

SYMPOSIA AND ORAL SESSIONS

Animal Behavior and Well-Being: Swine

240 ASAS Centennial Presentation: Animal behavior and well-being: What does the future hold? A. K. Johnson*, *Department of Animal Science, Iowa State University, Ames.*

Compared to the more traditional sciences of nutrition, physiology and reproduction, farm animal behavior and well-being science is quite young. Seven colleagues who are considered to be the future generation of ethologists were asked several questions on the challenges and opportunities facing the field. The information collected was pooled for anonymity. The average time working in the field was 10 yr. Species that are regularly worked with were beef (5), swine (5), dairy (2), poultry (1), and sheep (1). Challenges identified by the group were (1) are we making progress and if so how can we define this? (2) the demand for information has outpaced the science (3) pressures from stakeholders (4) individuals in the field of research, teaching and extension are over-worked and (5) the need to address basic ethological questions has been lost. Solutions were (1) to continue providing sound science that has been validated, measured objectively and is reliable, (2) to separate behavior and well-being into their own research funding categories and for a percentage of this funding to be directed towards the basic science and (3) for animal science and veterinary medicine departments to continue to employ faculty trained in ethology. Highlights for the future are the willingness and acceptance for ethologists to work across disciplines within their department, across departments within the same institution, and across state lines. There is also interest in continuation and expansion of new teaching models that bring together a critical mass of experts and students and the innovative researchers who are discussing questions in regards to animal cognition, emotions and pain. In conclusion, new and innovative tools, personalities and dedication to the field of animal behavior and well-being will continue to provide scientific information and direction. ASAS has a critical role in bringing together scientists in this field to deliver new and invigorating findings to the scientific community and beyond.

Key Words: Behavior, Future, Well-Being

241 Effects of facility design on the stress response of market weight pigs during loading and unloading. A. Johnson*¹, L. Sadler¹, M. Faga², C. Feuerbach², H. Hill², R. Bailey³, and M. Ritter⁴, ¹*Department of Animal Science, Iowa State University, Ames,* ²*Iowa Select Farms, Iowa Falls, IA,* ³*Swift and Co., Marshalltown, IA,* ⁴*Elanco Animal Health, Greenfield, IN.*

Thirty three loads of market weight pigs (n = 5,901) were used in randomized complete block design to determine the effects of 2 different facility designs on stress responses and transport losses at the plant. The new (NEW) design had 192 pigs/pen and internal swing gates that were used to manually pre-sort market weight pigs on the day before loading. Traditional (TRAD) design had 32 pigs/pen; it was not feasible to pre-sort market weight pigs prior to loading. This design confounds the effects of facility design with pen size and pre-sorting, but this is how the 2 facility designs are being utilized under commercial conditions. Three sites were used in this study. Each site had 2 rooms and both facility designs were represented in each room. During loading, treatments were randomly assigned to trailer decks. Pigs were moved in groups using sort boards and prods, when necessary. Pigs were loaded onto straight deck trailers, mixed with unfamiliar pigs, provided with ~0.41 m²/pig and were transported ~1 h to a commercial plant. During loading and unloading, the number of pigs displaying open mouth breathing (OMB), skin discoloration (SD) and muscle tremors (MT) were recorded. At the plant, dead and non-ambulatory pigs were recorded during unloading, and total losses were defined as the sum of dead and non-ambulatory pigs at the plant. Data were analyzed by Proc Glimmix of SAS. NEW pigs had lower ($P \leq 0.05$) percentages of OMB, SD and MT during loading and unloading compared to TRAD pigs. NEW pigs had fewer ($P < 0.05$) dead pigs (0.01 vs. $0.23 \pm 0.05\%$), non-ambulatory pigs (0.29 vs. $0.66 \pm 0.12\%$) and total losses (0.30 vs. $0.89 \pm 0.14\%$) at the plant compared to TRAD pigs. In summary, utilizing large pens and pre-sorting prior to loading, reduced physical signs of stress during loading and unloading, and reduced total losses at the plant by 66% compared to pigs from traditional pens.

Key Words: Facility Design, Pig, Transportation Stress

242 Effect of trailer design on the behavior of market weight pigs during unloading and lairage. S. Torrey^{*1}, H. Gonyou^{2,3}, J. A. Correa⁴, R. Bergeron⁵, T. Widowski⁵, N. Lewis⁶, T. Crowe², C. Dewey⁵, and L. Faucitano¹, ¹*Agriculture and Agri-Food Canada, Sherbrooke, QC, Canada*, ²*University of Saskatchewan, Saskatoon, SK, Canada*, ³*Prairie Swine Centre, Saskatoon, SK, Canada*, ⁴*Université Laval, Quebec City, QC, Canada*, ⁵*University of Guelph, Guelph, ON, Canada*, ⁶*University of Manitoba, Winnipeg, MB, Canada*.

