

crude protein; 4000 kcal kg⁻¹) with increasing levels of BC (0, 5, 10, 15 and 20%) (n=3). Liver and intestine DNA concentrations increased (P≤0.05) between d 30 and 60 indicating a hyperplasia process, but no significant differences (P≥0.05) for RNA concentration in the same period were registered. Liver TP did not differ (P≥0.05) between diets, but decreased (P≤0.05) with time; significant effect of diet and period was observed for intestinal parameters, BC 5% being superior to others

diets. Intestine TP decreased (P≤0.05) between d 30 and 60. Diets did not influence RNA/DNA ratios in both liver and intestine, but decreased (P≤0.05) markedly between 30 and 60 d. Liver and intestine growth was characterized by a major contribution of hyperplasia compared to hypertrophy, as confirmed by linear increases in total DNA and a decrease in RNA/DNA and protein:DNA ratio.

Key Words: Siluriformes, Visceral Tissues, Nucleic Acids

Production, Management & the Environment - Livestock and Poultry I

M273 Effect of ProAgri™ amendment, before and after cleanout, on broiler litter moisture, calcium, nitrogen, and total and soluble phosphorus. N. G. Zimmermann^{*1}, R. Angel¹, and W. Saylor², ¹University of Maryland, College Park, ²University of Delaware, Newark.

Nutrient pollution is a serious problem whenever animal production is concentrated and too little land is available for manure application. A 60 pen broiler experiment was conducted where diet and litter management were used concurrently to reduce nutrient pollution. A single flock (Ross 308) was grown on fresh pine shavings. The experiment was a 3 × 2 × 2 factorial design with unequal replication. Main effects were sex, feeding regimen, and litter amendment. The sex main effect was female, male, or straight run; number of birds per 1.52 × 2.44 m pen was 55, 45, and 50, respectively. Four and six phase diets were the feeding regimen main effect. The litter amendment main effect was ProAgri™ Activator followed by ProAgri™ 8-26-2 sodium silicate solutions sprayed onto litter (2.54 and 0.76 l/m², respectively). Total number of birds was 2880. At the end of the trial samples of litter from each pen, including cake, were collected to measure percent moisture, available water (A_w), N, Ca and total (tP) and soluble P (sP). Furthermore, a subsample of litter was treated with ProAgri™ Activator solution, 1:1(w:v) then ProAgri™ 8-26-2 sodium silicate solution, 2.4:1 (w:v). After oven drying, N, Ca, and tP and sP were measured. Only the effects of the litter amendment are reported here except for main effect interactions. Application of the litter amendment prior to bird placement did not have an effect on percent moisture, A_w, N, Ca, tP, or sP in clean out litter. However, clean out litter treated with the amendment had reduced (P>.05) sP (486 vs 271 mg/g) and N. Furthermore, a significant interaction of litter amendment with diet regimen was observed. The litter amendment reduced (P>.05) sP in litter when diets containing higher levels of tP were fed.

Key Words: Litter Amendment, Phosphorus, Nitrogen

M274 Genotype analysis of *Campylobacter* spp. isolated from various internal organs and unabsorbed yolks of commercial broiler and roaster chickens. K. L. Hiett, R. J. Buhr*, N. A. Cox, L. J. Richardson, P. J. Fedorka-Cray, J. S. Bailey, and J. K. Northcutt, USDA-ARS, Russell Research Center, Athens, GA.

Campylobacter spp. are presently believed to be the leading bacterial etiological agent of acute gastroenteritis in the human population. Evidence implicates poultry as a significant source of the organism for human illness; however, the pathways involved in *Campylobacter* spp. contamination of poultry flocks remain unclear. In an effort to further understand the dissemination of naturally occurring *Campylobacter* spp. through commercial broiler and roaster chickens, *Campylobacter jejuni* isolates previously recovered from the liver/gallbladder, spleen,

ceca, and unabsorbed yolks of broiler and roaster chickens were genotyped using *flagellinA* Short Variable Region (*flaA*-SVR) DNA sequence analysis. All isolates recovered from broilers were of one *flaA*-SVR subtype regardless of the site of recovery. Isolates recovered from roasters comprised two subtypes. The predominant subtype (*flaA*-SVR type 1) contained isolates recovered from all locations tested. Additionally, this same *flaA*-SVR subtype was recovered from both broilers and roasters. This investigation demonstrated that very closely related subtypes of *C. jejuni* were naturally present within the internal organs and unabsorbed yolks of commercial broilers and roasters from different flocks, companies, and breeder strains. Further investigations of these subtypes are needed to understand their involvement in intestinal tract microbiology and the subsequent contamination of the final food product.

Key Words: *Campylobacter*, Genotyping, Tissues

M275 Recovery of naturally occurring *Campylobacter* from the circulating blood of market age commercial broilers. L. J. Richardson¹, N. A. Cox¹, R. J. Buhr^{*1}, and M. A. Harrison², ¹USDA-ARS-PMSRU, Russell Research Center, Athens, GA, ²Department of Food Science and Technology, University of Georgia, Athens.

