minate ultrasound's potential for applications in the dairy industry.

Key Words: milk, ultrasound, enzyme, quality

100 Effects of dietary tallow and DDGS on pork fat quality. J. M. Pomerenke*[1], G. C. Shurson[1], S. K. Baidoo[2], and L. J. Johnston[3], *[1]University of Minnesota, St. Paul, [2]Southern Research and Outreach Center, Waseca, MN, [3]West Central Research and Outreach Center, Morris, MN.*

A study was conducted to determine if supplementing beef tallow to grower-finisher diets containing corn dried distillers grains with solubles (DDGS) would reduce the negative effects of DDGS on pork fat firmness. Crossbred pigs (n = 315) were blocked by initial BW (32.4 ± 1.9 kg) and assigned randomly to 1 of 4 dietary treatments in a 3-phase feeding program using a 2 × 2 factorial arrangement of treatments. Diets consisted of a conventional corn-soybean meal diet (C), C containing 30% DDGS (D), C containing 5% tallow (T), and C with 30% DDGS and 5% tallow (DT). Pigs were housed in a confinement facility containing 40 pens with 7 to 8 pigs per pen to provide 10 replications per treatment. Gilts and barrows were housed separately, but fed common diets formulated to contain similar available P and Standardized Ileal Digestible Lys:ME across treatments. For fat quality characteristics, one pig from each pen was selected based being the closest to average pen BW (n = 20 barrows and 20 gilts). Data were analyzed utilizing the Proc Mixed functions of SAS with random effect of block and fixed effects of DDGS, tallow, gender, and DDGS × tallow. Hunter L* and b* values for backfat and belly fat were greater ($P < 0.01$) for pigs fed C and T diets compared with pigs fed D and DT. Similarly, Japanese Color Score for belly fat was higher ($P < 0.03$) for pigs fed D and DT. Pigs fed D and DT exhibited softer bellies based on a lower belly flop angle ($P < 0.01$) compared with pigs fed C and T. An interaction ($P < 0.03$) between DDGS and tallow was observed for belly fat iodine value (IV), indicating that tallow decreases IV when DDGS was included in the diet, but tallow increased IV when no DDGS was included. Backfat IV increased ($P < 0.01$) when either DDGS or tallow were fed. In conclusion, adding 5% tallow to diets containing 30% DDGS did not improve pork fat firmness.

Table 1. Tallow and DDGS effects on belly firmness and fatty acids in pork fat

							P value	
	C	T	D	DT	PSE	DDGS	TALLOW	DDGSx TALLOW
Belly Flop, °	125.8	115.3	72.6	63.1	9.9	<0.01	NS	NS
Belly Fat								
PUFA, %	8.6	8.5	15.4	11.4	1.8	<0.01	NS	NS
MUFA, %	51.1	57.5	43.8	56.2	3.2	NS	<0.01	NS
SFA, %	40.3	34.1	30.8	32.4	2.1	<0.01	<0.01	NS
IV	59.0	64.2	71.2	67.9	1.9	<0.01	NS	<0.03
Backfat								
PUFA, %	8.9	9.9	16.3	18.5	1.3	<0.01	NS	NS
MUFA, %	23.5	27.6	14.4	23.7	1.8	<0.01	<0.01	NS
SFA, %	43.2	38.0	37.9	33.1	2.9	NS	<0.01	NS
IV	56.7	61.9	65.3	73.6	2.2	<0.01	<0.01	NS

Key Words: DDGS, tallow, pork fat quality

Graduate Student Oral Competition—Ph.D.

101 Effect of sow omega-3 fatty acid supplementation on growth performance of piglets from low birth weight litters. M. N. Smit*[1], J. D. Spencer[2], S. A. Crowder[2], J. L. Patterson[1], F. Aarsse[1], and G. R. Foxcroft[1], *[1]University of Alberta, Edmonton, AB, Canada, [2]JBS United Inc., Sheridan, IN.*

