

322 Lipoic acid-induced changes in food intake in chickens. D. M. Denbow* and P. B. Siegel, *Virginia Polytechnic Institute and State University, Blacksburg.*

The enzyme AMP-activated protein kinase (AMPK) is believed to serve as an "fuel gauge" monitoring the energy level in the body. It may function both within and outside the central nervous system. Using a line of chickens selected for either low- or high-eight week body weight, we investigated whether altering the activity of this enzyme affected food intake, and whether genetic selection for high or low body weight altered the effect of lipoic acid. Lipoic acid is known to inhibit AMPK. Therefore, lipoic acid was injected either intraperitoneally (IP) or intracerebroventricularly (ICV) to determine its effect on food intake in both lines of birds. Food intake was monitored for 3 or 24 hours postinjection following ICV or IP injections, respectively. The ICV injection of 0, 12, 24 or 48 µg lipoic acid dose-dependently increased (P<0.05) food intake in 7 week-old high weight male birds while having no effect in 15 week-old low weight male birds. The IP injection of 0, 50, or 100 mg/kg BW of lipoic acid decreased (P<0.05) food intake in 11-15 week-old males of both lines. Therefore, altering AMPK activity can affect food intake in chickens.

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Key Words: AMP-Activated Protein Kinase

323 Clock gene expression in the premammillary nucleus (PMM) and the pineal gland of turkey hens. B. Leclerc*¹, S. Kang¹, A. Thayananuphat¹, C. Howell¹, S. Kosonsiriluk², Y. Chaiseha², and M. E. El Halawani¹, ¹University of Minnesota, St. Paul, ²Suranaree University of Technology, Thailand.

Recent findings from our laboratory have implicated the PMM as a site of putative photoreceptive neurons. These neurons are shown to express both dopamine (DA) and melatonin (MEL), with DAergic activity up regulated during the light phase and MELergic activity during the dark phase of the light-dark illumination cycle. These neurons reach threshold activation (as indicated by c-fos mRNA expression) when a light period is provided during the photosensitive phase (14hr after light on). And, this is coincided with the activation of gonadotropic releasing hormone-I (GnRH-I) and the upregulation of GnRH-I mRNA expression. It is hypothesized that PMM DA-MEL neurons may be a component of a biological clock involved in reproductive photoperiodic time measurement (PTM), controlling seasonal reproduction in turkeys. In this study we cloned turkey's clock genes including Clock, Per2, Per3, Bmal1, Cry1 and Cry2 and examined their expression in the PMM which was compared to that expressed by the pineal gland. Turkey hens maintained on short photoperiod (6L:18D) were subjected to a 30 min light pulse at circadian times (CT) 8, 14 and 20. Tissues were collected 30 min, 1

hour and 3 hours following the onset of the light pulse. In the pineal gland, Per2 mRNA expression level was highest followed by mRNA expression of Cry1, Cry2, Per3, Clock and Bmal1. However, Per2 gene was not significantly modulated by light (one-way ANOVA; P>0.05) across all CTs. The expression of Per2, Cry1 and Cry2 genes was also examined in the PMM of turkeys following the 30 min light exposure. The expression of Cry1 and Per3 transcripts was enhanced 2-3 fold by the 1 hour light pulse at CT14 and CT20 and both were statistically significant by the ANOVA (P<0.05) and confirmed by the Tukey-Kramer test. It is not clear at this time whether clock genes are involved in mediating photic information to the reproductive neuroendocrine system of turkeys.

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Key Words: Clock Genes, Turkey, Hypothalamus

324 The expression patterns of HIF 1 α , HYOU1, HO1, and cTnT during embryonic development in the chicken heart. S. Druyan*¹, A. Cahaner², and C. M. Ashwell¹, ¹North Carolina State University, Raleigh, ²Hebrew University, Rehovot, Israel.