Campylobacter species have recently been recovered from several primary and secondary lymphoid tissues and internally from the spleen of poultry. The objective of this study was to determine whether naturally occurring *Campylobacter* can be recovered from the circulating blood of market age commercial broilers utilizing aseptic techniques. Broilers (n=100) were acquired from two commercial processing facility's live haul area on 10 separate days. The feathers were removed from the ventral surface of the humerus and alcohol was sprayed on the skin, then Betadine was applied to the area and allowed to sit for 1 min before vena-puncture (brachial vein) with a sterile needle. Five mL of circulating blood was collected and added to 45 mL of Bolton's broth without antibiotics and incubated at 42 C in microaerophilic conditions for 48 h and then streaked onto Campy-Cefex plates. For flocks 9 and 10, direct plating onto aerobic plate count agar was also performed to verify that the skin had been disinfected. Standard laboratory procedures for *Campylobacter* were performed on ceca contents collected from all broilers sampled. *Campylobacter* were not recovered from the blood (0/60) nor the ceca (0/60) from flocks 1-4, 6, or 7. From flocks 5 and 8-10, *Campylobacter* were recovered from the blood (11/40) and the ceca (28/40). From aerobic plate counts performed in flocks 9 and 10, no growth was observed suggesting that the method utilized results in aseptic sampling of the circulating blood. With *Campylobacter* being recovered from the circulating blood, this provides insight to a possible means by which this organism is able to rapidly disseminate to tissues within the bird and suggests that *Campylobacter* is not strictly limited to the

digestive tract. Further research will determine whether *Campylobacter* resides in the blood for prolonged periods of time or if the organism's presence is merely transitory.

Key Words: *Campylobacter*, Blood, Broilers

M276 Effect of a *Lactobacillus* spp-based probiotic culture product on broiler chick performance under commercial conditions. A. D. Wolfenden^{*1}, J. L. Vicente^{1,2}, L. Aviña², A. Torres-Rodriguez³, G. Tellez¹, and B. M. Hargis¹, ¹University of Arkansas, Fayetteville, ²Sigrah Zellet de Mexico S.A. de C.V., Cuernavaca Morelos, Mexico, ³Cobb-Vantress, Siloam Springs, AR.

Concern about antimicrobial resistance has led to increased attention to alternatives for controlling infections and increasing performance in animal production. Probiotics and organic acids have gained attention as options in poultry industry. Our laboratory has been working in the selection of lactic acid bacteria, mainly from the genus *Lactobacillus*, as potential probiotic candidates. Previous data indicates that these selected probiotic bacteria are able to reduce *Salmonella* infection and improve performance in broiler and turkey under experimental and commercial trials in the USA. The selected probiotic organisms were used in field trials to evaluate their efficacy in commercial conditions in Mexico. In the present report, the probiotic culture (n= 6 broiler houses) significantly reduced mortality (P<0.01) compared to 6 control houses (5.87% vs. 6.72%). Also, a consistent, albeit non-significant, improvement of body weight, 2.06% (Control: 2.429 ± 0.157kg vs. Treated: 2.479 ± 0.164kg) and reduction of FCR (3.5%) was observed in the treated flocks. Average daily gain was improved by 1.8% in the treated flocks (50.4 ± 1.98g) compared to the control (49.5 ± 1.88g) with p=0.06. The results of this report suggest that this *Lactobacillus*-based probiotic culture could be useful to reduce mortality and improve performance in commercial poultry farms.

Key Words: *Lactobacillus*, Broiler, Performance

M277 Factors affecting the eggshell thickness on laying hens in Tepatitlan, Jalisco. R. G. Ramirez^{*}, A. J. Zárate, M. G. Alcorta, and J. A. C. Meneses, Universidad Autónoma Chapingo, Texcoco, Estado de México, México.

The eggshell quality is a very important trait in laying hens, due to the losses by broken eggs. The objectives of this research were to evaluate genetic and environmental factors affecting eggshell quality in Leghorn type hens in the Tepatitlan, Jalisco area, and to determine the relationship between Eggshell Thickness (ET) and Eggshell Stiffness (ES). A total of 6,157 eggs of 24 poultry farms were sampled and their eggshell thickness and eggshell stiffness values were measured. The Laying Strain (LS), Laying Age (LA) and Feed Type (FT) were registered for each egg measured. Data analysis included a linear correlation (ET-ES), regression for ET (n=2626) and ES (n=6151) with LA as a covariate of LS, and means tests to determine differences among LS, LA and FT on their ET and ES values. There were differences within Laying strains and Feed Types (P<0.05) for both, ET and ES. Linear correlation coefficient between ET and ES was 0.67 in this research. Means and standard deviation for ET and ES was 0.324 ± 0.0308 mm and 3481 ± 850.9 g/cm² respectively.

Key Words: Eggshell Quality, Strain, Feed

M278 Effects of feeding blends of grains naturally contaminated with Fusarium mycotoxins on performance, hematology and blood chemistry of turkeys. C. K. Girish^{*}, T. K. Smith, H. J. Boermans, and N. A. Karrow, University of Guelph, Guelph, Ontario, Canada.

