

	Negative control	Fish meal control	HP 300 replacing fish meal		15% HP 300	SEM	P <
			SID Lys basis	kg for kg			
d 0 to 21							
ADG, g	247 ^{yz}	278 ^x	253 ^{yz}	269 ^{xy}	245 ^z	10.2	0.080
ADFI, g	382 ^{ab}	407 ^a	354 ^{bc}	379 ^{abc}	352 ^c	11.1	0.003
G:F	0.649 ^b	0.687 ^a	0.713 ^a	0.709 ^a	0.693 ^a	0.0115	0.002
Final BW, kg	11.54 ^b	12.30 ^a	11.64 ^b	12.12 ^{ab}	11.48 ^b	0.238	0.042

^{a,b,c} Means within the same row with different superscripts differ ($P < 0.05$).

^{x,y,z} Means within the same row with different superscripts differ ($P < 0.10$).

performance. Pigs were weaned at 21-d of age, placed in nursery pens according to BW, and fed a common pelleted starter diet for 3-d, at which time pigs were weighed and pens allotted to 1 of 5 dietary treatments in a complete randomized block design with 5 pigs/pen and 14 pens/treatment. A composite sample of fish meal and HP 300 (Hamlet Protein, Findlay, OH) was collected and analyzed for AA content and proximate analysis to use in diet formulation. Diets were corn soybean-meal based with 10% spray-dried whey and formulated to contain 1.35% standardized ileal digestible (SID) Lys and balanced on an NE basis. The 5 treatments were: 1) a negative control (no specialty protein products); 2) diet with 6% fish meal; 3) diet with 9.1% HP 300 replacing fish meal on a SID Lys basis; 4) diet with 6% HP 300 replacing fish meal on a kg/kg basis; and 5) diet with 15% HP 300 included at the expense of SBM and fish meal. Overall (d 0-21), ADG ($P < 0.10$) was marginally decreased and ADFI ($P < 0.05$) decreased when pigs were fed 15% HP 300 compared with pigs fed the fish meal control. Pigs fed the negative control diet had the poorest G:F ($P < 0.05$), with the other treatments not different from each other. Furthermore, pigs fed the fish meal control diet had increased ($P < 0.05$) final BW compared to pigs fed the negative control, HP 300 replacing fish meal on a SID Lys basis, and 15% HP 300 diet. In conclusion, nursery pigs fed diets with fish meal had improved performance compared with those fed the control diet.

Key Words: nursery pig, HP 300, fish meal

333 Evaluating the Effects of Fish Solubles in Whole Fish Meal on Nursery Pig Performance. A. M. Jones^{*1}, J. C. Woodworth¹, M. D. Tokach¹, S. Herbert², J. Smith², D. Berry², B. D. Goodband¹, J. M. DeRouche¹, S. S. Dritz¹, ¹Kansas State University, Manhattan, KS, ²Daybrook Fisheries, New Orleans, LA

A total of 700 barrows (Line 200 × 400, DNA, Columbus, NE; initially 6.5 kg) were used in a 21-d growth trial evaluating the effects of fish solubles in whole fish meal on nursery pig performance. Pigs were weaned at approximately 21-d of age, placed in nursery pens according to BW, and fed a common pelleted starter diet for 3-d, at which time pigs were weighed and pens were allotted to 1 of 5 dietary treatments in a randomized complete block design with 5 pigs/pen and 28 pens/treatment. Dietary treatments included a corn soybean meal-based control diet and 4 diets containing 6% fishmeal (LT Prime Menhaden Fishmeal Daybrook Fisheries Inc., New Orleans, LA). One batch of fish meal contained 0.87% fish solubles and the second batch contained 24.35% solubles. The 2 batches were then blended to provide dietary treatments with fish meal containing 0.87, 8.70, 16.52, and 24.35% fish solubles. A composite sample from each batch of fish meal was collected and analyzed for AA content and proximate analysis and used in diet formulation. Dietary treatments contained 10% spray-dried whey and formulated to contain 1.35% standardized ileal

	Control	Fish Solubles, %				SEM	P < ¹
		0.87	8.70	16.52	24.35		Control vs. Fish meal
d 0 to 21							
ADG, g	293	322	309	322	321	14.9	0.001
ADFI, g	412	442	431	447	449	13.9	0.001
G:F	0.711	0.729	0.717	0.722	0.716	0.0133	0.258
Final BW, kg	12.7	13.2	13.1	13.4	13.3	0.15	0.001

¹Fish solubles%, not different ($P > 0.10$) for all growth criteria.

digestible Lys and balanced on an NE basis (2,502 kcal/kg). Net energy values from the 2012 NRC were used for the high solubles fish meal as the fat level was similar. For the lower soluble fish meal diets, choice white grease was used to balance based on added fat. Data were analyzed as a randomized complete block design using the proc GLIMMIX procedure in SAS with pen as the experimental unit. Overall (d 0 to 21), there was no evidence for differences observed for ADG, ADFI, G:F, or final BW as the amount of fish solubles in fish meal increased. However, pigs fed diets with fish meal regardless of the fish soluble amount had increased ($P < 0.05$) ADG, ADFI, and final BW compared to pigs fed the control diet without fish meal. In conclusion, our results suggest that level of fish solubles contained within fish meal does not impact growth performance.