Oxygen is one of the critical determinants of appropriate embryonic and fetal development including cardiogenesis. When tissues demand for oxygen exceeds oxygen supply, hypoxic conditions develop. In the developing embryo, hypoxia is associated with increased fetal mortality, cerebrovascular anomalies, cardiovascular dysfunction and altered angiogenesis. In this study 4 genes: hypoxia inducing factor subunit a - 1 (HIF 1 α), hypoxia up regulated protein 1 (HYOU1) also known as ORP150, heme oxygenase 1 (HO1) and cardiac troponin T (cTnT), were examined in the embryonic heart of the chicken to determine the expression patterns throughout development. The effect of embryonic age on gene expression was determined by real-time quantitative PCR normalizing to the level of GAPDH. On embryonic day 7 (E7) all three hypoxic induced genes were expressed at their highest levels evaluated, likely due to the fact that the yolk sac is the principal gas exchange organ and the origin of the primitive red blood cells. All three hypoxic induced genes expression significantly decreased from d E7 to E19 (internal pipping) followed by a significant increase in expression between internal pipping and external pipping (E20). During this period a gradual hypoxia and hypercapnia develop due to the decline in the allantois gas exchange the embryo metabolic requirement depends on the lungs, as the new breathing organ, thus limiting the O₂ supply. As expected cTnT expression increased with embryonic development in correlation with the cardiovascular system development. It appears that tissue hypoxia is a necessary component of normal embryonic development.

Key Words: Gene Expression, Hypoxia, Incubation

Production, Management & the Environment - Livestock and Poultry: Broiler and Broiler Breeder Production and Management

325 Dosing with the fatty acid, sodium caprylate in the water did not reduce enteric *Campylobacter* concentrations in broilers. J. H. Metcalf*¹, K. Venkitanarayanan², F. S. de los Santos¹, A. M. Donoghue³, M. L. Dirain¹, I. Reyes-Herrera¹, V. Aguiar¹, P. Blore¹, and D. J. Donoghue¹, ¹University of Arkansas, Fayetteville, ²University of Connecticut, Storrs, ³PPPSRU, ARS, USDA, Fayetteville, AR.

Campylobacter is a leading cause of foodborne disease and poultry is an important vector for this pathogen. Water additives are one possible method to reduce Campylobacter concentrations within preharvest poultry. Previous research in farm animals using the medium chain fatty acid, sodium caprylate, demonstrated the potential to reduce enteric pathogens. To determine the ability of sodium caprylate to

reduce *Campylobacter* concentrations in preharvest poultry, two separate trials were conducting dosing young chickens with this compound. Chicks were dosed for the last 72 h of a 15 d study with either 0, 0.175, 0.35, 0.7, 1.4% or 0, 0.044, 0.088, 0.175, 0.35, 0.7, 1.4% sodium caprylate in the water (Trial 1 or 2, respectively, n=10 birds/group). Chicks were challenged with *Campylobacter jejuni* on d 3. At d 15, chicks were sacrificed, cecal contents collected, serially diluted and plated on Campy Line Agar. Colonies were counted after 48 h of incubation at 42C. In Trial 1, only the 0.175% sodium caprylate dose caused a significant reduction in cecal *Campylobacter* concentrations when compared with controls. In Trial 2, there were no significant differences between any of the treatment groups. These results indicate, at least for the dosing regime used, sodium caprylate was not consistently effective in reducing enteric *Campylobacter* concentrations in young chickens.

Key Words: Sodium Caprylate, *Campylobacter*, Medium Chain Fatty Acid

326 Performance comparison between the use and non-use of an enteric health antibiotic program in commercial broiler flocks. J. Bray^{*1,2}, T. Cherry¹, J. Carey², and C. Smith^{1,2}, ¹Stephen F. Austin State University, Nacogdoches, TX, ²Texas A&M University, College Station.