An experiment was conducted to investigate the effects of feeding blends of grains naturally contaminated with Fusarium mycotoxins on performance, hematology and blood chemistry of turkeys. The efficacy of polymeric glucomannan mycotoxin adsorbent (GMA, Mycosorb[®], Alltech, Inc., Nicholasville, KY) in preventing the adverse effects of Fusarium mycotoxins was also evaluated. Three hundred 1-d-old male turkey poults were fed wheat, corn and soybean meal-based starter (0-3 wk), grower (4-6 wk), developer (7-9 wk), and finisher (10-12 wk) diets formulated with uncontaminated grains, contaminated grains and contaminated grains + 0.2 % GMA. Feeding contaminated grains to turkeys significantly decreased body weight gains during the grower and developer phases. Feeding contaminated grains did not, however, alter feed intake or feed efficiency. GMA supplementation prevented the effects of contaminated grains. The feeding of contaminated grains reduced (p<0.05) total lymphocyte counts at wk 3. Supplementation with GMA increased plasma total protein concentrations compared to controls and birds fed the contaminated diet. Plasma uric acid concentrations in birds fed contaminated grains were increased at the end of the experiment compared to controls and the feeding of GMA prevented this effect. The feeding of contaminated grains for 12 wk increased the relative weights of gizzard and bursa of Fabricius. Dietary supplementation with GMA in contaminated diet prevented the effects on the bursa of Fabricius. It was concluded that turkey performance, some blood parameters and organ weights were affected by feed borne Fusarium mycotoxins, and that GMA prevented many of these effects.

Key Words: Fusarium Mycotoxin, Performance, Hematology

M279 Impacts of raising season and phytase addition to standard and vegetable diets on broilers performance and litter physical characteristics. N. Bergeron^{*1}, A. Ouyed², and M. Lefrançois¹, ¹Université Laval, Québec, Québec, Canada, ²Centre de recherche en sciences animales de Deschambault, Deschambault, Québec, Canada.

Two experiments were conducted in summer and winter, respectively, to assess the effects of phytase (PHY) addition to conventional (CON) and all vegetable (VG) diets on broilers performance and litter physical characteristics as dry matter content. To this end, 3080 Ross × Ross male broilers were allotted to 40 pens in each assay, according to a complete randomized block design with diets (CON vs VG) and PHY (0 vs 100 g/t liquid Natuphos 5000[™]) as main factors. CON diets contained animal fat (Sani-Santé[™]) and meat meal (54.35% CP) which were replaced with micronized soybean in the VG diets. Broilers were submitted to a four phases feeding program respecting the following nutritional specifications for CP (%), ME (kcal/kg), aP (%) and Ca (%) : starter from 0-15 d (21.9; 3039; 0.45; 0.96), grower from 16-21 d (19.9; 3139; 0.40; 0.85), finisher 1 from 22-32 d (17.9; 3193; 0.37; 0.80), and finisher 2 from 33-38 d (16.9; 3216; 0.32; 0.71). Broilers fed the CON diets had greater final body weights when results from both assays were combined (2905 vs 2853 g; P<.01), whereas PHY addition had no effects (2883 vs 2875 g with PHY). Overall feed efficiency (FE) was improved (1.667 vs 1.615; P<.0001) when broilers were fed the VG diets. PHY addition had no effects on FE (1.642 vs 1.641 with PHY). FE was also better (P<.05) in winter (1.631) than

in summer (1.651). Apparent litter density (kg/m^3) was not influenced ($P > .05$) by the dietary treatments (CON/-PHY:350.38; CON/+PHY: 350.24; VG/-PHY: 360.11; VG/+PHY:353.80) but increased ($P < .0001$) in winter (375.56 vs 331.70). In summer, litter dry matter content was higher with CON diets (70.06 vs 64.14%; $P < .0001$) and without added PHY (68.67 vs 65.44%; $P < .01$). CON fed broilers showed better feed efficiency and final body weight than VG fed broilers. VG fed broilers produced a more humid litter in summer only. PHY addition increased litter moisture but did not influence broilers performance. These results suggest that VG diets and dietary phytase addition had significant but limited negative impacts on broilers performance and litter characteristics.

Key Words: Broiler Performance, Phytase Vegetable, Litter

M280 Reduction of emissions from in vitro swine manure using monensin. T. R. Whitehead* and M. A. Cotta, *USDA-ARS-NCAUR, Peoria, IL.*

Storage of swine manure is associated with the generation of malodorous compounds and emissions. These are produced as a result of anaerobic degradation of materials present in manure and include sulfides, methane, organic acids, ammonia, and other volatile compounds. Because odor emission from livestock creates a nuisance and may be regulated, there is considerable interest in devising methods to control these emissions. Previous research in our laboratories has demonstrated that the primary microbial populations in stored swine manure are low (G+C), Gram positive anaerobic bacteria. One approach for reducing emissions production would be to target these populations. Monensin has been used to alter the bacterial population and metabolic end products in the rumen of domestic animals for improved animal performance, largely through its effect on Gram positive bacteria. Therefore, it was decided to test the effects of monensin on stored swine manure. Fecal and manure pit slurry were collected from a local swine production facility. Manure slurry (20% final concentration) was combined with 20% (w/v) feces and buffer and mixed under gas. The mixture was aliquoted into glass bottles under gas. Monensin (10 mM) was added to three bottles, and three bottles without monensin were used as controls. Gas production was measured over time, and aliquots were removed for chemical analyses and determination of viable bacterial numbers. Gas production in the monensin samples was greatly reduced within 24 hr (<10% of controls), and this reduction was maintained over a 28 day test period. Methane production was also reduced (<5% of controls). However, no detectable hydrogen was observed in any sample. Volatile fatty acid production was only slightly decreased in the monensin samples, while butyrate production increased 3 fold. These results are quite different from those observed in the rumen. The results of this study suggest that addition of antimicrobial compounds may prove useful for reducing gaseous, odorous emissions from swine facilities. Evaluation of other microbial inhibitors in addition to monensin appears warranted.

