

P067 (GS-PHD) **Impact of an acute water and feed deprivation event on performance, histology, and stress markers in weaned pigs.** N. Horn^{1,*}, F. Ruch², K. Ajuwon¹, G. Miller³, O. Adeola¹, ¹*Animal Sciences, Purdue University, West Lafayette*, ²*Enzyvia, LLC, Sheridan*, ³*Biomatrix, Princeton*.

The impact of acute stressors on performance, histological parameters, and serum stress markers in weaned nursery pigs were evaluated. Pigs (6.21 ± 0.29 kg) were allotted in a randomized complete block design to 4 post-weaning treatments on the basis of body weight at the time of weaning. There were 8 pigs per pen and 12 replicate mixed-sex pens per treatment. The post-weaning treatments were arranged in a 2 x 2 factorial of 0 or 24-h feed deprivation period and 0 or 24-h water deprivation period after which the piglets were returned to normal management procedures. Growth performance was measured the day following the stressor, 7, 14, and 28 d post weaning. Serum and intestinal samples were taken d 2 and 7 post weaning. Serum was analyzed for cortisol and corticotrophin releasing factor, and villus height and crypt depth were measured in the jejunum and the ileum. There was a decrease in ADG with the water stressor ($P < 0.01$) immediately following the stressor although there was a significant improvement in ADG and feed efficiency ($P < 0.01$) at d 7 post weaning. Furthermore, there was a reduction in ADFI during the last 14 d of the trial and cumulatively ($P < 0.05$) in the water stress group. On d 7 post weaning, there was a reduction ($P < 0.05$) in jejunal crypt depth with the water stressor and a reduction ($P = 0.05$) in ileal villus height with the feed stressor. With administration of the water stressor there was an increase ($P < 0.05$) in serum cortisol and corticotrophin releasing factor on d 2 post weaning and an increase in serum cortisol but not corticotrophin releasing factor 7 post weaning. There was no impact of the feed stressor or a feed x water stressor interaction on growth performance or any of the serum measurements. The results from the current trial show that an acute water stressor at the time of weaning has negative impacts on growth performance, histological measurements, and serum stress indicators not only immediately following the stress event but throughout the nursery period.

Key Words: acute stressors, nursery pig

NONRUMINANT NUTRITION: NURSERY AND GROW-FINISH NUTRITION

P068 **An evaluation of dietary natural zeolite or humic acid substances and high sulfate water on nursery pig performance.** J. R. Flohr*, M. D. Tokach, J. L. Nelssen, S. S. Dritz, J. M. DeRouchey, R. D. Goodband, *Kansas State University, Manhattan*.

A total of 350 nursery pigs (PIC 1050 barrows, initially 21 d of age) were used in a 21-d study to determine the effects of high-sulfate water, and natural zeolite and humic substances on growth and fecal consistency of nursery pigs. Treatments were arranged in a 2 × 5 factorial with 2 water treatments (control or water with 2,000 ppm Na₂SO₄) and 5 dietary treatments (control, 1 or 2% zeolite, 1% humic acid [HA], or 1% humic and fulvic acid [HFB]). There were 7 replications/treatment and 5 barrows/pen. Water treatments remained the same from d 0 to 21, and all diets were fed in 2 phases, with the same treatment inclusion rates in both phases. Phase 1 diets were fed in a pellet form (d 0 to 8) and Phase 2 diets were fed in meal form (d 8 to 21). Fecal samples were

collected on d 5, 8, 15, and 21, visually scored for consistency (1= firm, 5= watery), and analyzed for DM. Overall (d 0 to 21), a water source × diet interaction ($P < 0.03$) occurred for ADG and G:F, because pigs fed 1% HA had poorer ($P < 0.01$) ADG and G:F than other treatments when drinking 2,000 ppm Na₂SO₄ water but improved ADG and G:F when drinking control water. Pigs drinking 2,000 ppm Na₂SO₄ water had poorer ($P < 0.01$) ADG and G:F; and tended ($P = 0.08$) to have lower ADFI than pigs drinking control water. Pigs drinking 2,000 ppm Na₂SO₄ water had more fluid fecal samples ($P < 0.01$) and lower ($P < 0.01$) fecal DM on d 5 and 8 compared to pigs drinking control water. In conclusion, pigs drinking water with 2,000 ppm Na₂SO₄ had decreased ADG, G:F, and tended to have lower ADFI, also they had more watery feces on d 5 and 8 as measured by fecal DM compared to pigs drinking control water. The zeolite or humic acid products tested did not improve pig growth or alter fecal DM for pigs drinking high sulfate water.

