Animal Behavior & Well-Being - Livestock and Poultry I

M1   Analysis of the association of parity, body condition and lactation feed intake with claw lesions in breeding sows. S. S. Anil*, L. Anil, and J. Deen, *University of Minnesota*, *St Paul*.

Severe claw lesions can cause lameness in pigs. It is important to identify and analyze the association between claw lesions and various risk factors in order to minimize the incidence of such lesions to reduce removal of sows for lameness. The objective of this study was to analyze the association of factors such as parity, body condition (BC) score and average lactation feed intake (LFI) with lesion scores ($<$ median vs. $\geq$ median) on different claw areas in breeding sows using separate univariate logistic regression models (Proc logistic, SAS V 9.1). Claws of 771 sows in a breeding herd in Minnesota were examined for lesions on day 110 of gestation. Areas on the claw were classified as side wall (SW), heel (H), overgrown heel (OGH), sole (S), heel-sole junction (HSJ), white line (WL) and toe (T). Lesions were scored on a scale of 0 (no lesions) to 4 (severe). The final score on each area was obtained by multiplying the number of lesions by the severity of these lesions. Data on the parity of the sow and LFI were collected from the sow cards and BC was scored visually on a 5 point scale. For analysis, parity was categorized as parities 1 and 2, 3-5 and $\geq$ 6. The BC scores were categorized as $\leq$ 2 and $\geq$ 3. Average LFI was included in the model as a continuous variable. Sows of parity 1 and 2 had a higher likelihood of $\geq$ median scores for WL and HSJ lesions than sows of parity $\geq$ 6 (Odds ratio, OR 4.34 and 1.94 respectively) and lower likelihood of $\geq$ median scores for H lesions and OGH (OR 0.56 and 0.58 respectively, P $\leq$ 0.05 for all). Sows of parity 3-5 had lower (P $\leq$ 0.05) likelihood of $\geq$ median scores for OGH (OR 0.60) and higher (P $\leq$ 0.05) likelihood of $\geq$ median scores for WL lesions (OR 2.23) and HSJ lesions (OR 1.57). The odds of having $\geq$ median lesion scores were 58% and 43% higher (P $\leq$ 0.05) for sows with BC score of $\leq$ 2 compared to sows with a condition score of $\geq$ 3 on SW and WL respectively. The likelihood of $\geq$ median H lesion scores increased (P $\leq$ 0.05) by approximately 50% with every kg increase in average LFI. Results indicated that claw lesions were associated with parity, body condition and lactation feed intake.

Key Words: Claw Lesions, Sows

M2   Analysis of the association of claw lesions with lameness in breeding sows. L. Anil*, S. S. Anil, and J. Deen, *University of Minnesota*, *St Paul*.

Claw lesions are very common in pigs. Severe claw lesions can cause lameness, a welfare concern, and a major reason for early removal of sows from breeding herds. Housing conditions and management practices may be associated with the development of claw lesions. It is important to understand the association between claw lesions and lameness in order to minimize the incidence of such lesions and to reduce removal of sows for lameness. The objective of this study was to analyze the association of different types of claw lesions with lameness. Claws of 771 sows in a commercial breeding herd in Minnesota were individually examined for lesions on day 110 of gestation when sows were in the farrowing stalls. Lesions included erosions, cracks, and overgrowths. Areas on the claw were classified as side wall, heel, overgrown heel, sole, heel-sole junction, white line and toe. Lesions were scored on a scale of 0 (no lesions) to 4 (severe). The final score on each area was obtained by multiplying the number of lesions by the severity of these lesions. A multivariate logistic regression analysis was performed (Proc logistic) to assess the association of lesion scores (less than median vs. $\geq$ median) on different claw areas with lameness (lame vs. non-lame). The lesion scores on different claw areas of lame and non-lame sows were compared using Kruskal-Wallis test. Lesions on the heel and the white line were associated with lameness whereas overgrown heel, lesions at heel-sole junction and sole lesions were not associated with lameness. Sows with less than median heel lesion scores had 34% lower (P $\leq$ 0.05) likelihood of being lame. Similarly, sows with less than median white line lesion scores were less (P $\leq$ 0.05) likely to be lame (Odds ratio 0.689). Sows with less severe side wall lesions were less likely (Odds ratio 0.686) to be lame (P = 0.06). The comparison of lesion scores indicated higher (P $\leq$ 0.05) scores on side wall and white line in lame sows. Though not significant (P = 0.06), sole lesion scores tended to be higher in lame sows.