Key Words: Swine, Odor, Manure

M281 The relationship of animal, production, and carcass traits to consumer acceptability of grass-fed steaks. E. L. Steinberg*, J. W. Comerford, and V. H. Baumer, *The Pennsylvania State University, University Park.*

Twenty grass-fed steers and 10 grass-fed heifers were evaluated for the relationship of wintering growth rate, grazing daily weight gain, sex, grazing period, frame size, final weight, and carcass traits (fat thickness, ribeye area, marbling score, yield grade and shear force) to consumer evaluation of tenderness, juiciness, flavor, and acceptability of cooked steaks. All of the cattle were wintered for a targeted weight gain of 0.73 kg/d for 156 d, and then were grazed in rotationally-grazed paddocks containing primarily cool-season grasses. Cattle were harvested at a constant age (532.9 ± 5.7 d) in 6 harvest groups ranging from 124 d to 187 d of grazing and carcass data were collected. Final quality grade ranged from low Select to low Choice. Longissimus muscle steaks were thawed, cooked, and offered to trained panelists. Steaks were evaluated for Warner-Bratzler shear force, and analysis of covariance evaluated the relationship of carcass traits with growth and animal traits, and consumer evaluations were compared with all traits. There was a significant covariance of yield grade with frame size and with fat thickness and grazing days ($P < 0.05$). Animal, growth, and carcass traits were not related to panelist evaluations of tenderness, flavor, juiciness, meat texture, or overall desirability for grass-fed cattle harvested at 532 d of age ($P > 0.05$). The relationship of marbling score and consumer evaluation of juiciness was not significant ($P = 0.21$). There was no significant covariance among frame size, juiciness, flavor, tenderness, texture or overall acceptability ($P > 0.05$) except for yield grade with juiciness ($P = 0.01$). Mean panel scores for grass-fed steaks were moderate for overall acceptability (4.6 out of 9), flavor (5.1 out of 9), and juiciness (3.1 out of 7), while scoring them slightly tough (4.4 out of 9). Significant variation in scores for tenderness, juiciness, flavor, and overall acceptability were found, indicating post-harvest interventions may be more effective in increasing consistency for consumers of grass-fed meat compared to production and carcass traits.

Key Words: Grass-Fed Beef, Carcass, Production

M282 Differentiation of fecal alkane and fatty alcohol markers of diet composition of cattle and sheep grazing a complex heathland sward. J. M. Moorby*, M. D. Fraser, V. J. Theobald, and S. M. Morris, *Institute of Grassland and Environmental Research, Aberystwyth, UK.*

To investigate inter- and intra-species differences in foraging strategy, two breeds of each of cattle (Welsh Black, WB, and a continental crossbreed, CX) and sheep (Welsh Mountain, WM and Scottish Blackface, SB) were rotationally grazed on four adjacent 1 ha plots of a *Calluna vulgaris*-dominated heathland community. In each of two sampling sessions in 2005, late July and late September, after adaptation for 21 d, fecal samples were collected from each animal and bulked over 7 d. These were dried and analyzed for alkane and long-chain fatty alcohol (LCFA) concentrations, which are of plant (diet) origin and are largely undigested. Their profiles in plants differ between species and thus their profiles in feces depend on diet composition. Data were analyzed by principal components (PC) analysis and hierarchical cluster analysis. A scatter plot of PC1 v. PC2 showed differentiation between cattle and sheep and within-species segregation of the sampling sessions, indicating different diets for cattle and sheep. This also indicated that diets differed by session, or at least that the marker profiles differed within the diets in different sessions. Analysis of variance of PC1 (accounting for 90.6% of data variation) with species, breed and month as treatment factors were significant ($P < 0.001$) for each factor. Similarly, HCA showed clear

clustering of species and sample months, with some overlap of breed within sample month. There was greater spread (PC variation and HCA heterogeneity) among the sheep data (SD of PC1 = 1451 for all sheep data, 1423 for WM, and 1258 for SB) than among the cattle data (SD of PC1 = 415 for all cattle data, 553 for WB, and 229 for CX). This indicates that cattle, and in particular CX, chose more consistent diets than sheep and perhaps while the cattle consumed diets dependant on plant availability, different breeds of sheep chose more varied diets. In conclusion, this work found greater variation in diet composition of sheep than of cattle given equal selection opportunities, and that diets differed in their alkane and LFCA concentrations at different times of the year.

