$, with no differences in body condition score) were inseminated (d 0) laparoscopically with fresh semen from rams of the same breed. Blood samples were taken from the ewes every other day from d 0 to 21. Hormone concentrations were analyzed by repeated measures including using the fixed effects of maternal breed, day of sampling and their interaction; the covariance structure was first-order autoregressive AR(1), and for P4 concentrations the number of corpora lutea was used as a covariable. Cheviot dams had a higher P4 concentration than Suffolk dams from d 6 to 21 of pregnancy (6.82 ± 0.31 vs. 5.84 ± 0.33 ng/mL, $P < 0.05$) and P4 was also affected by ovulation rate ($P < 0.001$) as animals presenting with 2 corpora lutea had greater P4 than those with a single ovulation. No effect of ovulation rate was found for the rest of the hormones. Insulin concentrations were also greater in Cheviot dams compared with Suffolk dams (27.0 ± 2.0 vs. 20.4 ± 2.3 μ UI/mL, $P < 0.05$), while IGF-1 concentrations did not differ among breeds. Suffolk ewes tended to present greater adiponectin concentrations than Cheviot ewes (4.4 ± 1.0 vs. 2.1 ± 0.8 ng/mL, $P = 0.099$). The greater P4 concentration found in Cheviot dams is consistent with their higher insulin concentration, as insulin stimulates granulosa cell P4 production. The opposite profile was found for adiponectin concentration, with the higher levels found in Suffolk dams potentially associated with adiponectin inhibition of insulin-induced progesterone secretion by granulosa cells, as has been found in other species. The differences in hormone concentrations according to breed could explain the distinct embryo growth found during early gestation.

Key Words: sheep, gestation, hormone

T346 Gene expression in the kidneys of broilers fed dietary ochratoxin A for different time periods. C. P. Zeferino*¹, K. D. Wells¹, A. S. A. M. T. Moura², G. E. Rottinghaus¹, and D. R.

Ledoux¹, ¹University of Missouri, Columbia, MO, ²São Paulo State University, Botucatu, São Paulo, Brazil.

Consumption of ochratoxin A (OTA) contaminated diets results in economic losses to the poultry industry. The objective of the current study was to evaluate the effects of quantity and time of exposure to dietary OTA on performance, organ weights, serum biochemistry, and gene expression in the kidneys of chicks. One hundred eighty day-old male broiler chicks (Ross 308) were randomly assigned to a 3×3 factorial arrangement of treatments (3 levels of OTA: 0, 1 and 2 mg OTA/kg diet and 3 time periods: 7, 14 and 21 d) with 4 replicate pens of 5 birds each per treatment. Birds fed 2 mg OTA/kg diet had decreased feed intake, body weight gain and increased serum uric acid levels at 14 and 21 d, and also poorer feed conversion and increased relative kidney weight. Birds fed 1 mg OTA/kg diet had decreased serum total protein. At 21 d, birds fed 1 mg OTA/kg diet had decreased albumin, and aspartate aminotransferase concentrations. For RNA-Sequencing analysis (RNA-Seq), kidney samples were collected weekly from 3 controls and 3 chicks fed 1 mg OTA/kg. NextGENe software was used for read alignment and transcript quantification. Reads per kilobase of target per million tiled reads (RPKM) were used in the Student's *t* test ($P < 0.05$, fold change > 2). A total of 27,638,976 50-bp RNA-Seq reads were produced over the 3 time periods. Transcripts (40,782) were assembled de novo and annotated by homology to either *G. gallus* or *H. sapiens*. Genes associated with carbohydrate and amino acid metabolism were downregulated and genes associated with the immune system were upregulated at 7 and 14 d. Genes associated with lipid metabolism and xenobiotics biodegradation and metabolism were also downregulated at 14 d. These metabolic changes disappeared at 21 d, suggesting that damage to the kidney and other related organs was repaired or the damage was contained. In conclusion, the decreased performance and increased kidney weight and serum uric acid levels in birds fed 2 mg OTA/kg confirmed the nephrotoxic effects of OTA. The supplementation of 1 mg OTA/kg diet caused time-dependent alterations in renal gene expression in chicks.

Key Words: chicken, mycotoxin, RNA-sequencing

T347 Maintenance energy requirements of gestating beef cows and effects on cow reproduction and performance of calves. Brit H. Boehmer* and Robert P. Wettemann, Oklahoma Agricultural Experiment Station, Stillwater, OK.