In the US, current trends show that enteric health antibiotics have been removed from broiler diets. The use of these antibiotics in broiler production is a contentious issue. An experiment was conducted to compare the differences in performance and yield parameters between broilers that were fed enteric health antibiotics in the diets and broilers that were not fed enteric health antibiotics in the diets. For five consecutive flocks broilers were reared under commercial settings in solid-side wall, tunnel ventilated broilers houses on built-up litter. The four-house farm was divided into two separate farms with two houses being fed the enteric antibiotic program (AGP(+)) and the other two were fed a naïve feed (AGP(-)). For each flock, 27,600 broilers were placed per house and reared for 49 days. All birds were fed commercially produced starter, grower and withdrawal rations. Individual body weights of 100 birds per house were collected at 18, 35, and 49 days of age. Feed conversion and adjusted feed conversion were calculated for each of these days. Coccidiosis lesion scores using the Johnson and Reid Method were collected at 14, 21, 28, 35, and 42 days of age. At the conclusion of each flock, a yield study was conducted on 280 birds (140 per treatment). The nature of the differences in bird performance between the treatments varied from flock to flock. Through the first two flocks, the AGP(-) birds had a high body weight with a lower feed conversion and adjusted feed conversion at 49 days of age when compared to the AGP(+) birds. Furthermore, statistically higher yield weights were detected in the AGP(-) birds through the first two flocks. By the third flock, all performance and yield parameters were equal between the two treatments. Preliminary data from the final two flocks indicates there is a slight improvement in performance and gut health among flocks receiving antibiotics.

Key Words: Broilers, Antibiotics, Performance

327 Saponin rich extracts from quillaja, yucca, soybean, and guar differ in antimicrobial and hemolytic activities. S. M. Hassan^{*1}, J. A. Byrd², A. M. Berhow³, C. A. Bailey¹, and A. L. Cartwright¹, ¹Texas A&M University, College Station, ²USDA, Agricultural Research Service, College Station, TX, ³USDA, Agricultural Research Service, Peoria, IL.

Saponin rich extracts prepared from guar meal, quillaja bark, yucca, and soybean were evaluated for antibacterial and hemolytic activities. Ninety six multi-well plate assays for hemolytic and antimicrobial activities were tested using 8 serial dilutions of saponin concentrations from 5 to 666 µg/mL. A hemolytic assay used a 1% suspension of chicken red blood cells with water as a positive control and phosphate buffer solution as a negative control. A minimal inhibitory concentration (MIC) assay was used to evaluate the antibacterial activity of *S. aureus*, *Salmonella Typhimurium* and *E. coli* with ampicillin as a positive control and bacteria without saponin as a negative control. Optical densities of ELISA plate wells were read at 650 nm to assay hemolytic and bacterial growth. Results showed that saponin from different sources have different hemolytic and antibacterial activities. Guar and quillaja saponins were hemolytic, while yucca and soybean were not hemolytic at the concentrations tested. No saponin source had antibacterial activity against *Salmonella Typhimurium* or *E. coli* at the concentrations tested in this study. Both guar and quillaja saponin extracts exhibited antibacterial activity against *S. aureus*.

Key Words: Antibacterial, Guar, Saponin

328 Factors influencing distribution of pellets and fines in a commercial broiler pan feeding system. C. Hancock^{*}, S. Beyer, C. Rude, S. Daly, K. Dobbelaire, and J. Burden, *Kansas State University, Manhattan.*

A series of studies were conducted to determine the impact of feed fines on the distribution of particles within a commercial broiler pan feeding system. A Chore-Time Model C2 Plus feed line with Brock feed bin and a Model 75 auger line with surge bin was constructed with 93 pans spanning the 240 foot line. For the purpose of these studies, feed was added directly to the surge bin. The motor was activated, feed was moved down the line, and the samples were collected from select pans for later analysis. For the purpose of the initial studies, we collected from pans 1, 2, 3, 14, 25, 36, 47, 58, 69, 80, 91 and 93. A grower ration formulated to meet the requirements of the NRC was manufactured at the Kansas State University Feed Mill. The feed was pelleted to a pellet durability index (PDI) of 92. The feed system was tested using 3 combinations of pellets and fines. Trmt 1 contained no added fines, trmt 2 contained 10% added fines and trmt 3 contained 20% added fines. To blend pellets and fines, a 1000 lb. Davis horizontal paddle mixer was used with a 1 minute mix time. Feed was then placed in plastic tubs until fed into the surge bin to begin the auger process. Each trmt was fully distributed throughout the line until the automated stopping mechanism was activated, at which point samples were collected by removing all feed from selected pans. The entire system was then purged of feed and the process was repeated. Pellets and fines were separated using an automated Ro-Tap system. Results indicate that the initial pans accumulated feed with 90% pellets, allowing fines to traverse into later pans where pellets only reached 70%. As the fines were collected in later pans, this then allowed

remaining pellets to traverse and flow into pans further down the line. This indicates that different pans may have different ratios of fines to pellets. The data indicates distribution of feed was similar in all 3 trmts. To maximize flock uniformity, it is important that the system releases feed in a uniform manner, however our results indicate pellets and fines may separate during the feeding process.