Key Words: Grazing, Diet Selection, Alkanes

M283 Predicting the retention of ruminal boluses for the electronic identification of goats. S. Carné*, G. Caja, J. J. Ghirardi, and A. A. K. Salama, *Universitat Autònoma de Barcelona, Bellaterra, Spain.*

A total of 1,725 boluses were used to build-up a model for predicting the long-term retention of boluses into the forestomachs of adult goats under on-farm conditions. Animals belonged to Murciano-Granadina (dairy) and Blanca de Rasquera (meat) Spanish autochthonous goat breeds. Boluses consisted of 15 capsules made of different materials (ceramic, concrete, plastic with or without metallic balast) for achieving a wide range of physical features: length (37 to 84 mm), o. d. (9 to 22 mm), weight (5 to 110 g), volume (2.6 to 26 mL) and specific gravity (1 to 4.3). Each bolus contained an ISO half-duplex glass encapsulated transponder (32 × 3.8 mm). Boluses were administered by trained operators using adapted balling guns. Full-ISO handheld transceivers working at a frequency of 134.2 kHz were used to perform static readings. When a bolus loss (bolus not readable) was detected, a heavier bolus was applied. Retention rate (RR = 100 × read/applied) was calculated from data recorded from 2 to 24 mo post-application. No application problems or apparent behaviour alterations were observed for any bolus type. Bolus RR ranged 0 to 100% depending on their physical features. Only the largest bolus (26 ml; 110 g; and SG = 4.23) showed RR > 99%. Data allowed fitting a logistic model for predicting bolus retention from their volume (V, ml) and weight (W, g). The model ($R^2 = 0.956$; $P < 0.001$) was: $RR (\%) = 100 / (1 + 0.8086 e^{0.879 V - 0.283 W})$. An exponential relationship ($r = -0.84$; $P < 0.01$) was found between specific gravity and W for the predicted values of bolus retention. Estimated weight and specific gravity for producing a standard size bolus (22 mL) with RR > 99% are greater than 95 g and 4.32, respectively. Further research is required for improving prediction accuracy.

Key Words: Electronic Bolus, Electronic Identification, Goat

M284 Effects of age and rearing method on long-term retention of different electronic identification devices in goat. S. Carné*, G. Caja, J. J. Ghirardi, and A. A. K. Salama, *Universitat Autònoma de Barcelona, Bellaterra, Spain.*

A total of 70 Murciano-Granadina kids were used for evaluating the use of visual ear tags and 3 types of electronic identification (ID) devices (injectable, ear tag and bolus) in replacement goats. Kids were ID after birth with 2 types of plastic ear tags (V1, n = 42; V2 = 25) in

the left ear, and raised as a single group with ad libitum milk substitute, concentrate and straw until 60 d of age (7.7 ± 0.8 kg BW). Four kids (5.7%) died during this period. Half of the kids (n = 33) were weaned and a daily single milk feeding was maintained thereafter in the other half (n = 33) up to 5 mo of age. Kids were also ID at d 60 with 1 electronic ear-tag in the right ear (ET, n = 66; half-duplex double button tag, 6 g) and 1 electronic mini-bolus (B1, 13.7 g, 51 × 11 mm, n = 66; half-duplex) containing a 32 × 3.8 mm half-duplex transponder. Additionally, kids were ID at d 90 with 2 injectable transponders in each metacarpus (IM1, 12 × 2.1 mm, n = 50; IM2, 15 × 2.1 mm, n = 75; full-duplex B glass encapsulated). Lost B1 were replaced by larger bolus (B2, 20.1 g, 56 × 11 mm). Retention rate (read/applied × 100) of ID devices was recorded weekly up to 18 mo of age. Intermediary retention at mo 5 varied between devices (V1, 85.4%; V2, 100%; E1, 100%; E2, 100%; B1, 77.3%; B2, 100%; IM1, 92.0%; IM2, 98.0%; $P < 0.05$). Extended milk-fed rearing tended to increase B1 losses (84.8 vs 69.7%; $P = 0.148$), which should be confirmed with a larger kid number. V1 were removed at 1 yr of age. Lost B1 during the experiment were replaced with B2 boluses (n = 21). Finally, at 18 mo of age, average retention rate of devices were: bolus, 62.5% (B1, 68.2%; B2, 78.6%; $P = 0.087$); injectable, 93.3% (IM1, 91.4%; IM2, 96.0%; $P = 0.333$); and, electronic ear tag, 100% (E1, 100%; E2, 100%). Mini-bolus showed the lowest retention ($P < 0.05$) when compared to ear tag and injectable. In conclusion, only electronic ear tags proved to be efficient devices for the identification of goats from suckling to adult, and new bolus designs are required for the electronic identification of goat in practice.