Spring calving, Angus cows were used to evaluate the repeatability of maintenance energy requirements (MR) during subsequent gestations, and the effects of MR on reproduction in cows and performance of calves. A total of 62 cows (5 to 11 yr of age, 150 ± 2 d of gestation) were individually fed a complete diet to meet MR (Model 1, NRC 1996) during 1 or more yr. Body weights were obtained twice weekly and daily feed intake was adjusted every 2 wk until constant BW was achieved for 30 d (regression analyses). Cows were classified by MR as low (L; < 0.5 SD less than yearly mean), moderate (M; ± 0.5 SD of mean) or high (H; > 0.5 SD more than mean). Cows (n = 26) were selected for repeatability analyses when MR was determined on 2 sequential years. The influence of MR on metabolic body weight, DMI, and pregnancy rate of cows and WW and ADG of calves was determined by ANOVA (PROC MIXED; SAS Inst. Inc.). Repeatability of individual cow MR in sequential years was determined using Pearson correlations with year in the model (PROC CORR; SAS). Pregnancy rate was analyzed by Chi-squared test (PROC FREQ; SAS). Mean MR of cows was 88.79 ± 0.89 kcal/kg BW^{0.75}/d. Mean yearly difference between cows with the greatest and least MR was 26.9%. Year influenced MR of cows ($P < 0.001$) but cow age did not affect MR ($P = 0.99$). Maintenance

energy requirement of cows was repeatable ($r = 0.30$, $P = 0.02$) between sequential years. Repeatability of MR was determined when cows were fed to maintain a constant body weight rather than estimates of MR. Metabolic body weight at maintenance was greater in L cows ($P = 0.01$; $117.1 \pm 1.1 \text{ kg}^{0.75}$) compared with H cows ($111.8 \pm 1.1 \text{ kg}^{0.75}$) and M cows tended to be intermediate ($P < 0.09$; $114.45 \pm 1.1 \text{ kg}^{0.75}$). At maintenance, DMI was greater in H cows ($P < 0.001$) compared with M and L cows. Subsequent pregnancy rate of cows conceiving to AI was not influenced by MR ($P = 0.11$). Maintenance energy requirement of cows did not influence performance of calves before weaning ($P = 0.92$). Production efficiency of beef cows may be improved by identifying cows that require less energy input and maintain performance.

Key Words: beef cow, maintenance, cow-calf performance

T348 Activation and deactivation of renal genes of chicken associated with induced ochratoxicosis at different exposure times.

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This study investigated the expression of genes that were turned on or off in renal cells of chicks as a result of different exposure times to ochratoxin A (OTA). One hundred and 80 d-old male broiler chicks (Ross 308) were randomly assigned to a 3×3 factorial arrangement of treatments (3 levels of OTA: 0, 1 and 2 mg OTA/kg diet and 3 time periods: 7, 14 and 21 d) with 4 replicate pens of 5 birds each per treatment. For RNA-Sequencing analysis (RNA-Seq), kidney samples were collected weekly from 3 controls and 3 chicks fed 1 mg OTA/kg. Birds fed 2 mg OTA/kg diet were not used because their reduced feed intake could affect gene expression. The libraries were constructed by Illumina's TruSeq RNA protocol. NextGENe software was used for alignment and transcript quantification. Reads per kilobase of target per million tiled reads (RPKM) were used in the Binary test analysis ($P < 0.05$). A total of 27,638,976 50-bp RNA-Seq reads were produced over the 3 time periods. Transcripts (40,782) were assembled de novo and annotated by homology to either *G. gallus* or *H. sapiens*. The interleukin 9 (*IL9*) and tubby like protein 1 (*TULP1*) genes were activated at 7 d, the growth hormone secretagogue receptor (*GHSR*) gene was activated at 14 d, and the G protein-coupled receptor kinase 6 (*GRK6*) and glyceraldehyde-3-phosphate dehydrogenase (*GAPDH*) genes were activated at 21 d. The preprogastrin (*LOC396365*) was activated during all time periods. The sperm associated antigen 4 (*SPAG4*), sperm-associated antigen 4 protein-like (*LOC100857131*) and V-region-like B-G antigen, and MHC class IV antigen (*B-G*) were deactivated at 7 d, the zinc finger B-box domain-containing protein 1-like (*LOC771469*), NK2 homeobox 1, variant 2, and NK2 homeobox 8 (*NKX2-1* and *NKX2-8*), forkhead box O1 (*FOXO1*), myosin heavy chain (*MyHC*) and claudin 18 (*CLDN18*) genes were deactivated at 14 d and finally, the V-region-like B-G antigen (*B-G*) and xeroderma pigmentosum, complementation group C (*XPC*) genes were deactivated at 21 d. The turning on and off of the genes may be a response to the carcinogenic and tumorigenic effects of OTA in birds.

