238 Effect of gestation housing systems on reproductive performance and oxidative status of sows during gestation and lactation. Y. Zhao*[1], W. L. Flowers[1], A. Saraiva1,2, K.-J. Yeum[3], and S. W. Kim[1], *[1]North Carolina State University, Raleigh, [2]Universidade Federal de Viçosa, Viçosa, MG, Brazil, [3]Tufts University, Boston, MA.*

Two types of gestational housings were used to evaluate the effects on reproductive performance, physiological status, and behavior of sows during gestation and lactation. Ninety 6 multiparous sows were randomly assigned to either the individual crate (CON) or group pen (PEN) on d 35 of gestation. Behaviors of sows were video recorded and observed for the first 4 d after housing assignment on d 35 of gestation. On 6 d before farrowing date, sows were moved to individual farrowing crates. Sows were weighed on d 35 and 109 of gestation, and d 1 and 18 of lactation. Jugular blood was collected from all sows on d 35, 60, 90, and 109 of gestation, and on d 3 and 18 of lactation. Plasma malonedialdehyde (MDA), protein carbonyls (PCS), 8-hydroxy-deoxyguanosine (8OHdG), and immunoglobulins (Ig) G and M were quantified. Litter size and piglet BW were recorded on d 1 and 18 of lactation. Sows in PEN gained less BW ($P < 0.05$) than sows in CON during gestation. Sows in PEN tended to have smaller ($P = 0.069$, 0.096) litter size than sows in CON on d 1 and 18 of lactation, respectively. Sows in PEN tended to have smaller ($P = 0.089$) litter weight than sows in CON on d 1 of lactation. Sows in CON and PEN had greater ($P < 0.05$) 8OHdG on d 109 of gestation than d 35 of gestation. Plasma PCS on d 109 of gestation was greater ($P < 0.05$) than d 90 of gestation for sows in CON. Plasma PCS on d 109 of gestation was greater ($P < 0.05$) than d 60 of gestation and d 18 of lactation for sows in PEN. Plasma and colostrum IgG and M did not differ between treatments. The eating time of sows in PEN tended to be less ($P = 0.060$) than sows in CON. Collectively, sows had reduced reproductive performance when housed in pens during gestation, and oxidative stress of sows was elevated during late gestation and early lactation compared with early gestation regardless of gestation housing systems.

Key Words: gestation crate, oxidative stress, pen, sow

239 Effect of increasing feeding levels in sows during late gestation on piglet birth weights. J. Soto*[1], L. Greiner[1], J. Connor[1], and G. Allee[2,1], *[1]Innovative Swine Solutions, LLC, Carthage, IL, [2]PorkTech, LLC, Columbia, MO.*

A group of 224 (C22 and C29) sows (parity 1 n = 72, parity 2 n = 24, parity 3 n = 36, and parity 4 or more n = 92) sows were assigned to one of 3 treatments 14 d before farrowing to determine the effect of increasing feeding levels during late gestation on individual piglet and litter birth weights. One week of a commercial farm′s bred gilts and sows were randomly allotted to one of 3 treatments (0, 0.91, 1.82 kg feed increase). Treatments were blocked within parity and body condition score. Gestating females were fed the dietary treatment starting 14 d pre-farrow. Two days before farrowing, the animals were moved into the farrowing house where feed intake was reduced to 1.82 kg per day of lactation feed until farrowing. Gestation diets were formulated to 0.55% total lysine. All other nutrients met or exceeded NRC (1998) requirements. Individual pre-suckle birth weights were collected on litters when farrowings were attended. All other farrowings were recorded as post-suckle total litter weights. Both measurements included stillborn and mummified fetuses in the analysis. Number of total born and born alive had no significantly differences between treatments. Total litter weights, total born alive weights, individual piglet weights and individual stillborn weights had no significantly differences in multiparous (P2 or more) sows. However, total litter weights was significantly ($P = 0.019$) higher in parity 1 (P1) sows fed with 1.82 kg than P1 sows fed with no extra feed (16.1 vs. 18.7 kg, respectively) as well as total born alive weights was significantly ($P = 0.030$) higher (15.1 vs. 16.6 kg, respectively). Furthermore, individual born alive weights was significantly ($P < 0.001$) higher in P1 sows fed with 1.82 kg than P1 sows fed with no extra feed (1.312 vs. 1.438 kg, respectively). Based on these data, feeding parity 1 females 1.82 kg per day additional feed from d 100 to parturition improves piglet birth weight, but does not improve piglet birth weight in multiparous sows.