Trailer design has been implicated with influencing in-transit mortality and carcass quality in market weight pigs, although little is known about its effect on behavior during unloading or lairage. Therefore, the objective of this experiment was to determine if trailer design influenced behavior during unloading and lairage at a commercial facility. Over the course of 6 wk, 1,596 pigs (BW=118.4±0.4 kg) were transported on either a 3-deck pot-belly truck with internal ramps to upper and lower levels (PB; n=181 pigs per week in 8 experimental compartments; 0.40 m²/pig) or a double-decker hydraulic truck without internal ramps (DD; n=85 pigs per week in 4 compartments; 0.40 m²/pig) for 2 h to a commercial abattoir. Pigs were unloaded by compartment at the abattoir and driven into lairage pens segregated by truck compartment. Behavior during unloading (slips and falls), time to unload each compartment (adjusted for number of pigs per compartment), latency to rest (75% of pen lying) and total time lying during the first hour of lairage were observed. Behavior data were analyzed using the mixed model procedure in SAS. Accounting for the number of pigs, unloading from PB was significantly longer than from DD ($P<0.001$; PB: 2.9±0.1 sec/pig; DD: 2.1±0.2 sec/pig), although there was no difference in the number of slips and falls during unloading ($P=0.48$; PB: 0.04±0.01 incidence/pig; DD: 0.05±0.01 incidence/pig). During lairage, there was no difference between trucks in latency to rest after transportation ($P=0.96$; PB: 35.3±2.4 min; DD: 35.1±3.9 min), although pigs from DD tended to spend more time lying than PB pigs ($P=0.06$; PB: 45.2±2.0% of time lying; DD: 51.4±3.0% of time lying). Although trailer design did not influence latency to rest, pigs from PB took longer to unload and spent less time lying in lairage. Further analyses will determine the effect of location within truck on behavior and welfare.

Key Words: Pig, Transportation, Behavior

243 Space requirements of weaned pigs during transport in summer. M. A. Sutherland^{*1,2}, P. J. Bryer^{1,2}, B. L. Davis^{1,2}, and J. J. McGlone^{1,2}, ¹*Pork Industry Institute, Lubbock, TX*, ²*Texas Tech University, Lubbock*.

Currently there are no trucking quality assurance recommendations for space allowance of weaned pigs during transport. The objective of this research was to establish an estimate of the space requirements of weaned pigs during transport in summer based on measures of animal well-being. A commercial semi-trailer was fitted with compartments that provided 0.05, 0.06, and 0.07 m²/pig (on both upper and lower decks) with 100 pigs per compartment. Cameras were placed in each compartment to record behaviors and postures of the pigs during transport. The frequencies of standing, lying, sitting, standing on another pig, and lying or huddling on top of another pig were recorded using 1 min scan samples during the entire duration of transport. Blood samples were taken and weights and lesion scores recorded from 4 pigs (5.1 ± 0.10 kg) per compartment for performance and physiology measures before and after transport (n=8 pigs/treatment). Pigs were transported for 60 min to the wean-to-finishing site using the same route for each 4 replicates

during summer (28.4 ± 1.23 °C and 59.8 ± 4.42% humidity). Data were analyzed by Proc MIXED of SAS. The trailer was the experimental unit. Cortisol, hematocrit, blood urea nitrogen, total protein, albumin, aspartate aminotransferase, creatine kinase, and gamma glutamyl transferase were increased ($P<0.05$) during transport regardless of space allowance. Glucose and body weight were decreased ($P<0.05$) during transport regardless of space allowance. The neutrophil to lymphocyte (N:L) ratio was greater ($P<0.005$) in pigs transported at 0.05 m²/pig compared with pigs transported at 0.06 and 0.07 m²/pig. Pigs transported at 0.05 m²/pig laid down less ($P<0.05$) than pigs transported at 0.06 and 0.07 m²/pig between 30 and 60 min of transport. In conclusion, increased N:L ratio and decreased lying behavior in pigs transported at 0.05 m²/pig suggest that space allowances of 0.06 or 0.07 m²/pig are preferable when transporting weaned pigs during summer.