Key Words: Ear tag, Electronic Identification, Goat

M285 Performance of milk recording procedures based on visual or electronic identification in dairy goats. A. Ait-Saidi, G. Caja*, S. Carné, and A. A. K. Salama, *Universitat Autònoma de Barcelona, Bellaterra, Spain.*

A group of 24 Murciano-Granadina dairy goats at early-mid lactation (60 to 120 DIM; 1.44 to 2.41 L/d) was used to compare labor time and data collection efficiency of using manual or semi-automated systems for milk recording on-field conditions. Goats were milked in a 2 × 12 parallel platform with 6 milking units by side (3 units/operator), automatic head lockers and manual concentrate feeding and goat releasing. Manual (M) system used visual identification (48 × 38 mm plastic ear tags recorded with 3 digits), on paper data recording (ear tag number, milk yield and observations) and typing for uploading data to a computer. Semi-automated (SA) system used electronic identification (75 g boluses, 21 × 68 mm; containing HDX transponders, 32 × 3.8 mm, Rumitag, Barcelona, Spain) and reading (hand-held reader with stick antenna; Smart-reader, Rumitag), data recording by typing on reader keyboard (milk yield and observations) and automatic data uploading to computer by blue-tooth connection. Data were collected by groups of 12 goats in 10 milk recordings of each system done during an interval of 55 d. Although there was no difference between M and SA in milk recording time corrected by milk yield (0.72 ± 0.04 min/L/goat, on average), a marked difference was observed for time needed for transferring data of series of 24 goats to the computer (M, 0.22 ± 0.02 min/goat; SA, 0.05 ± 0.01 min/goat; $P < 0.001$). Total milk recording time corrected by yield and per goat was lower ($P < 0.01$) in SA than in M (0.77 vs 0.93 min/L/goat). Time necessary for transferring milk recording data of groups 24 goats was 5.24 and 1.25 min for M and SA, respectively. Data transfer time increased by 0.2 min for each additional 24 goats in the SA system. Consequently,

differences in estimated labor time for downloading data between both systems increased with number of goats recorded in the same test day, being: 4.0, 14.2, 29.4, 44.7, 59.9, and 75.2 min; for: 24, 72, 144, 216, 288, and 360 goats, respectively. Differences in labor time cost (\$15/h) ranged from \$1.0 to \$18.8 per milk recording, in favour of using electronic identification.

Key Words: Electronic Identification, Milk Recording, Dairy Goats

M286 Is ethanol production sustainable? An animal science approach. H. Koknaroglu¹, T. Purevjav*¹, T. Akunal², and M. P. Hoffman¹, ¹*Suleyman Demirel University, Isparta, Turkey*, ²*Iowa State University, Ames*.

A three-year grazing and feedlot finishing trial was conducted to examine the inclusion of condensed corn distillers solubles (CCDS) on sustainability of cattle feeding program. Cultural energy (CE) is the energy other than solar energy needed to produce food and fiber and energy output/input ratios is one of the most useful methods to examine the potential long-term sustainability of various agricultural practices and this analysis is performed to quantify the energy return from products produced relative to the CE invested to produce the product. CCDS is a by-product of ethanol production and is a valuable feed resource that can be used with corn stalks to feed cattle. In our research, we assumed that CCDS and corn stalks have no CE embedded. Each year, calves (n=112) were assigned to four treatment groups by weight and color pattern. Treatments 1 and 2 were pasture (P) rotational grazing (May-September) followed by feedlot finishing (FL) on chopped alfalfa hay and corn (P/FL) or corn, corn stalks and CCDS (P+CCDS/FL), respectively. Cattle in treatments 3 (FL) and 4 (FL+CCDS) were fed in the feedlot from May until harvested. The FL included chopped alfalfa hay and corn, and FL+CCDS included corn, corn stalks, and CCDS. Cattle were weighed every 28 days, and about 586 kg live weight, they were harvested. CE used for pasture establishment, feed consumption, and maintenance were calculated using the actual inputs and corresponding energy values from the literature. FL had higher total CE expenditures and pasturing decreased total CE expenditures (P<0.01). Feed energy comprised more than half of the total CE and was highest for FL and was lowest for P+CCDS/FL (P<0.01). Kilocalories of CE required to produce kilocalories of protein energy was lower for cattle receiving CCDS (P<0.05). Results showed that including CCDS and corn stalks into cattle feeding programs saved 480.5 Mcal CE expended per head corresponding to more than 10% of total CE expended. Thus this shows that CCDS and corn stalks are an effective way to reduce CE expenditure of cattle feeding and this amount will help to increase sustainability of ethanol production.

Key Words: Condensed Corn Distiller Soluble, Feedlot Cattle, Ethanol

M287 Impact of producing low DCAD forage on chloride farm-gate balance. O. Soucy*, D. Pellerin, E. Charbonneau, and G. Allard, *Universite Laval, Quebec, Canada*.

The addition of chloride (Cl) to prepartum dairy cow diets can reduce incidence of milk fever by reducing their dietary cation-anion difference (DCAD). Chloride can be added in the ration as anionic salts or be included through forage produced on the farm and fertilized