Key Words: fish meal, fish solubles, nursery pig

334 Influence of Meal Periodicity and Time Restricted Feeding Under Limit Feeding Regime on Sow and Subsequent Litter Performance.

H. Manu*, L. Su Hyup, D. Pangen, S. K. Baidoo, *Southern Research and Outreach Center, University of Minnesota, Waseca, MN*

The aim of this study was to investigate the influence of meal periodicity and time restricted feeding during gestation on sow and subsequent litter performance. Two hundred and ninety-three sows [(Landrace \times Yorkshire); BW 211.86 ± 1.29 kg; parity 3.80 ± 0.16 ; backfat (BF) 13.50 ± 0.25 mm] were blocked by parity, farrowing date, and randomly assigned to 1 of 5 treatments in a RCBD. Treatments include sows fed corn-soybean meal-based diet once at [0730 (Control, T1), 1130 (T2), or 1530 h (T3)], twice [half ration at 0730 and 1530 h (T4)], or thrice [one third portion at 0730, 1130, and 1530 h (T5)], with daily feed quantity kept at $1.25 \times$ maintenance energy intake ($100 \times (BW)^{0.75}$) kcal ME/d. On average, sows received 6934.5, 7140.8, and 7436.6 kcal ME day⁻¹ from d30-60, d61-90, d91-109 of gestation respectively. The gestation diet contained SID Lys:ME of 1.71 g/Mcal. One common lactation diet was offered to the sows. Body weight and BF were recorded on d 30, 60, 90, and 109 of gestation, 24 hours post-farrow, and at weaning. Count and continuous data were analyzed using GLIMMIX and MIXED procedure respectively of SAS 9.4 with sow as the experimental unit. Statistical significance was set at $P \leq 0.05$ while a trend was considered at $0.05 < P \leq 0.10$. Data are presented as least squares means \pm SE. Treatments evaluated did not influence BW changes from d30 to d109 of gestation or from d30 to weaning ($P > 0.05$). From d30 to d109 of gestation, sows fed once daily at 1530 h gained more BF compared

to both the control (3.82 ± 0.46 mm vs 2.22 ± 0.48 mm, $P \leq 0.01$) and T2 (3.82 ± 0.46 mm vs 2.55 ± 0.48 mm, $P \leq 0.03$). Similarly, from d30 to weaning, sows fed once daily at 1530 h tended to have increased BF depth compared to the control (0.75 ± 0.39 mm vs -0.09 mm ± 0.41 , $P = 0.09$) but similar to T2 ($P > 0.05$). Sows fed twice daily gained more BF relative to the control group ($P \leq 0.05$) but similar to T5 ($P > 0.05$) from either d30 to d109 of gestation or from d30 to weaning. Feeding of sows thrice daily tended to be associated with increased mummified fetuses compared to the control (0.51 ± 0.11 vs 0.29 ± 0.08 , $P = 0.08$). Sows fed twice daily had lower number of stillborn relative to the control sows (2.2 ± 0.24 vs 1.6 ± 0.19 , $P \leq 0.03$). In conclusion, our data suggest that BW changes is not synonymous to BF changes and feeding of sows twice daily may improve performance compare to single or thrice feeding under limit-fed conditions.

Key Words: time restricted feeding, gestation sow performance, Meal periodicity

335 Effect of Soybean Meal Supplementation during Gestation on Piglet Quality. M. T. Knauer*, E. van Heugten, *North Carolina State University, Raleigh, NC*

The objective of this study was to investigate the impact of supplementation of soybean meal during gestation on piglet quality. Females were reared at the NCDA Tidewater Research Station (Plymouth, NC). Genetics consisted of composite PIC Landrace \times Large White females mated to Duroc males. During gestation, a cohort of second parity sows ($n = 74$) were fed daily 2.1 kg of a diet formulated to contain 0.58% SID lysine, 2979 kcal ME per kg and other nutrients to meet or exceed NRC (2012) requirements. At breeding, sows were randomly allocated by weight to receive either 139 g of soybean meal (SBM) daily or no supplementation (CON) until farrowing. Soybean meal was added as a top-dress to the sow's feed drop box. Sows were housed in individual gestation stalls with ad libitum access to water and natural ventilation. Sow body condition was measured at the last rib with the sow body condition caliper at breeding and at farrowing. Piglets were individually identified and weighed within 1 d of birth and at 25 d of age. Traits included total number born, litter birth weight (LBW), average piglet birth weight (BWT), litter birth weight CV (BWT_CV), litter size at weaning (LSW), 25 day litter weaning weight (LWW), average piglet weaning weight (WWT), litter weaning weight CV (WWT_CV) and piglet survival. Weaning traits were calculated as those of the biological dam. Data were analyzed using PROC GLM in SAS with