grazing E+ exhibited symptoms of fescue toxicity which included agalactia (n=4 of 5), compromised delivery (n=2), retained placenta (n=3), and one mare aborted at 301 days gestation. Additionally, mares exposed to E+ had longer ($P < 0.05$) gestation (353 d) compared to those grazing NTE+ and E- (333 and 340 d, respectively). Mean urine ergot alkaloid content was greatest ($P < 0.01$) for E+ (38.5 ng/mg creatinine) compared with NTE+ and E- mares (5.9 and 3.4, ng/mg creatinine, respectively). Placental measurements showed increased ($P < 0.03$) thickening of the cervical aspect of the placenta in E+ (4.49 mm) compared with NTE+ and E- mares (1.58 and 1.57 mm, respectively). A difference ($P < 0.05$) was also seen for amnion thickness between E+ and NTE+ mares (2.37 vs. 1.0 mm, respectively). Pasture endophyte infestation rates were 2.3%, 63% and 91% in March and 1.5%, 92% and 91% in May for E-, NTE+ and E+ pastures, respectively. Of the infected tillers during May, 6% of the E- and NTE+ samples were positive for ergot alkaloids while 100% of the tillers in the E+ pasture were positive. Tall Fescue stands were 32 % for E-, 96 % for NTE+, and 95 % for E+ pastures in mid-March and 1 % (E-), 41 % (NTE+), and 27 % (E+) at the end of September, after a dry and hot summer (< 1 cm rainfall, 27 days > 37 C during July- September). Stand decline and survival in both NTE+ and E+ were related to soil type and landscape features. These findings suggest that NTE+ is a safe herbage for the grazing of late-term pregnant mares.

Key Words: Equine, Preganncy, Non-toxic infected-fescue

872 Manipulation of the dopaminergic system affects prolactin but not LH secretion in anestrous and cycling mares. K. Bennett-Wimbush*[1], B. Musolf[2], and D. Keisler[3], [1]*Ohio State University Agricultural Technical Institute, Wooster, Ohio,* [2]*Cuyahoga Community College, Parma, Ohio,* [3]*University of Missouri, Columbia, Missouri.*

Previous research has shown that dopamine antagonists can hasten follicular growth and ovulation in transitional mares. The mechanism of action appears to be by modulation of prolactin and not FSH. However, the effect of dopamine antagonists on LH is unknown. The purpose of this study was to determine the effects of 2-bromo-ergocriptine (dopamine agonist) and perphenazine (dopamine antagonist) on prolactin and LH secretion during different reproductive stages. Six mares were used in a 3x3 Latin Square design experiment. Treatments included .375 mg/kg oral perphenazine (P), 0.08 mg/kg$^{.75}$ 2-bromo-ergocriptine (B) intramuscularly (IM) or an equivalent volume of saline (S), IM. Each mare received all treatments once during anestrus, estrus and diestrus. Prior to treatment, each mare was fitted with an indwellling jugular catheter and pre-treatment blood samples were collected every 20 minutes for one hour, starting at time 0. After pre-treatment samples were collected, a single dose of either P, B or S was administered as described above. Blood samples were obtained every 20 minutes for 7 hours following treatment. Samples were analyzed for prolactin and LH via radioimmunoassays. Differences in mean prolactin (PRL), mean LH (LH), maximum prolactin (MAXPRL) and maximum LH (MAXLH) for cycle, treatment and cycle*treatment were tested using GLM. The relationship of prolactin and LH observed during this study parallels previously published works. Plasma PRL and MAXPRL were lower ($p < .01$) during anestrus (13.4 $\pm$ 7.3 , 18.0 $\pm$ 9.0 ng/ml) when compared to concentrations observed during estrus (18.3 $\pm$ 9.8, 26.2 $\pm$ 13.1 ng/ml) or diestrus (18.8 $\pm$ 9.3, 30.0 $\pm$ 14.1 ng/ml). As expected, plasma concentrations of LH and MAXLH were higher ($p < .01$) during estrus. Perphenazine treatment increased ($p < .01$) PRL and MAXPRL during all stages of the mares' cycles. PRL was 23.7 $\pm$ 9.3, 12.2 $\pm$ 5.6, 14.1 $\pm$ 7.0 ng/ml for P, B and S treatments respectively. Treatment with B did not significantly alter either PRL or MAXPRL when compared to the control (S). Similarly neither of the treatments had any effect on LH or MAXPRL. In conclusion, the dopaminergic system plays a key role in the regulation of pituitary prolactin secretion, but does not appear to regulate LH.