Key Words: Lameness, Sow, Claw Lesions

M3   Analysis of the association of periparturient risk factors with sow longevity. L. Anil*, S. S Anil, and J. Deen, *University of Minnesota*, *St Paul*.

Premature removal of sows in breeding herds is a reason for both economic and welfare concerns. Removal of younger parity females means that they are removed before they attain peak production performance. Farrowing is a high risk event in the life of a breeding female. The objective of the present study was to analyze the association of factors including parity, number of piglets born alive, lactation length, lactation feed intake and incidence of lameness during periparturient period (including lactation) with likelihood of sow

removal (cull, death or euthanasia) within 35 days post farrowing or before the next farrowing using multivariate logistic regression models (Proc logistic, SAS v 9.1). Data were (n =1357) collected from a commercial herd in Minnesota. Risk factors found significant (P ≤ 0.05) in the univariate analyses were only included in the multivariate model. For analysis, lameness was categorized as lame or non-lame and parity as parities 1 and 2, 3-5 and ≥ 6. Other variables were included in the model as continuous variables. The results indicated that the likelihood of removal from the herd within 35 days post-farrowing decreased (P ≤ 0.05) by approximately 19% with every additional piglet born alive. The risk of removal from the herd before 35 d post-farrowing decreased (P ≤ 0.05) by 34 % with every additional kg increase in average lactation feed intake. Sows that did not have lameness during periparturient period had a lower (P ≤ 0.05) likelihood of removal from the herd before 35 d post-farrowing (Odds ratio 0.260) compared to the other sows. Sows of parity 1 and 2, and 3 to 5 had lower (P ≤ 0.05) likelihoods of removal from the herd before 35 d post-farrowing compared to sows of parity ≥ 6 (Odds ratios 0.181 and 0.285 respectively). Number of piglets born alive (Odds ratio 0.916), incidence of lameness (Odds ratio 0.626) and parity (Odds ratio 0.548 and 0.558 respectively for parities 1 and 2 and parities 3-5 respectively) appeared to influence the likelihood of removal of sows from the herd before next parity as well (P ≤ 0.05 for all).

Key Words: Longevity, Sows, Periparturient Risk Factors

M4   Stress level of steers in long distance transport in Japanese four seasons. T. Ishiwata*, K. Uetake, Y. Eguchi, and T. Tanaka, *Azabu University*, *Sagamihara, Kanagawa, Japan*.

The objectives of this study were to investigate transportation conditions and behavioral and physiological responses of beef steers in long distance commercial transport in Japan. Japanese black × Holstein steers aged 8 mo were transported by truck in spring (n = 8), summer (n = 5), autumn (n = 8) and winter (n = 5). Transport distances (time) were 1,020.6 km (25 h including lairage periods): 615.4 km (6.4 h) on expressways, 163.2 km (3.7 h) on arterial roads and 242.0 km (10.5 h) by ferry. Internal temperatures of the truck were $14.7 \pm 4.7°C$ in spring, $27.9 \pm 2.6°C$ in summer, $24.4 \pm 2.8°C$ in autumn and $9.2 \pm 4.3°C$ in winter. During transport, more steers were lying during moving on expressways (chi square test, P < 0.001). The reason for this should be that vibration acceleration (m/s^2) of the truck in the lateral direction was smaller on the expressways (0.29 ± 0.36) than on arterial roads (0.31 ± 0.16) (Tukey's studentized range test, P < 0.05). Blood glucose, plasma cortisol, serum triiodothyronine (T_3) and ALT (reflecting liver function) concentrations were higher in spring (Tukey's studentized range test, all P < 0.05). This could be explained by that vibration acceleration (m/s^2) of the truck in the longitudinal direction was bigger in spring (-0.19 ± 0.43) than in the other seasons (-0.14 ± 0.09 in summer, -0.15 ± 0.20 in autumn and -0.15 ± 0.13 in winter) (Tukey's studentized range test, all P < 0.01). Furthermore, internal airflow velocity (m/s) of the truck was lower in spring (0.75 ± 0.70) than in summer (1.72 ± 1.88) and winter (1.31 ± 1.33) (Tukey's studentized range test, both P < 0.01). Heart rate, serum concentrations of T_3, cholesterol, protein, AST (reflecting liver function) and ALT were higher just after transport than 1 wk after transport (Tukey's studentized range test, all P < 0.05). However, level of transport stress should be low, since no difference between before and after transport was shown on concentrations of plasma cortisol, blood lactate and serum NEFA, and serum pH and BW.