Key Words: Pellets, Fines, Feed Manufacturing

329 Characterization of atmospheric ammonia/ammonium forms in broiler production facilities. C. S. Smith^{*2,1}, J. L. Bray^{2,1}, T. E. Cherry², R. E. Lacey¹, and J. B. Carey¹, ¹Texas A&M University, College Station, ²Stephen F. Austin State University, Nacogdoches, TX.

The nature and prevalence of the forms of ammonia nitrogen (ammonia/ammonium) within the environment of a broiler production facility is largely unknown. An annular denuder system was utilized to separate ammonia compounds in air samples into three categories. The air sample first passed through a cyclone filter which trapped large airborne particles. Subsequently, the air sample was passed through an annular denuder coated with citric acid in a glycerol solution. The denuder absorbed the gaseous form of ammonia. The final stage of the system was a boric acid trap which collected the very small particulate forms of ammonium. Samples were collected over 24 h periods from commercial broiler production facilities throughout the final 2-3 weeks of production. Volumes sampled over the 24 h period averaged 6.5 cubic meters. Following collection, fractions were extracted from the system and stored under acidic conditions until analyzed for ammonia nitrogen content by selective ion analysis. Results of the survey reveal that less than 0.1% of the ammonia nitrogen detected was attached to large particles found in the cyclone filter. The amount of gaseous ammonia trapped in the annular denuder accounted for less than 1.0% of the total with over 98% of the ammonia nitrogen recovered detected in the acid trap. These data indicate that under typical broiler production conditions, most ammonia nitrogen is in the ammonium form attached to small particles. This data will clarify the potential for environmental impact of emissions from broiler production facilities.

Key Words: Ammonia/Ammonium, Broilers, Annular Denuder

330 Effect of different feeding strategies on productivity of broiler breeders. L. F. Romero^{*1}, M. J. Zuidhof², F. E. Robinson¹, A. Naeima¹, and R. A. Renema¹, ¹University of Alberta, Edmonton, AB, Canada, ²Alberta Agriculture and Food, Edmonton, AB, Canada.

This study was done to evaluate the effect of four feeding strategies on productivity relative to feed in settable egg production of broiler breeders ($P_{E:F}$), defined as Cumulative Settable Eggs (CSE) produced per kg of Cumulative Feed Intake (CFI). A total of 288 Ross 708 pullets were raised in floor pens, individually caged at 16 wk of age and assigned to one of four feed allocation groups. Three groups had feed allocated on a group basis with divergent target BW reached at 20 wk: Standard (STD), HIGH (STD \times 1.1), and LOW (STD \times 0.9). The fourth group had feed allocated on an individual bird basis (IND) and followed the STD BW target. Productivity was assessed at the end of the experimental period (56 wk) and a production function of the form $CSE=a+b(CFI)^c$ was fit in every group to compare the dynamics of

$P_{E:F}$ relative to the use of feed. The F statistic was used to evaluate the fit of separate groups versus a pooled fit. Final CSE production (to 56 wk of age) of LOW hens was lower (131.67 eggs, $P<0.01$) than IND, STD and HIGH (148.71, 144.67 and 145.65 eggs), which did not differ significantly. However, HIGH birds showed lower $P_{E:F}$ (4.17 eggs / kg, $P<0.05$) than IND, STD and LOW (4.61, 4.43 and 4.28 eggs / kg), and LOW hens showed lower $P_{E:F}$ than IND ($P=0.03$). Fitting the production function in every group separately showed better fit than when pooled ($P<0.0001$). IND hens had the lowest variability of the residuals (MSE=81.76). As every bird was fed based on individual requirements, the function of this group is a reflection of the individual potential of $P_{E:F}$. This is consistent with a higher c coefficient (=1.057) of IND, which indicates a greater productivity at higher levels of CFI. In contrast, HIGH showed $c=1.021$, a more linear trend than IND hens, but had lower $P_{E:F}$ than LOW, STD and IND along the experimental period, demonstrating that this strategy was inefficient compared with the others. The c coefficients of STD and LOW were 0.941 and 0.884, showing decreasing productivity as the CFI increased.

