

POSTER PRESENTATIONS

Nonruminant Nutrition

192 Sow fertility is improved by feeding diets supplemented with omega 3 fatty acids from fish oil during lactation through to early pregnancy. R. J. Smits*¹, M. Mitchell², B. G. Luxford¹, and M. B. Nottle², ¹Rivalea Australia Pty Ltd, Corowa, NSW, Australia, ²Robinson Institute and School of Paediatrics and Reproductive Health, The University of Adelaide, Adelaide, SA, Australia.

Feeding sows a diet supplemented with omega 3 PUFAs from fish oil fed pre-farrowing and during lactation has been reported to increase litter size in the subsequent parity. The aim of this study was to determine if there were added benefits when omega 3 supplemented diets continued to be fed during early pregnancy. At the start of lactation 1216 sows (parity 1–7, mean 3.7 ± 0.06) were fed one of 2 diets: either unsupplemented (Control lactation) with tallow (68 g/kg) or the same base diet supplemented with 3 g/kg of fish oil substituting v/v for tallow (Omega 3 lactation). Following weaning at 19.8 ± 0.1 d, sows continued on their lactation diet until estrus. In a 2x2 factorial design, a subset of 860 sows from Control and Omega 3 lactation treatments were fed either Control gestation containing tallow (10 g/kg) or a diet with 6 g/kg of fish oil (Omega 3 gestation) for 4 weeks from mating. Wean to estrus interval (WEI) and subsequent total born were analyzed in Univariate GLM ANOVA. There was no difference in WEI between sows on Omega 3 or Control diets (7.2 vs 6.8 d, $P = 0.268$). Across all parities Omega 3-Omega 3 sows tended to have larger litters following supplementation compared with Control-Control (12.6 vs 11.7, $P = 0.08$). Treatment differences were significant in older sows, with Omega 3-Omega 3 sows of parity 4–7 producing more piglets than Control-Control sows (12.8 vs 11.1, $P < 0.05$). Parity 4–7 sows fed Omega 3-Control (11.7) and Control-Omega (12.4) regimens had an intermediate litter size. Farrowing rates were similar between treatments (mean 83.1%, Chi-squared 3.45, $P = 0.327$). We conclude that supplementation with omega 3 fatty acids from fish oil fed to sows during lactation to early pregnancy improved subsequent litter size in older parities. Omega 3 supplementation offers producers a nutritional strategy to overcome declining productivity in older sows.

Key Words: pigs, omega 3, PUFA, litter size

193 Enterosorption therapy provided by Calibrin-Z enterosorbent after pigs were intoxicated by zearalenone. J. P. Wang*¹, I. H. Kim¹, S. W. Choi², J. Broomhead³, and F. Chi³, ¹Dankook University, Cheonan, Choongnam, South Korea, ²CTCBio, Seoul, South Korea, ³Amlan International, Chicago, IL.

The study was conducted to evaluate the effect of Calibrin-Z enterosorbent after pigs were intoxicated by zearalenone (ZEA). Sixty 4 female pigs were previously fed 0, 200, 400, or 800 ppb of ZEA (ZEA, University of Missouri, Columbia) contaminated diets for 28 d before the study. Sixteen pigs from each pre-fed ZEA treatment were randomly divided into half (4 replicate pens with 2 pigs each) and fed either a control diet (no detectable mycotoxins) or control + 0.2% Calibrin-Z (Amlan International, Chicago) for 18 d to form 8 treatments in a 4 by 2 factorial arrangement design (Table 1). Blood samples were collected on d-9 and d-18; serum malondialdehyde (MDA), superoxide dismutase (SOD), and liver enzymes such as aspartate aminotransferase (AST), alanine aminotransferase (ALT), and alkaline phosphatase (AP) were

analyzed. Pigs previously fed diets containing ZEA at 400 and 800 ppb had reduced ($P < 0.05$) ADG in the post-ZEA period compared with pigs previously fed a non-ZEA diet. Supplementation with 0.2% Calibrin-Z increased ($P < 0.05$) ADG in pigs pre-fed 200 (651 vs. 734 g), 400 (615 vs. 686 g), or 800 (617 vs. 690 g) ppb ZEA diets as compared with the pigs pre-fed the same ZEA diets. However, improved FE ($P < 0.05$) from Calibrin-Z feeding was observed in pigs pre-fed the 400 (757 vs. 832) ppb treatments, only. Pigs fed 0.2% Calibrin-Z reduced ($P < 0.05$) average vulva size through-out the 18 d period as compared with those pigs fed the control diet regardless of pre-fed ZEA dosage. The rate of vulva size reduction was significantly improved in pigs fed the Calibrin-Z diet, over those fed the control diet. Serum MDA was reduced ($P < 0.05$) in pigs fed Calibrin-Z supplementation on d-18 but not different on d-9; SOD increased ($P < 0.05$) in those pigs fed Calibrin-Z on d-9 but not different on d-18. In general, serum liver enzymes were not different between control and Calibrin-Z feeding, except the AP was lower ($P < 0.05$) in pigs pre-fed 800 ppb ZEA and continued on the control diet. The results suggested that Calibrin-Z may increase detoxification of ZEA in pigs possibly by preventing re-absorption of ZEA metabolites in the small intestine originating from bile (enterohepatic circulation); and it may be used to accelerate the recovery from ZEA intoxicated pigs.