Multiparous sows with a low litter birth weight phenotype were matched at weaning by parity and average birth weight of their last 3 litters, and designated as controls (CON; n = 81), fed standard gestation and lactation diets, or treated (GRO; n = 82), fed standard gestation and lactation diets supplemented with 0.48% of a marine-oil based supplement rich in eicosapentaenoic and docosahexaenoic acid (O3FA; Gromega, JBS United Inc.). Number of pigs born and weaned, and individual pig weight at birth and weaning, were recorded. From each of 4 breeding groups, the 6 lowest average birth weight litters of each treatment (n = 24/trt) were weaned and strategically allocated across treatments by litter birth weight ranking into adjacent pens in nursery rooms with 24 pens, 3–6 pigs/pen and 1 or 2 pens per litter. Average pen weight and feed intake in the nursery were recorded at 0, 1, 3 and 5 wks and ADG, ADFI and Gain/Feed was calculated for wk 1 (period 1), wks 2–4 (period 2) and wks 3–5 (period 3). Data were analyzed with a repeated measures analysis with nested design using the mixed models procedures in SAS. Litter size was greater ($P < 0.05$) for CON than GRO sows (12.3 ± 0.4 vs. 10.9 ± 0.4 born alive, respectively). Litter average body weight was similar between treatments at birth and weaning, but gradually diverged during the nursery phase to become greater ($P < 0.05$) in GRO than CON litters at the end of period 3 (18.21 ± 0.34 vs. 17.28 ± 0.33 kg, respectively), associated with a trend ($P < 0.10$) for higher ADG (0.51 ± 0.01 vs. 0.48 ± 0.01 kg, respectively) and ADFI (0.72 ± 0.01 vs. 0.69 ± 0.01 kg, respectively) in period 3 in GRO litters. A decreased litter size at birth in O3FA supplemented sows is not consistent with previous research. However, this study supports the hypothesis that O3FA supplementation to sows with lower average birth weights will improve the post-natal growth performance of their offspring.

Key Words: birth weight, growth, omega-3 fatty acids, pigs

102 Meta-analyses to improve prediction of pork carcass fat quality. J. R. Bergstrom,* M. D. Tokach, J. L. Nelssen, S. S. Dritz, R. D. Goodband, J. M. DeRouchey, and T. A. Houser, *Kansas State University, Manhattan.*

Largely because of the increased availability and use of dried distillers grains in swine diets, concerns over quality of pork fat as mea-

sured by iodine value (IV) have increased. Data indicates that, within experiment, regression equations are highly accurate to predict pork fat IV based on dietary IV product (IVP) or polyunsaturated fatty acids (PUFA), such as C18:2. However, experiences in the field indicate that these predictions are not as accurate when applied to different genetic lines or environmental conditions. This implies that other factors beside diet IVP value are contributing significant amounts of variation and reducing the accuracy of the prediction. Therefore, 2 meta-analyses were performed to identify variables that may improve the accuracy of pork fat IV value prediction equations. The first analysis used data from 21 experiments where pigs were fed a relatively constant dietary IVP and the second analysis used 6 experiments where pigs were fed a dietary IVP-reduction strategy. As expected, dietary concentration of PUFA was the most important prediction factor. However, models were improved by including variables to describe initial and final BW, ADG, and carcass leanness. Increased ADG, final BW, BW range over course of the diet, and backfat depth resulted in reduced backfat IV ($P < 0.02$). Belly fat IV was reduced with increasing final BW, BW range over the course of the diet, and backfat depth ($P < 0.03$). Reduced jowl fat IV was associated with an increase in backfat depth and a lower fat-free lean index (FFLI, $P < 0.02$). The R^2 of the equation for jowl fat IV improved from 0.45 when including only diet IVP to 0.75 when including other variables (jowl fat IV = 2.70+0.18*diet IVP+2.15*diet C18:2(%)-0.33*diet ME from fat (%)+1.10*FFLI). Reducing diet PUFA in the initial and diet just before marketing led to lower fat IV, indicating that increasing the length and magnitude of dietary IVP-reduction strategy resulted in the greatest fat IV value reductions. The IV of backfat was most amenable to change using an IVP-reduction strategy. Feeding pigs for a longer period and heavier final BW resulted in a reduced backfat IV ($P \leq 0.05$). These results indicate that including variables besides diet IVP or C18:2 greatly improved the ability to predict IV of pork fat.

Key Words: fatty acids, fat quality, iodine value, prediction equations

103 Enterosorption therapy provided by Calibrin-Z when pigs were fed low zearalenone concentrations. J. P. Wang*[1], I. H. Kim[1], S. W. Choi[2], J. Broomhead[3], and F. Chi[3], *[1]Dankook University, Department of Animal Resource & Science, Cheonan, Choongnam, South Korea, [2]CTCBio, Seoul, South Korea, [3]Amlan International, Chicago, IL.*