with CaCl₂. Both practices have an impact on the Cl farm balance. The objective of this study was to model the Cl cycle on dairy farms and to compute their farm-gate Cl balances according to two scenarios: 1- actual farm data; 2- actual farm data with production of low DCAD forage. The N-CyCLE model has been modified to describe the Cl cycling and to compute the farm-gate balance for Cl. The model was run with data from 18 farms from two different areas of the Quebec province. In scenario 2, a 160 kg / ha application of CaCl₂ was added on each 3.7 ha necessary to feed 50 lactating cows. Average Cl farm-gate balance is 2559 kg. It varies from -705 kg to 5441 kg. The high variability can be linked to the Cl in purchased feed, which varies from 1187 to 6260 kg Cl, and the Cl in crops sold, which varies from 1153 to 3380 kg Cl. On a milk production basis, Cl input by feed purchased is quite stable with an average of 5.7 kg Cl /hL. A larger variability is observed with Cl sold as crops, it accounts for 4.4 kg Cl /hL, varying from 2.9 to 12.2 kg Cl /ha. The environmental impact, predicted using the Cl balance expressed on a land basis, is, on average, 17.1 kg Cl / ha but varies from 5.3 to 29.9 kg Cl /ha. The production of low DCAD forage leads to an average farm-gate balance of 2969 kg Cl, varying from -457 to 6092 kg Cl, this represents a mean increase of 16 %. As expected, such an increase depends on the existent Cl global farm balance: for the farm with the minimum global balance, -705 kg Cl, the increase is 35% but it is only a 12% increase for the farm with the maximum balance of 5441 kg Cl. In order to predict the environmental impact of a management practice such as Cl fertilization, our data suggest that the Cl balance should be computed for every farm since a high variability exists between farms.

Key Words: Chloride, Balance, Model

M288 The effect of dehorning at twenty-eight days of age on calf growth and health. B. L. Miller*, T. J. Earleywine, and T. E. Johnson, *Land O'Lakes, Inc., Webster City, IA*.

Three hundred seventy two (372) 3 to 5 day old Holstein bull calves (mean BW=45.3 kg) were employed in two 42 day trials. These animals were employed to understand the impact of de-horning on performance and health. Not dehorned (NDH) or dehorned (DH) were stratified across different dietary treatments by initial weight and blood IgG status. No interactions were noted thus only main effects for dehorning treatments are presented. Calves were fed an average 359 g of a milk replacer twice daily. The milk replacer contained 20% fat and either 22% or 25% protein. Milk replacer was not medicated. Calf starter (18% CP) was fed throughout these trials. Calves assigned to the DH treatment were dehorned at 28 days of age via hot-iron method. Total gain, intake, respiratory and treatments costs were not impacted by dehorning (P>.05). Dehorning of calves at twenty eight days of age does not appear to influence calf growth or health.

Table 1.

| Item | NDH | DH |
|----------------------------------|------|------|
| No. calves | 188 | 184 |
| D 28-42 gain, kg | 9.34 | 9.26 |
| D 28-42 milk replacer intake, kg | 7.51 | 7.49 |
| D 28-42 starter intake, kg | 8.90 | 9.31 |
| D 28-42 respiratory days | .27 | .33 |
| D 28-42 treatment cost, \$ | .84 | .91 |

all means NS (P>.05)

Key Words: Calf, Dehorning, Milk Replacer

M289 Temperament and chute exit velocity scores of Senepol calves after weaning. R. W. Godfrey and R. C. Ketring*, *University of the Virgin Islands, Agricultural Experiment Station, St. Croix, US Virgin Islands.*

The objective of this study was to evaluate the temperament and chute exit velocities (EV) of weaned Senepol calves. Bull (n=14) and heifer (n= 30) calves were evaluated at an age of 8.7 ± 0.4 mo (d 0) using chute score (CS) and EV as indicators of temperament. All calves were fire branded with the herd identification on d 0, after the initial CS and EV were measured, and a second EV was recorded at this time (BRND). On d 49 CS and EV were measured again for all calves. The CS was determined on a 1 to 5 scale with 1 being calm and 5 being extremely agitated. Chute exit velocity, reported in m/sec, was measured as the animals exited the chute using an electric timing system. There was no difference ($P > 0.10$) in any trait measured between bulls and heifers so data were pooled across sex. There was no difference ($P > 0.10$) in CS of calves measured at d 0 or d 49 (2.1 ± 0.1 vs. 2.2 ± 0.2 , respectively). Only 6.8 % of the calves had a CS greater than 3 ($P < 0.006$). Calves had a greater EV at BRND ($P < 0.0009$) than at either d 0 or d 49 (3.1 ± 0.1 vs. 2.4 ± 0.1 vs. $2.4 \pm .01$ m/sec, respectively). At d 0 calves with a CS of 1 had a lower ($P < 0.03$) EV compared to calves with a CS of 2, 3 or 4 (1.7 ± 0.3 vs. 2.3 ± 0.2 vs. 2.6 ± 0.2 vs. 3.0 ± 0.5 m/sec, respectively). At d 49 EV of calves with a CS of 1 was lower ($P < 0.01$) than that of calves with a CS of 2, but not different ($P > 0.10$) from calves with a CS of 3 or 4 (1.9 ± 0.2 vs. 2.7 ± 0.2 vs. 2.3 ± 0.2 vs. 2.9 ± 0.6 m/sec., respectively). There was no difference ($P > 0.10$) in weaning weight among calves that received CS of 1, 2, 3 or 4 at day 0 or d 49. Overall CS and EV had a moderate correlation ($P < 0.002$, $r = 0.359$). At d 0 CS and EV had a moderate correlation ($P < .004$, $r = 0.446$) but not at d 49 ($P > 0.10$, $r = 0.209$). There was no correlation ($P > 0.10$) between weaning weight and EV at d 0 or d 49. At BRND EV tended to have a negative correlation with weaning weight ($P < 0.07$, $r = -0.298$). These results show that the temperament of Senepol calves does not change significantly over time after weaning.