Key Words: Dopamine, Prolactin, LH

873 Temporal variables of the park walk and park trot of the Morgan Horse. M.C. Nicodemus*[1], K.M. Holt[1], and H.M. Clayton[2], [1]*Mississippi State University, Mississippi State, MS/USA,* [2]*McPhail Equine Performance Center, East Lansing, MI/USA.*

During competition, two of the gaits performed by the Morgan Park Horse are the park walk and park trot. According to judging standards, the park trot is a definite 2-beat diagonal gait but the park walk can be either a 2 or 4-beat walk with both being snappy, collected, and cadenced. Distinguishing between these gaits can be difficult for the novice judge. Therefore, the objective was to clearly define the park walk and park trot. Frame-by-frame analysis was done on 5 Morgan Park Horses performing 4 strides of the park walk and park trot at Morgan Horse Nationals. The mean (SD) of the following stride variables were determined: stride duration, fore and hind stance durations, lateral and diagonal step intervals, and limb support phases. Both gaits demonstrated a diagonal footfall sequence (RH-LF-LH-RF) with short contact intervals between the hind and diagonal forelimb. In each park walk half-stride, the support sequence was: tripedal (2 hind and 1 fore), quadrupedal, tripedal (2 hind and 1 fore), and diagonal bipedal. In each park trot half-stride, the support sequence was: single hind, diagonal bipedal, single hind, and suspension. Both gaits demonstrated a diagonal footfall sequence with diagonal couplets. The park walk had walking support characteristics with trotting footfall characteristics, whereas the park trot was similar to the trot. The shorter stride duration, the lack of tripedal and quadrupedal support, and the inclusion of suspension in the park trot differentiate it from the park walk.

	Park Walk	Park Trot
Stride Duration (ms)	835 (60)*	673 (33)*
Fore Stance Duration (ms)	513 (14)*	316 (18)*
Hind Stance Duration (ms)	443 (22)*	232 (22)*
Lateral Step Interval (%)	50 (7)	51 (8)
Diagonal Step Interval (%)	4 (1)	6 (2)
Suspension (%)	NA	10 (2)
Hind Single Support (%)	NA	20 (4)
Diagonal Bipedal Support (%)	75 (1)	70 (3)
Tripedal Support (%)	20 (1)	NA
Quadrupedal Support (%)	5 (2)	NA

Table 1: Park walk and park trot temporal variables (mean, SD) with significant differences ($P<0.05$) between variables of the gaits indicated (*).

Key Words: Equine locomotion, Temporal variables, Morgan Horse

ASAS Nonruminant Nutrition: Growth Management and Sow Nutrition; Aquaculture

874 Effects of feed deprivation prior to slaughter on changes in body weight and stomach morphology of finishing pigs. C. M. Dodd*, D. L. Rader, J. D. Hancock, G. A. Kennedy, C. W. Starkey, C. L. Jones, and D. J. Lee, *Kansas State University, Manhattan.*