Key Words: Broiler Breeders, Productivity, Feeding Level

331 Effect of reducing body weight variability on the sexual maturation of broiler breeder females. R. A. Renema^{*1}, L. F. Romero¹, A. Naeima¹, M. J. Zuidhof², and F. E. Robinson¹, ¹University of Alberta, Edmonton, AB., Canada, ²Alberta Agriculture and Food, Edmonton, AB., Canada.

Sexual maturation traits of pullets fed either on a group basis or an individual basis were assessed in Ross 708 broiler breeders. Pullets (208) were assigned to a feeding treatment at hatch and reared together in floor pens prior to placement in individual cages at 16 wk of age. In order to study the impact of initial BW, pullets were grouped in one of three BW groups (Low, Std, or High) using the mean plus or minus 0.5 SD as the threshold. Half of the birds received a common feed allocation based on group BW (Control: CON), while remaining birds received a custom feed allocation to align their individual BW profile with management guide targets (Individual; IND). The IND BW profiles were fully converged by 20 wk of age. Photostimulation was at 23 wk of age. Carcass morphology was monitored between 16 wk and sexual maturity (SM). After their first egg, 64 birds (32/tmt) were dissected for determination of fleshing, fatness, and reproductive morphology. Remaining birds were kept for an egg production study. The CV of BW at 16 wk was 12.8%. By 23 wk it was 6.2% in CON birds and 1.4% in IND birds. ($P<0.0001$). Mean age at SM differed by only 0.15 d between feeding treatments (NS). However, age at first egg was affected by initial BW group ($P=0.018$). Low-IND birds entered lay 5 d faster than Low-CON birds and had an 11% longer total gut length. The range in mean SM age was 0.8 d among IND BW groups compared to 6 d among CON groups. Frame size (as shown by shank and keel length) was only affected by initial BW group, with smaller birds growing more between 16 wk and SM. Feeding treatment did not affect fleshing or fatness at SM. Mean oviduct weight and ovarian morphology parameters were also similar. Variability in LYF number was lower in IND (16.9%) compared to CON birds (22.3%), but was slightly higher for total LYF weight (CV=23.2% vs. 20.8%). Changes in the Low BW group accounted for much of the improved uniformity due to the IND feeding treatment.

Key Words: Broiler Breeder, Sexual Maturity, Ovarian Morphology

332 The energetics of female broiler breeders are affected by genotype and environment. M. J. Zuidhof^{*1}, R. A. Renema², F. E. Robinson², and L. F. Romero², ¹Alberta Agriculture and Food, Edmonton, AB, Canada, ²University of Alberta, Edmonton, AB, Canada.

This analysis was conducted to investigate the partitioning of ME by broiler breeder (BB) hens. A 3 × 4 × 2 factorial design trial with 3 BB strains, 4 rearing BW profiles and 2 photostimulation (PS) ages determined the impact of strain and management on female BB energetics during lay. Ross 708, Ross 508, and Hubbard Hi-Y BB were reared on BW profiles that diverged at 3 wk and converged at 32 wk of age as follows: STANDARD (mean target BW profile of 3 strains used); LOW (12 wk BW target=25% lower than STANDARD followed by rapid gain to 32 wk); MODERATE (12 wk BW target=150% of STANDARD followed by lower rate of gain to 32 wk); and HIGH (12 wk BW target=200% of STANDARD followed by minimal growth to 32 wk). Birds were photostimulated at 18 or 22 wk. A total of 288 hens were evaluated. A standard metabolic BW coefficient of 0.67 was used to estimate maintenance requirements. Residual ME Intake (RI) was calculated as the difference between the theoretical ME requirements of a bird and actual ME intake. Smaller values indicate greater efficiency. The average ME requirement for maintenance was 139 kcal/kg^{0.67}; for BW gain was 1.53 kcal/g; and for egg production was 1.80 kcal/g. Efficiency during lay differed due to rearing BW profile, strain, and age at PS. Rearing BW profile had the most dramatic effect on BB energetics. RI increased in all treatments until 30 wk, and then decreased, except in the HIGH treatment. Birds reared on the HIGH BW profile were most efficient, followed by MODERATE, then STANDARD, then LOW birds (RI= -22, -5, 9, and 20 kcal/d, respectively; P<0.0001). Early and overall RI was reduced in 18- vs 22-wk PS birds (RI=9 vs -8 kcal/d, respectively; P>0.0001). Overall RI of Ross 708 hens was -5 kcal/d. This was more efficient than 3 kcal/d, the average RI of Hubbard Hi-Y and Ross 508 strains (P<0.0001).