Table 1. Experimental treatments

28 d pre-feeding, ppb	18 d feeding, (No detectable mycotoxins)
0	Control
0	Control + 0.2% Calibrin-Z
200	Control
200	Control + 0.2% Calibrin-Z
400	Control
400	Control + 0.2% Calibrin-Z
800	Control
800	Control + 0.2% Calibrin-Z

Key Words: zearalenone, oxidative stress, clay enterosorbent, pigs

194 The effects of diet modifications and flow agent on growth performance of nursery pigs fed high levels of deoxynivalenol. E. D. Frugé*¹, E. L. Hansen², S. A. Hansen¹, M. D. Tokach³, and H. L. Frobese³, ¹Hubbard Feeds Inc., Mankato, MN, ²New Fashion Pork, Jackson, MN, ³Kansas State University, Manhattan.

An experiment was conducted to determine the effect of pelleting, increased nutrient density, and the addition of the flow agent Defusion® (DEF; Provimi N.A., Inc., Brookville, OH) on growth performance of nursery pigs fed high levels of Deoxynivalenol (DON) from naturally contaminated DDGS (18.9 ppm DON). Mixed gender pigs (n = 1008, 12.5 kg) were allotted to 6 treatments (TRT) with 6 replicates and 28 pigs per pen. The experimental TRT were; 1) positive control (PC), < 0.5 ppm DON; 2) negative control (NC), 3 ppm DON; 3) NC + 0.25% DEF; 4) NC + 0.5% DEF; 5) NC + 0.25% DEF and increased nutrient density; and 6) as 5 (pelleted). All diets contained 15.85% clean or contaminated DDGS. Increased nutrient dense diets, (ME +6% and

TID Lys +10%), were achieved with increased SBM, crystalline AA and fat. Pig weights and feed disappearance were measured on d 0, 7, 14, and 24. A summary of the overall (d 0 to 24) results is presented in Table 1. Feeding 3 ppm DON resulted in reduced ADG and ADFI (PC vs. NC; $P < 0.02$). Pigs fed 0.5% DEF (TRT 4) had improved performance compared with the NC ($P < 0.01$) and similar to PC ($P > 0.10$) with pigs fed 0.25% DEF (TRT 3) having intermediary performance. Pigs fed TRT 6 had similar ($P > 0.10$) ADG and improved ($P < 0.01$) G:F compared with PC. These results suggest that 0.50% inclusion of DEF in meal diets or 0.25% inclusion of DEF in an increased nutrient dense pelleted diet can alleviate the negative impact of 3 ppm DON.

Table 1. The effect of DEF and diet modifications on growth performance of pigs fed high levels of DON

Treatment	1	2	3	4	5	6	SEM	P-value
d 0 to 24								
Initial BW, kg	12.44	12.59	12.53	12.47	12.57	12.58	0.15	0.98
ADG, g	622 ^{ab}	586 ^c	602 ^{bc}	619 ^{ab}	588 ^c	637 ^a	7.83	<0.01
ADFI, g	892 ^a	850 ^b	863 ^{ab}	883 ^a	798 ^c	818 ^c	10.90	<0.01
G:F	0.70 ^c	0.69 ^c	0.70 ^c	0.70 ^c	0.74 ^b	0.78 ^a	0.01	<0.01
Ending BW, kg	27.38 ^{ab}	26.65 ^b	26.99 ^b	27.33 ^{ab}	26.69 ^b	27.87 ^a	0.28	<0.04

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

Key Words: deoxynivalenol, mycotoxin, nursery pigs

195 The effects of pelleting, increased nutrient density, and a flow agent on growth performance of nursery pigs fed high levels of deoxynivalenol. E. D. Frugé^{*1}, E. L. Hansen², S. A. Hansen¹, M. D. Tokach³, and H. L. Frobose³, ¹Hubbard Feeds Inc., Mankato, MN, ²New Fashion Pork, Jackson, MN, ³Kansas State University, Manhattan.