Key Words: Beef Cattle, Transport, Stress

M5   Welfare assessment of cattle transported in Japan. K. Uetake*, T. Ishiwata, Y. Eguchi, and T. Tanaka, *Azabu University*, *Sagamihara, Kanagawa, Japan*.

The objective of this study was to assess cattle welfare during transportation. Vehicle inspection and observation of cattle behavior were conducted at major livestock markets (T and M) in Japan. Market T provided young cattle (Wagyu and crossbred aged 6.8 to 9.0 mo) mainly for regions farther than 1,500 km. Market M provided young cattle (Wagyu aged 6.6 to 11.2 mo) and small calves (crossbred and Holstein aged 21 to 47 d) for nearby regions less than 500 km. Market T had loading platforms 1.0 m high, whereas market M did not have them and forced transporters to load cattle from the ground. Requirements to be met by vehicles were inspected according to the welfare standards for beef cattle of the RSPCA. Number of vehicles inspected was 36 and 31 in markets T and M, respectively. Cattle hesitations (kneeling down, slipping, balking, backing down, turning around, jumping and eliminating) were observed at the loading ramp. Vehicles inspected at the markets complied with most requirements of the welfare standards, but non-compliance was found in two requirements: In market M, 71.0% of vehicles had the loading ramp at more than a 20% incline, whereas 17.1% of vehicles did in market T (chi square test, P < 0.001). Slope of the loading ramp was steeper in market M than in market T (median 35.9% vs. 14.5%; Mann-Whitney test, P < 0.001). Market M had higher proportion of vehicles that did not comply with the requirement 'Both loading ramps and tail boards must be appropriately designed and covered with litter, to prevent animals from falling off or slipping' compared with market T (83.9% vs. 17.1%; chi square test, P < 0.001). Higher frequencies were observed in some hesitations in market M than in market T (Mann-Whitney test, all P < 0.05): Median frequencies (times/head) of slipping, balking and jumping were 1.0, 1.1 and 0.1 in market M, and 0.0, 0.8 and 0.0 in market T, respectively. Steeper loading ramp was correlated with higher frequencies of kneeling down (r = 0.53), slipping (r = 0.59), balking (r = 0.45) and backing down (r = 0.42) in market M (Pearson's correlation coefficient, all P < 0.05).

Key Words: Beef Cattle, Transportation, Welfare

M6   Spirit of humane. J. M. Regenstein*[1], J. Moses[2], and L. Jacoby[2], [1]*Cornell University*, *Ithaca, NY*, [2]*Shepherd Song Farms*, *Downing, WI*.

The recent emphasis in the US and Europe on animal welfare often presents a challenge for small meat processors and on-farm slaughter operations (where permitted by law) to meet modern animal welfare slaughter standards such as those of the Food Marketing Institute and the National Council of Chain Restaurants. This can especially be the case for the special slaughter needs of the religious communities, particularly the Muslim community, where all adult Muslim ideally slaughter a sheep or goat at least once a year. It may also be a challenge for small scale slaughter in the Jewish community, where only a trained slaughterman is used. Other ethnic groups wanting freshly slaughtered meat may not be knowledgeable about current animal welfare standards. As one looks at the developing world, there is an even greater need to educate people about animal welfare, ideally presenting them with a workable solution. Working with Dr. Temple Grandin (Colorado State Univ.), a small scale, low-cost sheep/goat slaughter pen has been designed that builds on her double rail animal support system. An appropriate commercially available slaughter knife with a long straight blade has been identified that is ideal for religious

slaughter and for the slaughter of un-stunned animals, giving an easily handled, calm animal. This assures that the full humane benefits of un-stunned slaughter can be realized. In addition an educational poster on humane animal handling has been prepared for both religious and non-religious slaughter and this poster has been translated into a number of other languages including: Arabic, Malay, Persian, Spanish, Somali, Turkish and Urdu. The original pen design for sheep and goats has been modified to make it efficiently shippable and easily assembled without any special tool requirements. An alternate pen for larger animals is being designed with the same criteria, but obviously requiring a sturdier structural framework.