Key Words: Residual ME Intake, Nutrient Partitioning, Broiler Breeder Management

333 Spread of a marker *Salmonella* in the presence of background *Salmonella* as detected from broiler litter. R. J. Buhr^{*1}, L. J. Richardson¹, N. A. Cox¹, and B. D. Fairchild², ¹USDA, ARS, Athens, GA, ²University of Georgia, Athens.

The impact of preexisting *Salmonella* in day old chicks on the colonization ability of subsequent marker *Salmonella* strains is not known as both may compete for the same intestinal niches. Chick-box pads were sampled to detect the presence of background *Salmonella* at placement and the flock was determined to be positive (serogroup C3). Day old chicks were placed 40/pen into 6 adjacent pens. In the two end pens (pens 1 and 6) one chick was orally inoculated with 0.1 mL of a 10³ cfu/mL suspension of a naladixic acid resistant *Salmonella* cocktail (*S. heidelberg*, *S. montevideo*, and *S. typhimurium*). At 1 through 7 wk, the pens were sampled using both conventional drag swabs (CDS) and intermittently stepped on drag swabs (ISODS), two of each per wk. At 1 and 2 wk both the challenge and adjacent pens were positive for the marker *Salmonella* from all drag swab samples (16/16). At 2 wk the middle pens were still negative for the marker strain and 1 positive sample for the background *Salmonella* was

detected with an ISODS. At 3 wk the number of marker *Salmonella*-positive samples peaked and extended into the middle pens with 4/4 ISODS and 2/4 CDS positive samples (overall 22/24). Then at 4 and 5 wk, the number of marker *Salmonella*-positive samples gradually decreased, mainly from the middle pens from 17/24 to 16/24 total samples positive. The marker *Salmonella* continued to decline at 6 and 7 wk from 12/24 and 3/24. Overall, ISODS samples had significantly more positive samples (57/84) than CDS (45/84) and all but 10/84 positive samples coming from the challenged or adjacent pens. By challenging only one chick per pen, the marker *Salmonella* spread easily from the challenged to adjacent pens and into the center pens. The *Salmonella* prevalence in the litter was the highest at 3 wk and then decreased by 7 wk. The presence of a background *Salmonella* at placement does not appear to inhibit colonization by the marker *Salmonella* or the spread into adjacent pens. However, at 6 wk *Salmonella* recovery from litter had progressively declined from the challenge pens (7/8), to the adjacent pens (4/8), to the middle pens (1/8).

Key Words: *Salmonella* Detection, Litter Sampling, Drag Swab

334 Effect of starter period duration on live oocyst vaccination efficacy and broiler performance following subsequent *Eimeria* challenge. J. T. Lee^{*1}, N. H. Eckert¹, S. M. Stevens¹, S. Anderson¹, P. Anderson¹, H. D. Danforth², A. P. McElroy³, and D. J. Caldwell¹, ¹Texas A&M University, College Station, ²USDA-ARS, Beltsville, MD, ³Virginia Polytechnic Institute and State University, Blacksburg.

