

weeks after service. The following time dependent variables were also included in the model: previous gestational length, total number of pigs born and stillborn and mummified piglets for serviced females. Almost 1% of females (0.8%) were removed due to prolapse (95% confidence interval: 0.75-0.84%), and the overall annualized prolapse incidence rate was 3.8 cases per 1,000 pig-years (95% confidence interval: 3.59-4.01). Factors that increased the risk of pig prolapse were the 16th week after service, being in parity 3 or higher, re-service, servicing in summer, autumn or winter, short previous gestational length and 2 or more stillborn piglets ($P \leq 0.04$). For example, the prolapse hazard was 30.8 times higher in the 16th week after service than in weeks 0-14 ($P < 0.01$). Also, the prolapse hazard was 1.6-1.9 times higher in parity 3 or higher sows than in gilts ($P < 0.01$), and 1.2 times higher in re-serviced pigs than in first serviced pigs ($P = 0.04$). It was also 1.3-1.5 times higher in females serviced in summer, autumn or winter than in females serviced in spring ($P < 0.05$), and 1.3-1.4 times higher in sows with up to 113 days gestational length than in sows with 114 days or longer gestational length ($P < 0.01$). Lastly, prolapse hazard was also 1.4 times higher in sows with two or more stillborn piglets than in sows with no stillborn piglets ($P < 0.01$). However, there were no associations between removal due to prolapse and any other factors, including age at first service ($P = 0.30$), total number of pigs born ($P = 0.06$) and mummified piglets ($P = 0.32$). Therefore, to reduce the risk of prolapse removals producers should try to identify prolapse occurrences at an early stage by paying attention to at-risk female pigs in peripartum periods.

Key Words: matched case-control study, hazard model, prolapse

90 Evaluating Body Condition of Group-Housed Gestating Sows: Sow Caliper Measurements Vs. Backfat Thickness and Visual Scores. Y. Li^{*1}, S. Cui¹, X. Yang², S. K. Baidoo², L. J. Johnston¹, ¹West Central Research and Outreach Center, University of Minnesota, Morris, MN, ²Southern Research and Outreach Center, University of Minnesota, Waseca, MN

This study was designed to evaluate body condition of gestating sows using the following approaches: objective body condition measurement (sow caliper), backfat depth, and subjective body condition scores (BCS). Sows (n=928, Parity 1-9) from 20 breeding groups were group-housed in pens (42 to 51 sows/pen) with an electronic sow feeder at wk 5 postmating until d 109 of gestation. Backfat depth, body condition, and BW were measured

for all sows upon entry and exit of gestation pens. Sow caliper measurements were recorded at the P2 location and backfat depth using an ultrasonic scanner (Renco Leanmeater[®]) was recorded at the same location on both sides of the body. A scoring system of 1 (emaciated) to 5 (obese) was used for BCS. At entry to gestation pens, 8% of sows across parities had caliper measurements between 14.5 and 18 (Fat), 54% of sows between 10.5 and 14 (Fit), 24% of sows between 8.5 and 10 (Thin), and 14% of sows between 4 and 8 (Very Thin). The corresponding backfat depth (median) for Fat, Fit, Thin, and Very Thin sows were 19, 16, 13, 11, and 10 mm, respectively, and the corresponding BCS were 4.0, 3.5, 3.0, 3.0, and 2.5, respectively. There were correlations (all $P < 0.0001$) between entry and exit of gestation pens for caliper measurements ($r=0.826$), backfat depth ($r=0.858$), BCS ($r=0.844$), and BW ($r=0.888$), suggesting that caliper measurements assessed body condition of sows at the two observation times similar to other measurements of body condition. Across parities at entry (r_1) and exit (r_2) of gestation pens, caliper measurements were correlated with backfat depth ($r_1 = 0.714$; $r_2 = 0.739$), BCS ($r_1 = 0.665$; $r_2 = 0.742$), and BW ($r_1 = 0.532$; $r_2 = 0.539$; all $P < 0.0001$). For sows in each parity category at entry to gestation pens, meaningful correlations (all $P < 0.0001$) between caliper measurements with backfat depth ($r_1 = 0.685$ for parity 1-2; $r_1 = 0.697$ for parity 3-4; $r_1 = 0.736$ for parity 5-6; and $r_1 = 0.685$ for parity 7-9), BCS ($r_1 = 0.629$, $r_1 = 0.673$; $r_1 = 0.635$, and $r_1 = 0.627$), and BW ($r_1 = 0.555$; $r_1 = 0.719$; $r_1 = 0.745$; and $r_1 = 0.676$), respectively. These data indicate that caliper measurements correspond to backfat depth and BCS, and can be used as a tool to evaluate body condition of gestating sows.