Key Words: Humane Slaughter, Sheep, Goats

M7   Comparison of beak trimming methods on early broiler breeder performance. S. N. Henderson*[1], J. T. Barton[2], W. J. Kuenzel[1], A. D. Wolfenden[1], S. E. Higgins[1], J. P. Higgins[1], C. A. Lester[1], G. I. Tellez[1], and B. M. Hargis[1], [1]*University of Arkansas, Fayetteville*, [2]*Tyson Foods, Springdale, AR*.

Beak trimming is necessary in commercial broiler breeders to prevent aggressive trauma as they mature. Two common methods were evaluated by early performance comparison with non-trimmed chicks (NBT). The robotic electrocautery device (ECD) trims and cauterizes the beak tip, while the robotic infrared beak trimming device (IBT) applies an infrared light beam to destroy the live basal tissue while leaving the hard corneum intact for the first ~10 days. On day-of-hatch, 900 Ross 708 byproduct chicks were obtained from a local hatchery, and 1/3 of the chicks were trimmed using IBT. All 900 chicks were then transported to another hatchery where 1/3 were trimmed using ECD. Personnel at each hatchery were highly experienced and skilled with their respective technique. All chicks were then transported to UA facilities where chicks were co-mingled, provided ample feeder and water space, and age-appropriate environment on fresh wood shavings. Prior to placement, chicks were individually neck tagged, weighed, and beaks were measured using a digital caliper: from the rostral point of the nares to either the beak tip (NBT and IBT) or amputated line (ECD). Initial beak measurements of NBT group (6.3 mm) were significantly (p<0.05) longer than ECD (3.8 mm) and the intact beak of IBT (5.8 mm). No significant (p>0.05) differences in body weight gain (BWG) were observed among treatments at 4 d (NBT: 35.5g; ECD: 32.3g; IBT: 32.7g) or 7d (NBT: 81.2g; ECD: 81.2g; IBT: 82.9g) post-placement. Effects of treatments on BWG through 6 wks will be reported. These results suggest that when beak trimming is performed on day-of-hatch by skilled and experienced personnel, little measurable effects on performance are observed during this critical first 7 day period when ample feeder and water space are provided.

Key Words: Beak Trimming, Early Performance

M8   Analysis of the incidence of claw lesions in breeding sows. S. S. Anil*, L. Anil, and J. Deen, *University of Minnesota, St Paul*.

A painful lesion in the claw can cause lameness in pigs. Housing conditions and management practices may be associated with development of claw lesions. Measures to minimize the incidence of claw lesions and lameness must be preceded by attempts to understand the pattern of the incidence of claw lesions. The objective of this study was to characterize claw lesions in breeding sows. Claws of 771 sows in a commercial breeding herd in Minnesota were individually examined for lesions on day 110 of gestation when sows were in the farrowing stalls. Lesions included erosions, cracks, and overgrowths. Areas on the claw were classified as side wall (SW), heel (H), sole (S), heel-sole junction (HSJ), white line (WL) and toe (T). Lesions were scored on a scale of 0 (no lesions) to 4 (severe). The final score on each area was obtained by multiplying the number of lesions by the severity of these lesions. The proportions of sows with and without lesions on different areas in the lateral and medial claws of front and hind limbs and the proportions with severe (≥ 4 score) and less severe (≤ 3 lesion score) were compared using 1-sample and 2 sample proportion tests. The proportions of sows with overgrown heel (OGH), and lesions on SW, H and WL were higher than the proportions without lesions ($P \leq 0.05$, 1- sample proportion test). However, a higher ($P \leq 0.05$) proportion of sows had no lesions on the T. There was no difference in the proportion of sows with and without lesions on the S and HSJ. A higher proportion of sows had lesions on the SW, WL, HSJ, S and T in the front limbs compared to the hind limbs ($P \leq 0.05$, 2-sample proportion test). A higher proportion of sows had H lesions and OGH in the hind limbs than in the front limbs ($P \leq 0.05$). In both front and hind limbs, the proportions of sows with lateral claw lesions were higher than those with medial claw lesions ($P \leq 0.05$, 2-sample proportion test). The proportions of sows with ≤ 3 lesion scores in all claw areas except the SW were higher ($P \leq 0.05$, 1-sample proportion test) than the proportions with ≥ 4 lesion scores. The study indicates a high prevalence of claw lesions, especially severe SW lesions.