Item	Dietary Treatment					SEM
	Control	1% Zeolite	1% HA	1% HFB	2% zeolite	
Control water						
ADG, g	268	274	300	274	248	13.4
G:F	0.72	0.74	0.78	0.73	0.71	0.021
d 8 fecal score	3.3	2.8	3.1	3.0	2.7	0.15
d 8 fecal DM, %	23.1	26.7	25.6	26.5	28.7	1.70
2,000 ppm Na ₂ SO ₄						
ADG, g	264	249	229	255	262	13.4
G:F	0.71	0.70	0.67	0.70	0.74	0.021
d 8 fecal score	3.3	3.7	3.3	3.5	3.4	0.15
d 8 fecal DM, %	22.3	18.8	22.7	22.0	22.1	1.70

Key Words: non-nutritive feed additives, nursery pig, sulfate water

P069 **Effects of varying ingredient particle size and diet form on nursery pig growth performance and caloric efficiency.** J. A. De Jong*, J. M. DeRouchey, M. D. Tokach, R. D. Goodband, S. S. Dritz, J. L. Nelssen, *Animal Science, Kansas State University, Manhattan*.

A total of 675 pigs (initial BW 11.1 kg) were used in a 21-d study to determine the effects of varying ingredient particle size and diet form on nursery pig growth performance and caloric efficiency. Pens of pigs were balanced by initial BW and randomly allotted to 1 of 8 dietary treatments (17 pens/treatment). The 8 diets included 3 corn-soybean meal-based diets consisting of: 1) corn ground to 620 μ and fed in meal form, 2) corn ground to 352 μ and fed in meal form, and 3) diet 2 pelleted. The remaining 5 diets contained 20% wheat middlings (mids) and 30% dried distillers grains with solubles (DDGS). Diets 4 to 8 consisted of: 4) corn ground to 620 μ, mids and DDGS unground (534 and 701 μ), and fed in meal form; 5) diet 4 but corn also ground to 352 μ and fed in meal form; 6) diet 5 fed in pellet form; 7) corn, soybean meal, DDGS, and mids finely ground (352, 421, 377, and 357 μ), and fed in meal form; and 8) diet 7 fed in pellet form. Diets were not isocaloric. Overall (d 0 to 21), pelleting improved ($P < 0.03$) ADG, G:F, and caloric efficiency on a ME or NE basis. Reducing corn particle size did not influence G:F or caloric efficiency, but tended ($P < 0.08$) to reduce ADFI, which led to a reduction ($P < 0.02$) in ADG. High-by-product diets reduced ($P < 0.01$) ADG, ADFI, final BW, and ($P < 0.01$) G:F, but caloric efficiency was similar to pigs fed the corn-soybean meal-based diet. Grinding the by-products to a smaller particle size further reduced ($P < 0.05$) ADG, ADFI, and final BW, but did not influence

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Treatment:	1	2	3	4	5	6	7	8	
Diet*:	C	C	C	H	H	H	H	H	
Portion Ground:		Corn	Corn		Corn	Corn	Diet	Diet	
Item Diet form:	Meal	Meal	Pellet	Meal	Meal	Pellet	Meal	Pellet	SEM
ADG, g	648	621	618	585	564	599	548	573	24.8
ADFI, g	1001	963	948	935	917	909	861	890	41.1
G:F	0.648	0.647	0.652	0.626	0.615	0.659	0.637	0.644	0.01
Caloric efficiency, mcal/kg									
ME	5.12	5.14	5.09	5.20	5.31	4.95	5.11	5.07	0.08
NE	3.66	3.67	3.63	3.65	3.73	3.48	3.59	3.56	0.05
Final wt, kg	24.8	24.2	24.7	23.4	23.3	23.8	22.4	23.1	0.58

G:F. Pelleting improved performance; however, fine grinding corn or other components of the high-by-product diet did not further improve nursery pig performance. (See table above.)

Key Words: DDGS, feed processing, wheat middlings

P070 The effects of feeder design (conventional dry vs. wet-dry) on growth performance of 20- to 112-kg pigs. S. Nitikanchana¹, S. Dritz, M. Tokach, R. Goodband, J. DeRouche, J. Nelssen, Kansas State University, Manhattan.

A total of 1,253 pigs (PIC 1050 × 337; initially 20.4 kg) were used in a 104-d study to evaluate the effects of using a wet-dry (WD) or conventional dry (CD) feeder on growth performance of growing-finishing pigs. There were 25 to 27 pigs per pen and 24 pens per feeder type. At the start of the trial, pens of pigs were weighed and randomly allotted to 1 of the 2 feeder types. The CD feeder was a single-sided, 1.42 m wide, stainless steel feeder (Thorp Equipment, Inc., Thorp, WI) with 4 feeding spaces that were 35.6 cm wide and a 10.8 cm deep trough. A cup waterer in the pen using CD feeders ensured ad libitum access to water. The WD feeder was double-sided (38.1 cm wide feeder opening on each side) with a single nipple waterer (Crystal Springs, GroMaster, Inc., Omaha, NE) where water in the feeder was the only source of water. All pigs were fed the same corn-soybean meal diets containing 30% bakery meal and 10 to 45% dried distillers grains with solubles during 5 dietary phases. For the overall period, pigs fed with WD feeders had greater ADG ($P < 0.01$) and ADFI ($P = 0.01$) with no differences in G:F ($P = 0.51$) compared with pigs fed using the CD feeder. This study confirms previous results where pigs fed using a WD feeder have greater ADG and ADFI than those fed with a CD feeder.