Key Words: Animal Welfare, Pigs, Transport

244 The effect of 30-hour transport at two space allowances on physiological measures of stress in breeding gilts. P. J. Bryer^{*}, M. A. Sutherland, B. L. Davis, J. Smith, and J. J. McGlone, *Pork Industry Institute, Texas Tech University, Lubbock*.

Long duration transport is an important welfare issue. Little experimental work exists on the effects of long duration transport on breeding gilts. The goal of this study was to evaluate the effects of a 30-h transport on acute physiological measures in breeding aged gilts. Two space allowances were constructed 5 times in a commercial semi-trailer allowing 0.334 and 0.409 m²/pig. The experiment was repeated twice in October 2007 in Lubbock, TX, USA and included 120 pigs (91.4kg ± SE1.40). In addition to 4 gilts per experimental treatment on the trailer, 4 control gilts remained in the home pen. Control gilts had access to food and water within their 3.05 by 4.27 m pen. Every 6 h, pigs in one pair of compartments were sampled by removal from the trailer. Blood samples (10 mL via jugular venipuncture) and body weights were collected from gilts and their respective controls before and after transport (at -24, 6, 12, 18, 24, and 30 h). The MIXED procedure in SAS with repeated measures was used with individual gilts as the experimental unit. Weight loss was greater ($P<0.05$) among transported pigs relative to controls at the first 6-h measure, however after the initial weight loss, body weights were not different ($P>0.05$) in transported pigs from 12 through 30 h. Additionally, no differences ($P>0.05$) were observed in weight between space allowances. Transient changes were seen in glucose, total protein, albumin, lymphocytes, granulocytes, neutrophil:lymphocyte ratio, hematocrit, and platelets. Cortisol, creatine kinase, and aspartate aminotransferase did not differ between treatments. Transported gilts experienced only transient compromises of health or welfare based on the parameters evaluated. Overall, these data indicate that the 28-h law may be too conservative to be broadly applied to all classes of livestock as we found no negative health trends at 30 h in gilts transported 12 to 24 h vs. gilts not transported.

Key Words: Transportation, Animal Welfare, Pigs

245 Responses to weaning and transport in pigs: Influence of sex and weaning weight. T. A. Cooper^{*}, M. P. Roberts, C. J. Kojima, and H. G. Kattesh, *University of Tennessee, Knoxville*.

Pigs (n=64; 22±0.3 d of age) were blocked by sex and weight and allocated into transported (T) or non-transported (NT) groups at weaning (d 0). All NT pigs were weaned into 1.2 m² pens (4 pigs/pen, 2 pens/factorial group) while T pigs were transported as a group for 3 h in a small livestock trailer before being similarly placed in pens. Pigs were weighed and a blood sample collected on d 0 (pre-weaning), 1, and 7. Data were analyzed using a mixed model with a factorial design and repeated measures; fixed effects were transport, sex, and time. Weaning weight was used as a covariate. Plasma concentrations of corticosteroid-binding globulin (CBG) decreased (P<0.001) by d 1 and remained lower through d 7 in both T and NT pigs. A sex*time interaction occurred (P=0.003) such that while cortisol concentrations in males increased from d 0 to d 1 and then decreased to pre-weaning levels by d 7, females had higher preweaning cortisol levels which did not change on d 1 but decreased by d 7 to lower levels than in males (P<0.05). The free cortisol index (FCI; a ratio of cortisol to CBG) was elevated (P<0.001) on d 1 in all groups but returned to pre-treatment levels by d 7. Regardless of

treatment, lighter weight pigs had lower CBG concentrations (r=0.330; P=0.010) and higher FCI (r=-0.305; P=0.018) as measured on d 1. Total white blood cell number increased from d 0 to d 1, then decreased by d 7 (P<0.001). The percentage and absolute number of neutrophils followed a similar pattern, whereas lymphocyte percentage and number changed in an opposite manner. The number of neutrophils present on d 1 also varied by sex (P<0.05) such that females had higher numbers of neutrophils than males. Correlation analysis revealed that, regardless of treatment, lighter weight pigs had greater numbers of neutrophils (r=-0.304, P=0.025) and percentages of neutrophils (r=-0.403, P=0.002) in circulation than did the heavier pigs prior to weaning but not after. The process of weaning appears to uncouple the relationship between body weight and circulating immune cell populations. The physiological response due to weaning is greater, especially in lighter weight pigs, than is the response to transport.

Key Words: Swine, Stress, Weaning