Key Words: Claw Lesions, Sows

M9   Effect of the presence of hungry conspecifics in the stress and weight gains of recently weaned lambs. J. Rojas, R. Vázquez, F. I. Flores-Pérez, V. Aguirre, and A. Orihuela*, *Universidad Autónoma del Estado de Morelos, Morelos, México*.

Newly-weaned lambs were exposed to feed in the presence of hungry conspecifics to determine if socially-facilitated feeding behavior would help to alleviate stress and improve weight gains during the period immediately following weaning. Twenty-two (Dorper X Santa Cruz) single lambs, were assigned to two groups at 60 days of age. No lambs were added to the control group, while in the experimental group, a total of fifteen hungry weaned lambs were added daily with a 90 min interval between introduction of each group of five hungry lambs starting at the time of mother young separation (08:00). These hungry lambs were fasted for 12 h previous to their use. Significant (P<0.05) increases in the number of visits to the feeders and serum cortisol concentration were observed daily during four days in the experimental lambs in comparison with the controls. Lambs in the experimental group vocalized less (P<0.05) frequently than controls during the third and fourth day of separation, while no differences (P>0.05) were found between groups or days in the number of animals lying and individual weight gains. It was assumed that the increased number of visits to the feeder by the experimental lambs was a socially facilitated behavior in response to the continuous use of the feeders achieved by the hungry lambs. As a consequence of this increase in locomotor activities, fewer experimental animals were observed lying. In addition, the reduction in vocalizations in the experimental group on days three and four may reflect a reduction in separation distress or habituation to the test procedure. The higher cortisol concentrations of the experimental group may have been induced by the constant changes in social

environment and handling that the experimental group experienced. It was concluded that social facilitation increased the number of visits to the feeders, but had no effect on the stress and weight gain of recently weaned lambs.

Key Words: Welfare, Weaning, Lambs

M10   Bone quality, behavioural repertoire, and physical condition of laying hens housed in conventional, modified and furnished colony battery cages. M. J. Jendral*[1], D. R. Korver[1], J. S. Church[2], and J. R. Feddes[1], [1]*University of Alberta*, *Edmonton, Canada*, [2]*Alberta Agriculture, Food and Rural Development*, *Edmonton, Canada*.

The welfare of White Leghorn hens housed in conventional (CON) (30cm x 45cm) (n=84), modified (MOD) (n=84) (60cm x 45cm) and furnished colony (120cm x 110cm) (n=24) cages was investigated by evaluating bone quality, behavior and physical condition. All cages provided 450cm^2 floor space/hen. CON and MOD each housed 3 hens, and MOD contained a perch (30cm x 5cm) and nestbox (NB) (24cm x 45cm), providing an additional 360cm^2 of nest area/bird. Colony units, which housed 26 hens, contained a perch (120cm x 5cm), NB (60cm x 55cm) and were furnished with (CWDB) or without (CWODB) a dustbath (DB) (60cm x 20cm), providing each hen with 126cm^2 NB space, and in CWDB, 46cm^2 DB area. Video recordings at 35 and 60 wks were examined for locomotory behavior, and hen physical condition was scored at 31 and 65 wks. At 65 wks, hens were euthanized and right femur, tibia and humerus were excised for analysis. Data were analyzed using GLM for mixed effects, and scored condition values were compared by chi-square analysis. Effects were significant at P<0.05. CON hens exhibited lower femoral and tibial total mineral density and mass, cortical area and mass, and breaking strength than CWDB, CWODB or MOD hens, but higher density and cross sectional area of bone in the trabecular space. Total and cortical humeral density, mass and breaking strength were higher in CWDB and CWODB than in CON and MOD. Birds in CON cages exhibited more pacing, standing and escape behaviors, but fewer bouts of walking, wing flapping, stretching and ruffling than hens in furnished cages. CWDB and CWODB hens perched, jumped and walked more than hens in MOD. Average and total feather condition scores were higher for MOD and CON hens, as were the proportion of hens with higher scores for individual body regions, and head and vent wounds. Foot and claw condition were improved in furnished cages, and keel bone scores were lowest for MOD hens. These finding suggest that while group size impacts hen welfare, MOD and colony cages provide amenities that encourage movement, performance of natural behaviours and improved bone condition.