An experiment was conducted to determine the effects of pelleting, increased nutrient density (ME + 6% and TID Lys + 10%), and Defusion[®] (DEF; Provimi N.A., Inc., Brookville, OH) on growth performance of nursery pigs fed high levels of Deoxynivalenol (DON) from naturally contaminated DDGS. Pigs (n = 980, 12.0 kg) were allotted to 7 dietary treatments (TRT) with 5 replicates and 28 pigs per pen in a randomized complete block design. The experimental TRT were; 1) PC (meal), < 0.5 ppm DON; 2) PC (pellet); 3) NC (meal), 3 ppm DON; 4) NC (pellet); 5) NC (meal) + 0.25% DEF; 6) NC (pellet) + 0.25% DEF; and 7) as 6, with increased nutrient density. 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 meal diets with 3 ppm DON (TRT 3 and 5) had reduced ADG and ADFI compared with the PC meal diet (TRT 1). Pigs fed 3 ppm DON in pelleted form (TRT 4 and 6) had ADG similar to the PC pelleted diet (TRT 2) and similar or better G:F than TRT 2. Pigs fed pelleted diet + DEF (TRT 6) had improved G:F over those fed pelleted diet without DEF (TRT 5). Pigs fed the increased nutrient dense diet (TRT 7 vs. TRT 6) showed no improvement in performance. These results suggest that DEF or increased nutrient density did not improve performance. However, pelleting a diet with 3 ppm DON resulted in similar performance to the PC containing < 0.50 ppm DON.

Table 1. The effect of DEF and diet modifications on growth performance of pigs fed high levels of DON

Treatment	1	2	3	4	5	6	7	SEM	P-value
d 0 to 28									
Initial BW, kg	11.9	12.0	12.0	12.0	11.9	12.0	11.9	0.10	0.93
ADG, g	641 ^b	666 ^c	589 ^a	653 ^{bc}	603 ^a	663 ^{bc}	654 ^{bc}	9.64	<0.01
ADFI, g	995 ^c	988 ^c	912 ^a	950 ^b	934 ^{ab}	939 ^{ab}	937 ^{ab}	15.08	<0.01
G:F	0.64 ^d	0.67 ^c	0.65 ^d	0.69 ^{bc}	0.65 ^d	0.71 ^a	0.70 ^{ab}	0.01	<0.01
Ending BW, kg	29.9 ^b	30.6 ^c	28.5 ^a	30.4 ^{bc}	28.8 ^a	30.6 ^{bc}	30.2 ^{bc}	0.31	<0.01

^{abcd} Within a row, means without common superscript differ ($P < 0.05$).

Key Words: deoxynivalenol, mycotoxin, nursery pigs

196 Actigen increases serum levels of cytokines and haptoglobin in pigs experimentally infected with porcine reproductive and respiratory syndrome virus (PRRSV). T. M. Che^{*1}, M. Song¹, R. W. Johnson¹, K. W. Kelley¹, W. G. Van Alstine², K. A. Dawson³, and J. E. Pettigrew¹, ¹University of Illinois, Department of Animal Science, Urbana, ²Purdue University, Animal Disease and Diagnostic Laboratory, West Lafayette, IN, ³Research, Alltech Biotechnology Center, Nicholasville, KY.

Mannan oligosaccharide products alter inflammatory responses in pigs. A study was conducted to evaluate effects of Actigen (a refined yeast-based mannan preparation, Alltech, Inc.) on serum levels of cytokines and haptoglobin (Hp) in pigs infected with PRRSV. Weaned pigs (n = 64, 21 d old), free of PRRSV, were divided into blocks of 4 based on BW, sex, and litter origin. They were randomly assigned from within blocks to 1 of 4 treatments in a 2 × 2 factorial arrangement [2 types of diet: control (0%) and Actigen addition (0.04%); 2 levels of PRRSV: with and without]. Pigs (16/treatment) were kept individually in each pen. After 2 wk of an 8-wk period of feeding the treatments, pigs were intranasally inoculated with PRRSV or a sterile medium (Sham) at 5 wk of age. Serum cytokines and Hp were measured at d 0, 3, 7 post-inoculation (PI), and subsequently weekly until d 42 PI. Data were analyzed as repeated measures over time using the MIXED procedure of SAS. Infection by PRRSV increased the levels of tumor necrosis factor (TNF)- α \pm , IL-1 β , interferon (IFN)- γ , IL-10, IL-12, and Hp in the infected pigs ($P < 0.001$). The levels of these inflammatory mediators increased at d 3 PI (except Hp at d 7 PI), peaked at d 14 PI (except IFN- γ at d 7 PI), and then declined to normal by d 35 PI, whereas IL-10 increased at d 14 PI and reached the highest level at d 35 PI. These results indicate PRRSV-induced secretion of cytokines involved in innate, T-helper 1, and T-regulatory responses. Actigen enhanced IL-1 β (18.3 vs. 14.0 pg/mL; $P = 0.019$), but decreased TNF- α \pm (129.1 vs. 141.6 pg/mL; $P = 0.058$). It also increased levels in infected pigs but not in Sham, specifically IL-1 β ($P = 0.016$) and IL-12 ($P = 0.026$) at d 7 PI, Hp ($P = 0.047$) at d 14 PI, and IL-10 ($P = 0.088$) at d 21 PI. The IL-1 β and IL-12 favorably promote innate and T cell immune functions, whereas IL-10 is anti-inflammatory and capable of stimulating B cell-produced antibody. Briefly, the modulation of secretion of inflammatory mediators by Actigen at critical time points may enhance protection against PRRSV and secondary bacterial infections.

Key Words: actigen, pigs, PRRSV