Key Words: sow, birth weight, feeding level, gestation

240 Umami taste stimulation improves the performance of weanling pigs. G. Tedó*[1], C. Risley[2], and I. Ipharraguerre[1], *[1]Lucta S.A., Barcelona, Spain, [2]Lucta USA Inc., Libertyville, IL.*

In response to the consumption of some protein-born chemicals, pigs perceived a pleasant taste called *umami*. Data from in vitro studies using a cell reporter system that expresses the porcine umami taste receptor, suggest that besides monosodium glutamate (MSG), L-Glu, L-Gln, and L-Ala, pigs perceive other substances as umami tastants. Results from later in vivo studies with weanling piglets supported the above suggestion by showing that combinations of some of those umami substances appear to be more potent and effective than MSG at stimulating the umami taste in pigs. Data reported herein is from a follow-up study aiming to investigate the impact of adding a high-intensity umami flavor (HIU) into transition diets on the performance of weanling piglets. A total of 96 piglets (*Landrace x Large White*) weaned at 23 d of age were used. Piglets were allotted to 2 dietary treatments (6 pens of 8 pigs each/treatment) following a randomized complete block design with 3 blocks of BW. Treatments were CON (control diets) or HIU (CON diets flavored with 1500 ppm of HIU) and were fed during the pre-starter (0–14 d) and starter (15–28 d) phases. The experimental diet was pelleted, medicated, and formulated to meet pigletâ€s nutrient requirements (NRC, 1998). Performance data was recorded weekly and analyzed using a mixed-effect model with repeated measures that included the random effect of pen and the fixed effect of treatment, block, and their interaction. During the first week after weaning, HIU piglets consumed more feed (87 vs. 133 g/d, $P < 0.05$) and grew faster (62 vs. 124 g/d, $P < 0.05$) than CON piglets. By the end of the study, animals fed HIU diets reached higher BW (16.13 vs. 17.30 kg, $P < 0.05$) and ADG (346 vs. 393 g/day, $P < 0.05$) but lower FG ratio (1.24 vs. 1.12, $P = 0.06$) than piglets fed CON. Within the HIU group and during the pre-starter phase, lighter piglets tended to grow faster ($P = 0.09$) than their heavier counterparts. In conclusion, adding HIU into piglet diets may improve animal performance and reduce variability in BW gain during the transition phase.

Key Words: umami, flavor, piglet

241 The effects of feeder adjustment on growth performance of finishing pigs. A. J. Myers,* R. D. Goodband, M. D. Tokach, S. S. Dritz, J. R. Bergstrom, J. M. DeRouchey, and J. L. Nelssen, *Kansas State University, Manhattan.*

A total of 234 growing pigs (initial BW 41.5 kg) were used in an 89-d trial to determine the effects of feeder adjustment (1.27, 1.91, or 2.54 cm minimum gap opening) on finishing pig performance. Feeders (Farmweld; Teutopolis, IL) were adjusted to a minimum gap setting, but the agitation plate could be moved upward to a maximum opening of 1.91, 2.54, or 3.18 cm, respectively. Treatments were arranged

in a completely randomized design with 9 replications of 8 pigs/pen and 1 replicate with 6 pigs/pen. To ensure equal floor space, pen gating was adjusted to provide 0.74 m2 per pig. All pens had the same feeder with 2, 35.6 cm-wide by 11.4 cm-deep feeder holes. Pigs had ad libitum access to corn-soybean meal-based diets containing 20% corn dried distillers grains with solubles. Pen weights and feed disappearance were measured every 2 wk. Pictures of feeders were taken and scored to detemine percentage pan coverage. Feeder adjustments of 1.27, 1.91, and 2.54 cm averaged 28, 58, and 75% pan coverage, respectively. From d 0 to 28, pigs exposed to increasing feeder gap had improved (linear; $P = 0.04$) ADG and ADFI, with the maximum ADG observed at 1.91 cm and the greatest ADFI at 2.54 cm. From d 28 to 56 and 56 to 89, G:F was highest for pigs fed from the 1.27 cm gap. Overall (d 0 to 89), there was a trend ($P = 0.08$) for increased ADG with increased feeder opening. However, pigs fed with a 1.27 cm feeder gap had improved (linear; $P < 0.03$) G:F compared with those with a 1.91 or 2.54 cm feeder opening. These results suggest that from 41 to 68 kg, ADG was optimized at the middle feeder setting of 1.91 cm. However, pigs fed from 68 to 122 kg had greater ADG and the best G:F at the lowest setting of 1.27 cm. Thus, it appears the optimum feeder-gap setting may differ by growth phase.

Table 1. Effects of feeder gap setting on finisher pig performance, (d 0 to 89)

	Feeder gap, cm			SEM	P-value	
Item	1.27	1.91	2.54		Linear	Quadratic
d 0 to 28						
ADG, kg	0.88	0.97	0.96	0.025	0.03	0.07
G:F	0.394	0.389	0.380	0.005	0.03	0.07
d 28 to 58						
ADG, kg	1.07	1.09	1.10	0.025	0.51	0.88
G:F	0.343	0.323	0.329	0.005	0.07	0.06
d 58 to 89						
ADG, kg	0.68	0.66	0.68	0.025	0.92	0.57
G:F	0.289	0.275	0.276	0.005	0.10	0.26
d 0 to 89						
ADG, kg	0.88	0.91	0.91	0.013	0.08	0.36
G:F	0.342	0.329	0.328	0.004	0.03	0.18