An experiment was conducted to investigate the effect of dietary starter period duration on broiler performance during a live oocyst vaccination program followed by field-strain *Eimeria* challenge. The experimental design was a 3 × 2 × 2 factorial with the variables of starter diet duration (13, 17, and 21 d), vaccination, and a mixed species *Eimeria* challenge. On d 21, broilers were challenged with a mixed species *Eimeria* inoculum containing *E. acervulina*, *E. maxima*, and *E. tenella*. On d 27, 10 broilers from each replicate pen were necropsied for the determination of intestinal lesion development. Average body weights for vaccinated and non-vaccinated broilers were similar (P>0.05) at 13 d of age. On day 17 and 21, vaccinated broilers had lower (P<0.05) average body weights compared to non-vaccinated broilers while no effect was observed with respect to starter duration. Feed conversion ratios were similar (P>0.05) for vaccinated and non-vaccinated broilers pre-challenge. Broilers switched to the grower diet on d 13 had an increased (P<0.05) feed conversion compared to broilers switched to the grower diet on d 17 and d 21. During the challenge period, body weight gains and feed conversion ratios were similar for all non-challenged treatments. In challenged broilers, all vaccinated treatment groups gained more (P<0.05) body weight and displayed reduced (P<0.05) feed conversions ratios than non-vaccinated broilers post-challenge. Cumulative feed conversion ratios (1d to 27d) were similar for all non-challenged treatments. Lesion development was reduced (P<0.05) in the upper and lower intestinal segments in vaccinated challenged broilers compared to non-vaccinated challenged broilers. Live oocyst vaccination resulted in improved broiler performance and reduced lesion development during a field strain *Eimeria* challenge regardless of starter period duration.

Key Words: *Eimeria*, Broiler, Vaccination

335 *Campylobacter* contamination of broilers fed cottonseed or cottonseed products. J. A. Byrd¹, R. D. Stipanovic², J. L. McReynolds¹, L. F. Kubena¹, and D. J. Nisbet¹, ¹USDA/ARS/SPARC, Food and Feed Safety Research Unit, College Station, TX, ²USDA/ARS/SPARC, Cotton Pathology Research Unit, College Station, TX.

Previous research has demonstrated that broiler breeders fed cottonseed meal had significant reductions in *Campylobacter* when compared to soybean controls. In the present experiment, three studies were conducted to evaluate the effect of dietary cottonseed meal or gossypol on the incidence of *Campylobacter* and *Salmonella* colonization in broilers. In the first study, an *in vitro* fermentation using cecal contents from six-week-old broilers were combined with gossypol (4 µg/mL) and challenged with either *Campylobacter jejuni* (10⁴ cfu/mL) or *Salmonella* Typhimurium (ST; 10⁴ cfu/mL) and evaluated for the presence of these bacteria at 1, 3, 5, or 18 hours after challenge.

Campylobacter was significantly reduced from the gossypol treated contents one h after exposure as compared to the controls. *Salmonella* was not significantly reduced compared to the control. In the second study, day-of-hatch broiler chicks were fed a diet containing 0, 300, or 600 mg/kg of gossypol for 10 days and challenged with ST at d 3. The incidences in cecal *Salmonella* concentrations were not significantly different in broilers fed gossypol when compared to the controls. In a third study, market-age-broilers were fed a diet containing either a corn-soybean control, 20% cottonseed meal, 5% cottonseed hulls, or 5% whole cottonseeds for 12 weeks to evaluate the effects on *Campylobacter* cecal colonization. Broilers fed each diet became *Campylobacter* positive after one week and remained positive until termination of the experiment. The results of the present study suggest that broilers fed cottonseed or cottonseed products were not protected from *Campylobacter* or *Salmonella* colonization.

Key Words: Broiler, *Campylobacter*, Cottonseed

Production, Management & the Environment - Livestock and Poultry: Dairy Production and Management II

336 Reasons for culling in Iranian Holstein cows. A. A. Naserian¹, M. Sargolzaee¹, M. Sekhavati¹, and B. Saremi², ¹Ferdowsi University Of Mashad, Agric college, Animal Science Department, Mashhad, Khorasan Razavi, Iran, ²Education Center of Jihad-e Agriculture, Animal Science Departemnt, Mashhad, Khorasan Razavi, Iran.