Key Words: Temperament, Cattle, Behavior

M290 The effect of calf ear infection (otitis media) on calf growth and health. B. L. Miller*, T. J. Earleywine, and T. E. Johnson, *Land O'Lakes, Inc., Webster City, IA.*

The Land O'Lakes Research facility in Webster City, IA conducts trials with over 1500 three-to-five day old Holstein bull calves annually. These calves are co-mingled sale barn calves purchased from Wisconsin. Upon the completion of research trials, these calves have been sold to local producers. However, during the last six years *Mycoplasma bovis* infection has reduced the value and number of saleable calves. To better understand the full impact of ear infection (otitis media), calf performance, health and total treatment costs were examined. One hundred thirty-one (131) Holstein bull calves (mean BW=45.2 kg) were employed in this 42 day trial. All calves were fed 340 g of a 20% all-milk protein, 20% fat milk replacer (MR) twice daily. Milk replacer was not medicated. Calf groups were formed by treatment for ear infection (1. no clinical signs, no antibiotic treatment; 2. clinical signs with antibiotic treatment for 1 - 6 days; or 3. clinical signs with antibiotic treatment for over 6 days). Daily antibiotic (AB) treatment was approved extra-label use of Lincomycin (.45 g/d) and Spectomycin (.33 g/d) intramuscular injection. Antibiotic treatment was not related to initial weight or blood gamma globulin status. Calf

starter (18% CP) was fed throughout this trial. Total gain, MR intake and starter intake were reduced ($P < .05$) for calves having clinical signs of ear infection and treated for more than six days compared with non-clinical, non-treated calves. Total calf treatment cost increased with number of treatment days.

Table 1.

| Item | No clinical/ No AB | Clinical/ 1-6 d AB | Clinical/ 6+d AB |
|----------------------------------|-----------------------|-----------------------|---------------------|
| No. calves | 77 | 33 | 21 |
| Total gain, kg | 14.0 ^a | 12.7 ^{a,b} | 11.0 ^b |
| Total milk replacer intake, kg | 26.4 ^a | 26.1 ^{a,b} | 25.5 ^b |
| Total starter intake, kg | 7.9 ^a | 6.6 ^{a,b} | 4.9 ^b |
| Total respiratory days | 2.2 ^b | 4.0 ^a | 3.4 ^{a,b} |
| Total calf otitis media cost, \$ | 0.00 ^c | 8.84 ^b | 19.82 ^a |
| Total calf treatment cost, \$ | 10.56 ^c | 22.15 ^b | 36.97 ^a |

^{a,b,c} $P < .05$

Key Words: Calf, Ear Infection, Milk Replacer

M291 Feeding behavior and weight gain of calves fed low or high quantities of milk using an automated feeding system. T. F. Borderas*^{1,2}, A. M. dePassillé¹, and J. Rushen¹, ¹*Agriculture and Agri-Food Canada, Agassiz, B.C., Canada*, ²*University of British Columbia, Vancouver, B.C., Canada.*

There is interest in feeding unweaned calves more milk but little is known about feeding behavior in group-housed calves fed with an automated feeder. In two experiments, we examined the effect of low and high milk allowances on behavior and weight gain of Holstein calves fed on an automated feeder. In Exp. 1, we fed calves either 4L/d milk replacer (N=25) or to ad libitum intake (N=25) to 42d of age. In Exp. 2, calves were fed 4L/d (N=14) or 12L/d (N=14) of whole milk to 32d. Calves were housed in dynamic groups of 3 to 15. Results were analysed using a mixed model with calf, treatment and age as factors. Differences were significant at $P=0.05$. Calves with a high milk allowance consumed more milk (Mean±SD Exp 1: 13.4 ± 1.9 L/d, Exp 2: 8.9 ± 0.7) than calves fed 4L/d. Low milk fed calves made more visits to the milk feeder than high milk fed calves (Exp 1: 22.9 ± 5.1 vs. 11.4 ± 3.5 ; Exp 2: 22.3 ± 5.8 vs. 11.7 ± 2.4). To d14, calves ate less than 200 g/d of concentrate and there were no differences between treatments ($P > 0.10$) After d14, high fed calves ate less grain (Exp 1: 17.3 ± 4.7 g/d; Exp2: 110.1 ± 33.4 g/d) than low fed calves (Exp 1: 793.8 ± 87.9 g/d; Exp2: 581.5 ± 149.1). At 2 wk of age, there were no differences in time spent resting between treatments, but in wk 4 and 5, high milk-fed calves rested for 21.6 ± 10.7 min/d longer than low milk-fed calves. In Exp. 1, weight gains of ad lib fed calves from d0 to d21 were higher (21.96 ± 1.3 kg) than for low milk-fed calves (10.1 ± 0.9 kg). From d21 to weaning, low milk-fed calves gained more than high milk-fed calves (24.8 ± 1.9 vs. 18.1 ± 0.55 kg) but at 42d weaning, body weights of high milk-fed calves were higher (86.9 ± 2.6 vs. 77.6 ± 2.3 kg). Feeding calves more milk improved weight gain until d21 and improved the efficiency of use of the automated feeder. However, feeding more milk reduces concentrate consumption after 14 d and growth advantages after 21 d of age.

Key Words: Dairy, Calf, Feeding