A total of 176 pigs were used to determine the effects of feed deprivation (none, 12 h, 24 h, and 48 h) prior to slaughter on changes in BW and stomach morphology of finishing pigs. The pigs were blocked by sex and weight and allotted to 16 pens with 11 pigs per pen. The pigs were fed a corn (mean particle size of 600 microns)-soybean meal-based diet (0.8% lysine, 0.6% Ca, and 0.5% P) for 36 d (from 92 kg until slaughter). The diet had 4% soybean oil, was fed in pelleted form, and was consumed on an ad libitum basis. For the feed deprivation treatments, feeders were removed from the pens. To end the experiment, the pigs were loaded onto a truck at 0000, shipped to a commercial meat packing plant, and killed at 0600. The pars esophagea of the stomachs were collected and scored on a scale of 0 to 3 (0 = none, 1 = slight, 2 = moderate, and 3 = severe) for keratinization and ulceration. The mean BW of all pigs at initiation of the feed deprivation treatments was 127 kg. At shipping (i.e., 48 h later), BW changes ranged from 1.5 to 5.4 kg as duration of feed deprivation was increased from none to 48 h (linear effect, $P < 0.001$). Also, hot carcass weight decreased as duration of feed deprivation was increased (linear effect, $P < 0.04$). Keratinization score increased from 0.44 to 1.77 as duration of feed deprivation was increased (cubic effect, $P < 0.03$). Ulceration score increased slightly (from 0.02 to 0.56) but the changes were negligible except for the 48 h treatment (cubic effect, $P < 0.04$). In conclusion, feed deprivation prior to shipping for slaughter decreased final BW and hot carcass weight. Also, keratinization of the pars esophagea increased as duration of feed deprivation was increased but changes in ulcer scores were minor.

	Hours of feed deprivation				
Item	None	12 h	24 h	48 h	SE
Shipping wt, kg	127.6	126.3	124.9	122.2	1.0
BW change, kg	1.5	-0.7	-2.7	-5.4	0.3
Carcass wt, kg	92.0	92.7	92.0	90.1	0.7
Stomach keratinization	0.44	1.29	1.35	1.77	0.10
Stomach ulceration	0.02	0.23	0.05	0.56	0.08

Key Words: Pig, Ulcer, Feed deprivation

875 Effects of induced stresses on productive performance and serum concentration of acute phase proteins in growing-finishing pig. C. Pineiro*[1], E. Lorenzo[2], A. Pineiro[3], and G. G. Mateos[4], [1]*PigCHAMP Pro Europa, Spain,* [2]*Proinserga S. A., Spain,* [3]*Universidad de Zaragoza, Spain,* [4]*Universidad Politecnica de Madrid, Spain.*

The objective of the trial was to study the influence of two induced stressors (ambient temperature and stocking density) on serum levels of two acute-phase proteins (Pig-MAP and Haptoglobine) and productive performance of pigs. A total of 228 Landrace x Large White pigs of 60 ± 3 d of age and 18.2 ± 2.4 kg of weight were randomly distributed in three rooms (cold, control, and warm). There were three densities (1.25, 0.72, and 0.56 m^2 per pig) and two sexes (boars and females) and one replicate per each ambient temperature. The trial lasted 98 d. Feed intake and body weight were measured every 14 d and blood samples from two pigs per replicate were taken at random at the same time. Overall performance was excellent (ADG = 818 g and FC = 2.08) and no clinical signs of any disease were observed. At the end of the trial pigs stocked at 1.25 m^2 grew faster and had better feed conversion than pigs stocked at 0.72 or 0.56 m^2 ($P < 0.05$) but ambient temperature did not affect performance. Significant interactions were found among main effects. Pigs placed at 1.25 m^2 grew faster than pigs placed at 0.56 m^2 under cold ($P < 0.05$) but not under control or warm temperature. From 60 to 74 d females grew faster and had better feed conversion than boars ($P < 0.05$). Pig-MAP serum concentration in this period was greater in boars than in females ($P = 0.06$). From 116 to 158 d, growth rate of boars decreased with increased density ($P < 0.01$). Also boars had higher levels of Pig-Map than females ($P = 0.06$) but no differences among sexes were detected for Haptoglobine. In the same period, the levels of both marker proteins were the highest for overstocked pigs ($P < 0.05$). We conclude that environmental stresses might impair pig performance and that the concentrations of Pig-MAP and Haptoglobine can be used under these circumstances to detect losses in performance.