Key Words: Body Condition, Sow Caliper, Group-housing

91 Floor Space Allocation Effects on Heavy Weight Finishing Pigs (over 135 kg). R. Samuel^{*}, B. C. Thaler, C. L. Levesque, J. Darrington, *South Dakota State University, Brookings, SD*

Finishing pigs are stocked to maximize floor space utilization, in accordance with the designed number of animals per pen. However, because currently available floor space allocation recommendations are based on considerably lighter market weight pigs, it raises the question of whether these recommendations require revision. The objective of this study was to investigate the effects of individual floor space allocation on feed conversion and overall performance of pigs from 105.2 ± 0.5 kg to heavy weight finishers over 135 kg. Pigs were provided free access to water via two cup

waters and meal diets from 173 cm of linear feeder space in each pen throughout the trial. Diets were based on corn and soybean meal and formulated to meet or exceed nutrient requirements (NRC, 2012) in two phases: 1) 100 to 120 kg providing 0.57% SID lysine and 2) 120 to 140 kg providing 0.48% SID lysine. Three floor space per pig allocations were tested: 0.88, 0.75, and 0.61 m²/pig. The standard gate position provided 0.88 m²/pig; all pens were stocked with 23 pigs per pen to begin the trial. All removals and treatments were documented. Pen weights were measured using a pen scale every week. Feed remaining was quantified by measuring the feed in the feeders before weighing the pens each period. Pigs were marketed when the average weight of pigs in the barn reached 135 kg. The heaviest 5 pigs from each pen were marketed in a first and a second cut one week apart before the remaining pigs were marketed in the third week. Data was analyzed as a randomized complete block design. Overall, feed disappearance per pig was not affected by floor space allocation ($P > 0.49$). Similarly, the mean body weights of pigs were not different between treatments at the beginning of the trial ($P = 0.89$) or any subsequent period ($P > 0.15$). As a result, feed conversion efficiency was not changed by the pen space treatments ($P > 0.10$). Marketing was balanced between treatments, which resulted in pigs raised with 0.61 m²/pig tending ($P < 0.09$) to be lighter at marketing in the first and second cut than those raised with 0.88 m²/pig. However, there was no difference in body weight between the floor space allocations when the final group was marketed (143.3 ± 0.6 kg; $P = 0.42$). Carcass lean percent tended ($P = 0.08$) to be greater (56.8 vs. 56.4 %) from pigs provided 0.61 m²/pig of floor space, thus improving ($P = 0.03$) the carcass value (\$60.52 vs. \$59.71/cwt) of those animals compared to pigs provided 0.88 m²/pig. Immediately before marketing the heaviest finisher pigs, reduced floor space allocation negatively impacted the final body weight of animals.

Key Words: finishing pig, growth, space

92 Effects of Supplemental Phytoncide Instead of Zinc Oxide on Growth Performance, Apparent Nutrient Digestibility, Blood Profiles and Fecal Microflora in Growing Pigs. J. K. Kim*, J. Y. Zhang, X. Z. Hao, H. M. Kim, I. H. Kim, *Department of Animal Resources Science Dankook University, Cheonan-si, Korea, Republic of (South)*

Zinc oxide as growth promoters and an antidiarrhea drug was widely used in the pig industry. However, the

excessive excretion of zinc in the pig's manure cause environmental problems. This study aimed to evaluate the effect of phytoncide (terpene), Korean pine extract as phytogetic feed additive (PFA), instead of zinc oxide on growth performance, apparent nutrient digestibility, blood Profiles and fecal microflora in growing-finishing pigs. A total of 120 grower pigs [(Landrace x Yorkshire) x Duroc] with an average initial body weight (BW) of 24.48 ± 1.62 kg. Dietary treatments: positive control (PC, basal diet + 0.3% Zinc oxide) and basal diet + 0, 0.5% or 1.0% phytoncide. The data were analyzed using the GLM procedure of SAS (SAS Institute, 1996) as a randomized complete block design. Pen served as the experimental unit. Linear and quadratic polynomial contrasts were used to examine effect of dietary treatment (without zinc oxide supplement: 0, 0.5% and 1% of phytoncide in the basal diet). Variability in the data will be expressed as the standard error of means (SEM) and $P < 0.05$ was considered to be statistically significant. Results indicated that during 1-3 weeks, 3-6 weeks, and overall phase, compared with basal diet treatment, the ADG of growing pigs tended to be increased in phytoncide treatment and was significantly increased in PC treatment ($p < 0.05$). During 3-6 weeks, and overall phase, pigs fed the PC diet showed improvement in average daily feed intake, compared with basal diet treatment as trend. The pigs received phytoncide diet significantly ($P = 0.027$) increased the digestibility of DM compared with basal diet. The concentration of aspartate transaminase (AST) was reduced ($P = 0.047$) in pigs receiving 1.0% phytoncide diet (32 U/L), compared with basal diet (40 U/L) at week 3. Meanwhile, the growth performance, digestibility of nutrients, and Lactobacillus and E.coli of pigs received phytoncide diet have no significantly change compared with PC diet. Otherwise, no difference was observed in fecal microflora among treatment ($P > 0.05$). Conclusion that the pigs fed 0.3% phytoncide diet could increase the digestibility of nutrition and reduce the risk of liver damage in growing pigs. All those suggests that phytoncide may be used as an environmentally friendly factors treatment instead of zinc oxide without excreting excessive zinc.

Key Words: phytoncide, growth performance and nutrient digestibility, growing pigs

93 Effects of Yeast Culture (*Saccharomyces cerevisiae*) Supplementation on Growth Performance, Fecal Score, and Nutrient Digestibility of Weaning Pigs. D. J. Lee*, X. Liu, H. Y. Sun, J. W. Park, I. H. Kim, *Department of Animal Resources Science Dankook University, Cheonan-si, Korea, Republic of (South)*

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