Culling of dairy cows is probably one of the most complex decisions in dairy operations. It involves several factors and farmers consider e.g. stage of lactation, age, health status, level of milk production and current reproductive status of cows while making decisions about which cows to keep and which ones to cull. The aim of this study was to determine the profiles of culled cows in order to access the possible contribution to economic losses due to health disorders in the dairy herds of Khorasan province (Northeast of Iran). Data regarding all exits of cows from the herd were collected during a 5-year prospective survey in 15 large dairy commercial Holstein herds with over 4000 milking cows totally (From March 1999 to March 2004). All herds were recorded by an official milk-recording scheme. The management and feeding systems were almost similar in all herds. Rolling herd averages were also similar in all herds; over 24000 lb. A polytomous stepwise logistic regression method was used because it allows the use of a non-ordinal categorical variable. The model was run (Procedure PR of BMDP). Table 1 shows the results of this study. The most frequent primary culling reasons were infertility and health disorders, 25.13, 28.57 of total cull respectively. Percentages of six groups of culling reasons for level of parity showed that the first parity level had more frequent reproductive problems and health problems too. Therefore, in this study, more than one half of the cows were declared culled for health or reproductive related problems.

Table 1. Primary culling reasons across parities (Iranian Holstein cows 1999-2004)

Problem	Parity						Total %
	1	2	3	4	5	>5	
Reproductive	6.02	4.62	3.54	3.76	3.97	3.22	25.13
Mastitis	4.08	1.84	0.97	1.18	1.50	1.50	11.06
Lameness	2.15	1.50	2.47	2.50	1.18	2.26	11.07
Milk fever	0.54	0.75	1.18	0.86	1.07	1.61	6.02
Low Milk yield	2.26	2.79	3.44	1.61	2.15	5.91	18.15
Health disorders	5.70	3.22	4.83	5.59	4.19	5.05	28.57

Key Words: Culling, Parity, Health and Production

337 Commercial application of sex-sorted semen in Holstein heifers. J. M. DeJarnette¹, R. L. Nebel¹, B. Meek², J. Wells³, and C. E. Marshall¹, ¹Select Sires, Inc., Plain City, OH, ²Cache Valley Select Sires, Logan, UT, ³All West Select Sires, Turlock, CA.

Flow cytometric procedures were used to produce sex-sorted (SS; ~90% X-bearing), cryopreserved Holstein semen for commercial use at 2.1 x 10⁶ sperm/dose. Data were obtained from 108 herds of Holstein heifers via electronic back-up of herd records and personal communications. Conception rates (CR) achieved at first services with conventional semen (CS) were used to assess relative field performance and were assumed to be 60% when CS data were not available. The unadjusted CR to SS across 121 herds was 44% (n=16,587). The CR achieved by SS averaged 85±2.9% of that achieved with CS at first service and 74% of herds achieved CR ≥70% of that obtained with CS at first service. Among 25 herds that used ≥100 doses of SS (n=608±122 per herd), CR to SS averaged 48±1.9% (range 33 to 72%) compared to a CS first service CR of 54±1.8% (range 38 to 70%; n=525±109 per herd). Among heifers bred to SS, the average age at AI (425±0.81 d, n=3969) and at calving (708±1.31 d, n=2280) was shorter (P<0.01) than for heifers bred to CS (461±1.05 d, n=2367; 745±1.19 d, n=4028, respectively) reflecting recommendations for preferential use of SS at first service. Among heifers that failed to conceive at AI, the percentage re-bred in a normal 18 to 24 d interval was greater (P<0.05) for SS (70%, n=5,495) than CS (64%, n=3,712), which may be a function of more accurate estrus detection among SS bred heifers or a result of increase rates of fertilization failure to SS. The percentage of abortions did not differ (P>0.05) among heifers that conceived to SS or CS (1.4%, n=1810 vs. 1.9%, n=4902, respectively). Among single births, the percentage of female calves was greater (P<0.001) for SS (90%, n=3,361) than CS (48%, n=10,999). Among twin births, a greater percentage (P<0.01) of female-female pairs were observed for SS (75%, n=20) than CS (22%, n=121). Legitimate comparisons of CR for SS and CS in the commercial setting are difficult due to bias in semen use, however these data imply >70% of herds achieved CR with SS that were ≥70% of first service CR obtained using CS with a resulting female gender bias of ~90%.

Key Words: Sexed Semen, Flow Cytometry, Heifer AI