Key Words: broiler, nephrocarcinogenicity, ochratoxin A

T349 Evaluation of models for predicting acidosis risk of barley grain in finishing beef cattle.

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A model to predict acidotic risk of barley grain was developed from a batch culture consisting of 50 barley samples varying in bulk density (BD), processing method (standard vs. precision processing: sieving grains into large versus small kernels and rolling based on kernel size), processing index (BD after rolling/BD before rolling), processing (ground vs. dry-rolled), geographical and agronomic origin. The objective of this study was to develop a model that can predict the relative 'hotness' of individual barley samples. Of all the independent variables (pH, starch content, dry matter disappearance (DMD), neutral detergent fiber, acid detergent fiber, in vitro gas kinetics, total and molar proportions of individual short-chain fatty acids at different incubation times) considered, dry matter disappearance at 6 h of incubation (DMD6) accounted for 90.5% of the variation in acidosis index with a root mean square error (RMSE) of 4.46%. When the new model ($-0.7826 + 2.5536 \times \text{DMD6}$) was applied to 3 independent data sets to predict acidosis, it accounted for 33.4, 90.9 and 25.6% of the variation in calculated acidosis index. Significant ($P < 0.01$) mean bias was evident in 2 of the data sets and it under-predicted acidosis index by 26.1 and 5.35%. There were marked similarities in the acidosis index ranking of barley samples by the models as shown by the result of a correlation analysis between calculated and predicted acidosis index ($R^2 = 0.67$, $P < 0.01$). We observed variations in the acidosis index ranking of samples that were processed differently (processing index of 75 versus 85% and precision processing versus control). Results suggest that our model which is based on DMD6 has the potential to predict acidosis risk and can rank different barley samples based on their acidotic risk; however, the model would benefit from further refinement.

Key Words: acidosis, barley, prediction

T350 Influence of growth-promoting implants on endocrine factors and efficiency of replacement beef heifers.

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Anabolic steroid implants are commonly used in the beef industry to increase BW gain in feedyard cattle. However, there are a limited number of implants approved for use in replacement heifers. Objectives were to use growth-promoting implants to add value to low-BW heifers, and to determine the relationships among hormones and cow efficiency. Charolais \times Balancer heifers ($n = 65$; $179 \pm 30 \text{ kg}$; $255 \pm 12 \text{ d}$ of age) were used to determine the influence of androgenic and/or estrogenic implants on serum concentrations of insulin-like growth factor-I (IGF-I), prolactin (PRL), cortisol (CORT), and reproduction. Heifers were blocked by BW and assigned to 1 of 4 implant treatment groups: 1) control, no implant (CON; $n = 16$); 2) trenbolone acetate (TBA; 200 mg of TBA; $n = 15$); 3) trenbolone acetate plus estradiol (TBA+E2; 40 mg TBA and 8 mg E2; $n = 17$); or 4) zeranol (ZER; 36 mg ZER; $n = 17$). Heifers were implanted on d 0, and blood samples collected on d 0 (15 Nov), 106 (1 Mar), and 195 (29 May) of the experiment. Heifers were AI on d 220 and exposed to an Angus bull for 28 d starting 12 d after AI. Calf birth date, and birth weight were recorded. At weaning, dam and calf weights were determined and cow efficiency was calculated by dividing calf adjusted 205 d weight by dam weight at weaning. Treatment did not influence ($P > 0.10$) calving rate (41.5%), Julian calving date ($96.8 \pm 2.5 \text{ d}$), cow efficiency (0.47 ± 0.23), concentrations of IGF-I ($78.4 \pm 3.9 \text{ ng/mL}$), PRL ($83.5 \pm 5.81 \text{ ng/mL}$), CORT ($36.3 \pm 9.9 \text{ ng/mL}$), or PRL:CORT (ratio = 2.19 ± 0.24). Serum PRL and IGF-I increased (P

< 0.01) from d 0 to 195. Serum cortisol increased ($P < 0.01$) from d 0 to 106, and concentrations were similar from d 106 to 195. Multiple regression analyses indicated PRL and IGF-I at d 195 described 30% of variation in adjusted 205 d calf weights; 35% of variation in cow weight at weaning was explained by PRL at d 0 and 106; and PRL:CORT at d 0 and IGF-I at d 195 accounted for 44% of variation in cow efficiency.

Anabolic implants did not affect heifer reproduction. Serum PRL, CORT, and IGF-I of heifers at weaning, yearling, and pre-breeding may serve as biomarkers of cow efficiency.

Key Words: cortisol, IGF-I, prolactin