Key Words: feeder adjustment, feeder, finishing pig

242 Effect of determining baseline plasma urea nitrogen (PUN) concentrations on subsequent post-treatment PUN in 20- to 50-kg pigs. A. M. Waguespack*[1], M. L. Roux[1], A. Donsbough[1], S. Powell[1], T. D. Bidner[1], R. L. Payne[2], and L. L. Southern[1], *[1]Lousiana State University, Agricultural Center, Baton Rouge, [2]Evonik-Degussa Corp., Kennesaw, GA.*

Plasma urea nitrogen can be used as an indicator of AA requirements and efficiency of AA utilization in swine. However, PUN may vary among a population of pigs fed the same diet and within a close range of BW. Thus, baseline PUN concentrations are commonly used as a covariate to reduce variation of post-treatment PUN. However, this procedure increases experiment costs and stress to the pig. Over the past 3 yr, we have conducted 14 experiments (26 to 28d in duration) using PUN as a response. Each of these experiments had 4 to 6 treatments. The purpose of this report is to summarize the effect of determining baseline PUN concentrations on subsequent post-treatment PUN concentration in 20- to 50-kg pigs. Pigs were fed corn-soybean meal positive control and low CP diets with various AA additions. In all experiments, pigs were assigned to dietary treatments in a randomized complete block design with a minimum of 4 replicates of 3 to 5 pigs each. Before the start of each experiment, all pigs were fed a common diet. Blood samples were collected from each pig before allotment to dietary treatments (d 0) and at the termination of each experiment. The baseline (d 0) PUN was analyzed as a covariate for the PUN determined at the end of each experiment. Data were analyzed with and without baseline PUN. In 7 of the 14 experiments, the covariate baseline PUN was significant ($P < 0.10$). However, in all experiments combined, there were 768 possible treatment comparisons, and there were only 3 treatment differences that changed significance as a result of analyzing the data with the baseline PUN as a covariate. These 3 differences were in one experiment. These results indicate that it is not always necessary to determine baseline PUN concentrations because PUN is a single point-in-time measure.

Key Words: plasma urea nitrogen, pigs

243 Effect of non-essential amino acid supplementation in low crude protein amino acid supplemented diets for late finishing pigs. A. Rojo*[1], L. Ochoa[1], Z. Li[1], W. Xiao[1], O. F. Mendoza[1], J. Charal[1], M. Ellis[1], and A. M. Gaines[2], *[1]University of Illinois, Urbana, [2]The Maschhoffs, Carlyle, IL.*

There has been limited research to establish if non-essential amino acids (NEAA) become limiting to growth performance in late finishing pigs fed low CP diets with increasing L-lysine (Lys)·HCl levels. The objectives of this study were to define the maximum inclusion level of L-Lys·HCl and whether NEAA become limiting in low CP diets for late finishing pigs. Individually penned barrows (n = 142; BW 89.4 ± 5.16 kg) were randomly allotted to 8 dietary treatments in a RCBD with 18 replicates. Trt. One through 5 contained increasing levels of L-Lys·HCl (0.00, 0.125, 0.225, 0.338 and 0.450%; with corresponding dietary CP levels of 13.0, 12.0, 10.7, 9.5, and 8.4%, respectively). Diets were formulated to the same ME (3.3 Mcal/kg) and standard ileal digestible (SID) Lys levels (0.60%) and met or exceeded NRC (1998) recommendations for other nutrients. Levels of other essential AA were kept constant across diets by the addition of crystalline AA. Diets for Trt. 6, 7, and 8 were formulated to the same NEAA levels as Trt. One by the addition of NEAA (50:50% mixture of glycine and glutamic acid) to Trt. 3, 4, and 5, respectively. Diets were fed over a 4-wk period. Increasing L-Lys·HCl resulted in a decrease (quadratic, $P \leq 0.05$) in ADG (1.147, 1.143, 1.156 and 1.118, and 0.999 kg respectively), which was attributed to a lower ADG in pigs fed 0.450% L-Lys·HCl. Furthermore, increasing L-Lys·HCl lowered (quadratic, $P \leq 0.05$) G:F (0.352, 0.342, 0.350, 0.331, and 0.308, respectively). There were no differences in ADFI ($P \geq 0.05$) with increasing L-Lys·HCl level. Broken-line analysis suggested that the maximum L-Lys·HCl level for ADG, and G:F was 0.315 and 0.262%, respectively. There were no improvements ($P \geq 0.05$) in growth performance with NEAA supplementation, regardless of L-Lys·HCl level. These results suggest that late finishing pigs can be fed diets with high levels of L-Lys·HCl (SID Lys:CP = 5.80%) and NEAA were not limiting in the low CP diets evaluated.

Key Words: amino acids, finishing pigs, growth

244 The effect of heat stress on intestinal bacterial translocation and Intestinal mucosal immune in rats. A. Lu*[1], X. Liu[1], F. Liu[1,3],