A total of one hundred and 40 4 gilts with an initial BW of 8.16 ± 1.27 kg were used in the study. Pigs were fed a common corn-soybean meal based diet for a 7 d adjustment period, then randomly allotted to 8 treatments according to their BW (3 replicate pens with 6 pigs each) and fed test diets for 28 d. Cultured corn meal contaminated with 180 mg/kg of zearalenone (ZEA, University of Missouri, Columbia) and a clay enterosorbent Calibrin-Z (Amlan International, Chicago) were used in the formulation to achieve increasing ZEA and clay concentrations in test diets while maintaining a consistent clay to toxin ratio between treatments (Table 1). Blood samples were collected on d-14 and d-28 and serum malondialdehyde (MDA), superoxide dismutase (SOD), and liver enzymes such as aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphatase (AP) were analyzed. Pigs fed 800 ppb ZEA diet showed a worse ADG and FE ($P < 0.05$) as compared with the pigs fed 0 ppb ZEA diet. Addition of 0.2% Calibrin-Z to the 800 ppb ZEA diet improved ($P < 0.05$) FE. The vulva size of pigs increased linearly ($P < 0.05$) as dietary ZEA increased. Addition of Calibrin-Z reduced ($P < 0.05$) average vulva size in the 400 and 800 ppb ZEA treatments but not in 0 and 200 ppb ZEA treatments. DM, CP and GE digestibility decreased ($P < 0.05$) as dietary ZEA increased and were all improved by Calibrin-Z supplementation and the improvement was independent of dietary ZEA dosage. Serum liver enzymes increased linearly as dietary ZEA increased on d-14 but not on d-28. Serum MDA increased and SOD decreased as dietary ZEA dosage increased ($P < 0.05$), and Calibrin-Z supplementation reversed the effects that ZEA had on serum MDA and SOD activity. The study demonstrated that, besides its estrogenic effect, feeding relative low ZEA concentrations reduced nutrient digestibility, increased oxidative stress and affected pig′ growth. Addition of Calibrin-Z to ZEA contaminated feeds and maintaining a 2,500:1 binder to toxin ratio can effectively ameliorate the negative effects of ZEA.

Table 1 – Experimental treatments

Treatment	1	2	3	4	5	6	7	8
ZEA, μppb	0	0	200	200	400	400	800	800
Calibrin-Z, %	0	0.20	0	0.05	0	0.10	0	0.20

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

104 Effects of including low fat dried distillers grains in finishing diets on feedlot performance and carcass characteristics of beef steers. J. M. Kelzer*[1], J. M. Popowski[1], S. Bird[2], R. Cox[1], G. I. Crawford[3], and A. DiCostanzo[1], *[1]University of Minnesota, St. Paul, [2]University of Minnesota, North Central Research and Outreach Center, Grand Rapids, [3]University of Minnesota Extension, Hutchinson.*

Angus steers (n = 48) averaging 317 ± 8 kg initial BW were used to evaluate effects of partially replacing dry-rolled corn (DRC) with conventional dried distillers grains plus solubles (27.6% CP, 10.9% fat) or low fat dried distillers grains (39.0% CP, 5.0% fat) in traditional DRC-based finishing diets on feedlot performance and carcass characteristics. Steers were assigned randomly to one of 3 finishing diets (DM-basis): 1) 82.5% DRC, 12.1% CP, 3.55% fat, 0.15% S, 1.29 Mcal/kg NE_g (CON); 2) 35% conventional dried distillers grains plus solubles, 17.1% CP, 5.96% fat, 0.42% S, 1.29 Mcal/kg NE_g (DDGS); or 3) 35% low fat dried distillers grains, 22.0% CP, 3.53% fat, 0.37% S, 1.26 Mcal/kg NE_g (LFDG). Diets contained 12% alfalfa haylage and supplied 300 mg monensin sodium/steer daily. Steers were fed *ad libitum* once daily at 0700 using individual Calan gates. On d −11 and 56, respectively, steers received initial and terminal implants (Synovex® Choice). On d 118, steers were harvested at a commercial abattoir and carcass characteristics were collected. Carcass-adjusted final BW was similar (P = 0.54) and averaged 553, 552, and 540 ± 9 kg for CON, DDGS, and LFDG, respectively. Overall DMI tended to be greater (P = 0.08) for CON compared with LFDG (10.3 vs. 9.7 ± 0.2 kg/d) but was similar (P = 0.58) to DDGS (10.2 kg/d). However, DMI from d 28 through finishing was greater (P < 0.01) for CON than LFDG (10.8 vs. 9.9 ± 0.2 kg/d) but was similar (P = 0.16) to DDGS (10.5 kg/d). Carcass-adjusted ADG and gain:feed were similar (P ≥ 0.49) among treatments and averaged 1.98, 1.99, and 1.91 ± 0.05 kg and 0.192, 0.196, and 0.197 ± 0.004 for CON, DDGS, and LFDG, respectively. Hot carcass weight, yield grade, 12th rib backfat, LM area, and marbling score were similar (P ≥ 0.18) among treatments. Percent carcasses grading USDA Prime and Choice were similar ($P = 0.86$) and averaged 81.3, 87.5, and 81.3 ± 9% for CON, DDGS, and LFDG. Finishing beef cattle with low fat dried distillers grains tended to reduce overall DMI; however, it may successfully replace conventional dried distillers grains or up to 35% DRC in feedlot diets without negatively affecting other live performance or carcass characteristics.

Key Words: dried distillers grains, feedlot performance, beef steers