Key Words: Pigs, Environmental stressors, Biomarker proteins

876 Influence of slaughter weight on performance and carcass quality of fattening pigs. M. A. Latorre*[1], A. Fuentetaja[2], P. Medel[1], and G. G. Mateos[1], [1]*Universidad Politecnica de Madrid, Spain,* [2]*COPESE S.A. Segovia, Spain.*

A total of 192 Pietrain∗Large White × Landrace∗Large White pigs of 75 kg of initial BW was used to study the influence of final slaughter weight (SW) on productive performance and carcass quality. There were six treatments arranged as a factorial 3×2 with three SW (115, 124, and 133 kg) and two sexes (castrated males and females). Each treatment was replicated four times and the experimental unit was formed by eight pigs penned together. All the animals received *ad libitum* a common diet based on cereals and soybean meal (2,415 kcal NE/kg and 0.70% total lys) throughout the test. No interactions were detected between SW and sex for any of the traits studied. At the end of the trial, pigs slaughtered at 115 kg grew faster and had better feed conversion than pigs slaughtered at 124 or 133 kg (843, 788, and 769 g/d; $P<0.05$, and 3.19, 3.24, and 3.48 g/g; $P<0.01$). Castrates ate more (2844 vs 2448 g/d; $P<0.01$), grew faster (848 vs 752 g/d; $P<0.01$), and had worse feed conversion (3.35 vs 3.26 g/g; $P<0.05$) than females. Carcass yield improved with increased SW (77.3, 77.7, and 78.6%, for 115, 124, and 133 kg SW, respectively; $P<0.01$). Also backfat and thickness of fat measured at the *Gluteus medius* muscle augmented with increased SW (22.1, 25.7, and 27.0 mm, and 15.3, 19.4, and 19.8 mm for 115, 124, and 133 kg, respectively; $P<0.01$). Castrated males had less carcass yield (77.4 vs 78.3%; $P<0.01$), were 23.7% fatter ($P<0.01$), and had 29.7% more fat at *Gluteus medius* ($P<0.01$) than females. The length of the carcass and the ham increased with SW ($P<0.01$) but sex did not influence any of these measurements. Increasing the slaughter weight of both castrates and females up to 124 kg might help improve the carcass and meat quality of pigs destined to cured products.

Key Words: Carcass quality, Slaughter weight, Fattening pigs

877 Impact of daily energy intake on rate and composition of gain in pigs with high lean growth potential. J.F. Patience*[1], C.M. Nyachoti[2], R.T. Zijlstra[1], R.D. Boyd[3], and J.L. Usry[4], [1]*Prairie Swine Centre, Inc., Saskatoon, SK,* [2]*University of Manitoba, Winnipeg, MB,* [3]*PIC USA, Franklin, KY,* [4]*Heartland Lysine Inc, Chicago, IL.*

While the response to changes in amino acid intake is becoming better understood, there is a paucity of information on energy effects on the modern pig. A total of 83 castrated male and 83 female pigs (PIC Camborough 15 X L65) were used to investigate the impact of declining daily energy intake on the rate, efficiency and composition of gain from 25 to 120 kg. Individually-housed pigs received a diet formulated to be non-limiting in amino acids, vitamins and minerals at 100, 93, 86, 79, or 72% of ad libitum. Pigs were killed at 25±2 kg (n=8 within sex) to provide baseline body composition and at 50±2 kg (n=3 within sex and treatment group), 75±2.5 kg (n=3), 100±2.5 kg (n=4) and 120±3 kg (n=5) to determine whole body protein, lipid, ash and water content. For each weight period until slaughter, rate of gain and feed intake were recorded; backfat and loin thickness were measured by real time ultrasound. A linear decline in ADG from 25 to 120 kg occurred as daily energy intake declined ($P<0.05$): 1.02 and 1.00; 0.94 and 0.90; 0.89 and 0.82; 0.78 and 0.73; 0.71 and 0.62 kg/d for males and females at 100, 93, 86, 79 and 72%, respectively. As daily energy intake declined from 8.8 (100%) to 6.4 (72%) Mcal DE/d in males and from 9.1 to 6.4 Mcal DE/d in females, total body protein at 120 kg increased from 15.0 to 17.4% of empty body weight in males and from 15.9 to 17.5% in females ($P<0.05$). Total body lipid declined from 27.5 to 20.7% in males and from 25.0 to 19.3% in females ($P<0.05$) while percent ash was unaffected ($P>0.05$). Empty stomach and intestine weights increased and then decreased in a quadratic ($P<0.05$) fashion as daily energy intake declined. Definition of body composition as influenced by energy intake is essential to the use of factorial models in estimating nutrient requirements of pigs.