Key Words: Layer, Welfare, Behaviour and Condition

Animal Health - Livestock and Poultry: Bovine I

M11   Osteopontin expression during the periparturient period in dairy cows naturally infected with *Mycobacterium avium* subsp. *paratuberculosis* infection. E. L. Karcher*[1], D. C. Beitz[1], and J. R. Stabel[2], [1]*Iowa State University*, *Ames*, [2]*USDA-ARS-National Animal Disease Center*, *Ames, IA*.

Investigation of the role of osteopontin (Opn) in Johne's disease is of interest based upon its ability to influence cytokine expression and to improve host defense against mycobacterial infections. The objective of this study was to characterize Opn expression and secretion by peripheral blood mononuclear cells (PBMCs) isolated from periparturient dairy cows naturally infected with Mycobacterium avium subsp. paratuberculosis (MAP). Twenty-five multiparous Holstein cows were assigned to 3 groups based upon their infection status: 1) noninfected healthy cows (n = 8), subclinically infected cows (n = 10), and clinically infected cows (n = 7). Blood was collected from the jugular vein from 3 wks pre- through 5 wks post-calving. PBMCs were isolated from the buffy coat fractions of whole blood. PBMC were cultured for 24 h with and without MAP whole cell sonicate (MPS). RNA was extracted from cells, and converted to first-strand cDNA. Real-time PCR was performed on each sample to evaluate the expression of Opn. RT-PCR data was evaluated using $2^{-(\Delta\Delta Ct)}$ with samples calibrated within treatment to mean $\Delta\Delta Ct$ value at one day after calving. Immunoblot analysis was performed for detection of Opn protein from cultured PBMCs. PBMCs isolated from subclinical cows expressed greater amounts of Opn mRNA compared with control (P<0.06) and clinical (P<0.05) cows. Expression was higher prepartum, followed by a decline at calving that was consistent until 21 days postpartum. MPS-stimulated PBMCs from subclinical cows expressed less Opn mRNA than control and clinical cows (P<0.05). There was no effect of parturition on expression from stimulated cells, regardless of treatment group. Immunoblot analysis of Opn detected a predominant band at 50 kDa and three minor bands at 62, 37, and 24 kDa. The data indicate an ability of MAP infection and parturition to modulate Opn expression.

Key Words: Periparturient, Osteopontin, *Mycobacterium avium* subsp. *paratuberculosis*

M12   Development of a novel enzyme-linked immunosorbent assay for the diagnosis of Johne's disease. S. Eda*[1], A. J. Branscum[2], Y. Kaneko[1], M. C. Scott[1], and C. A. Speer[1], [1]*University of Tennessee*, *Knoxville*, [2]*University of Kentucky*, *Lexington*.

Johne's disease (JD), caused by *Mycobacterium avium* subsp. *paratuberculosis* (MAP), has a significant economic impact on the US dairy cattle industry. Use of enzyme-linked immunosorbent assays (ELISA) to identify cattle for further fecal culture testing or for culling is listed as a recommended method for JD control in dairy and beef herds. However, several recent reports estimated diagnostic sensitivities of currently available ELISAs to be only 13.5 to 27.8%. For example, by using a Bayesian non-gold standard analysis, the diagnostic sensitivities of two current ELISAs were estimated to be 26-27%. Recently, it was predicted that if the diagnostic sensitivity of currently available ELISAs could be improved to 80%, then their use could result in an effective reduction of JD prevalence, higher level of milk production, and higher annual net revenue per cow. We developed a novel ELISA, called EVELISA, for the detection of MAP infections in cattle and is highly sensitive identifying 97.4% of fecal-culture positive cattle compared to a currently marketed ELISA that identified 50%. However, when 37 serum samples from a herd with a high rate of false-positives were tested by the EVELISA as well as a currently available ELISA, both ELISAs found more than 70% of the samples to be positive for JD. The false-positive rate of the