Effects of feeder design (conventional dry vs. wet-dry) in 20- to 112-kg pigs

Feeder type	Conventional dry	Wet-dry	SEM	Probability, $P <$
d 0 to 104				
ADG, g	863	891	4.58	0.01
ADFI, g	2153	2235	21.9	0.01
G:F	0.402	0.399	0.003	0.51

Key Words: feeder design, growth, pigs

P071 The effects of increasing levels of pellet fines on growth performance of 14 to 34 kg nursery pigs. E. D. Frugé^{1,*}, E. L. Hansen¹, S. A. Hansen¹, K. A. Frerichs¹, C. W. Hastad², ¹Hubbard Feeds, Mankato, ²New Fashion Pork, Jackson.

An experiment was conducted to determine the effects of increasing levels of pellet fines (0 to 100% fines) on growth performance compared to pigs fed meal diets. Pigs (N=1000, 14.5 kg) were allotted to 6 dietary treatments (TRT) with 6 replicates and 27

or 28 pigs per pen in a randomized complete block design. The experimental TRT were; 1) Meal diet; 2) pellet (screened); 3) Pellet with 25% fines; 4) Pellet with 50% fines; 5) Pellet with 75% fines; 6) Pellet with 100% fines. Percentage fines were achieved by roller grinding pellets and blending back to screened pellets. All diets were identical in ingredient and nutrient composition. Pig weights and feed disappearance were measured on d 0, 7, 14, 21, and 28. A summary of the overall (d 0 to 28) results is presented in Table 1. Pigs fed TRT 2 had improved ADG compared with pigs fed TRT 1, 5 and 6 with pigs fed TRT 3 and 4 intermediary. Pigs fed TRT 2 had improved G:F compared with all other TRT. Pigs fed TRT 3 and 4 had improved G:F compared to pigs fed TRT 1, whereas pigs fed TRT 5 and 6 had similar G:F with pigs fed TRT 1. There were no TRT differences for ADFI. Final BW of pigs fed TRT 2 was heavier than pigs fed TRT 1, 5 and 6 with those fed TRT 3 and 4 intermediary. Pigs fed TRT 6 had lighter final BW compared to those fed TRT 1. Regression curves were fitted for TRT 2 - 6 for ADG ($y = -0.6677x + 749.81$, $R^2 = 0.91$), ADFI ($y = -0.0088x + 0.05019x + 1121.4$, $R^2 = 0.89$) and G:F ($y = -0.0004x + 0.6587$, $R^2 = 0.95$). These data allow for performance and financial analysis on the effects of diet form and pellet fines of 14 to 34 kg pigs.

Table 1 The effects of increasing levels of fines.¹

TRT ²	1	2	3	4	5	6	SEM	$P <$
Initial BW, kg	14.6	14.5	14.7	14.4	14.5	14.5	0.10	0.50
ADG, g	705 ^b	742 ^a	721 ^{ab}	723 ^{ab}	699 ^{bc}	677 ^c	9.50	0.05
ADFI, g	1130	1126	1130	1131	1105	1089	15.71	0.33
G:F	0.62 ^c	0.66 ^a	0.64 ^b	0.64 ^b	0.63 ^{bc}	0.62 ^c	0.004	0.05
Final BW, kg	34.4 ^b	35.3 ^a	34.9 ^{ab}	34.7 ^{ab}	34.1 ^{bc}	33.4 ^c	0.31	0.05

¹abc Within a row, means without common superscript differ ($P < 0.05$).

²Actual fines: meal, 5, 43, 59, 73, & 100%

Key Words: fines, nursery pigs, pellet

P072 Effects of increasing dietary bakery meal on growing-finishing pig growth performance and carcass quality. C. Paulk^{1,*}, S. Nitikanchana², S. Dritz², M. Tokach¹, J. Nelssen¹, J. DeRouche¹, R. Goodband¹, K. Prusa³, ¹Animal Science and Industry, ²Diagnostic Medicine Pathobiology, Kansas State University, Manhattan, ³Animal Science, Iowa State University, Ames.

A total of 1,263 pigs (PIC 337 × 1050; initially 35.3 kg BW) were used in a 102-d study to determine the effects of dietary bakery meal on growth performance and carcass quality. Pens were randomly allotted to 1 of 3 dietary treatments while balancing for initial BW and gender. There were 16 pens per treatment with 25 to 28 pigs per pen. Dietary treatments included 0, 7.5, and 15% bakery meal. Analyzed bakery meal contained 14.0% CP, 8.1% ADF, 19.0% NDF, 6.4% fat, and 5.3% ash (as-fed basis). On d 84, the 5 heaviest