Key Words: Pig, Energy, Carcass

878 Effect of high temperature and energy intake on energy utilization in growing pigs. L. Le Bellego*, J. van Milgen, and J. Noblet, *INRA, St Gilles, France.*

Eight blocks of five barrow littermates were used to study the effect of ME supply at thermoneutrality (23C; TN; four blocks) and under heat stress (30C; HS; four blocks) on composition of BW gain. Relative to *ad libitum* intake (100) at each temperature, ME levels were 100, 90, 80 and 70 % for TN pigs and 100, 91, 85 and 77 % for HS pigs. Feeding levels were adjusted daily according to BW. Animals were fed a corn, wheat, and soybean meal based diet providing 0.95 g of standardized digestible lysine per MJ NE. One littermate per block was slaughtered at the beginning of the experiment (24 kg BW) to measure initial body composition; the four remaining littermates were affected to the four ME levels. Pigs were penned individually and slaughtered at 65 kg. Gain of nutrients and energy were calculated according to the comparative slaughter technique. Data were analyzed according to a covariance model including the effects of block, temperature, ME intake and interactions. At the TN-100 ME intake (32.2 MJ/d), daily gains of empty BW, protein, lipid and energy were 1021, 166, 259 g and 16.4 MJ, respectively. At 26 MJ/d ME intake, (corresponding to HS-100 and TN-80), daily gains of empty BW, protein and energy were higher ($P<0.05$) in TN (901 g, 151 g and 13.14 MJ, respectively) than in HS (876 g, 143 g and 12.75 MJ, respectively). Daily lipid gain was similar at both temperatures (190 g). At 22 MJ/d ME intake, corresponding to TN-70 and HS-85), daily gains of empty BW and protein were higher ($P<0.05$) in HS (795 and 139 g) than in TN (755 and 124 g), whereas daily gains of lipid and energy were lower in HS (141 g and 10.61 MJ) than in TN (169 g and 11.01 MJ). These results demonstrate that the partitioning of energy between protein and lipid deposition in growing pigs is affected by both ambient temperature and feeding level. At similar ME intakes, protein gain is reduced directly by heat stress in *ad libitum* pigs while a severe man-imposed feed restriction at thermoneutrality affects protein gain more that the combination of a man- and temperature imposed feed restriction.

Key Words: Growing Pig, Temperature, Protein Gain

879 Compensatory feed intake and growth in pigs.

J. van Milgen*[1] and J. Noblet[1], [1]*INRA, St-Gilles, France.*

Growing pigs may face temporary challenges, such as disease or seasonal heat stress that may be overcome later. The objective of this study was to determine the extent to which growing pigs may recover from a period of feed restriction. Eleven groups of two littermate barrows were used. At 35 kg, pigs were moved to individual pens and adapted to the experimental conditions for 4 d. One animal of each litter (A) had ad libitum access to feed throughout the experiment. Its littermate (R) received 60% of the anticipated voluntary feed intake for six d followed by 12 d ad libitum access to feed. This cycle of feed restriction and re-feeding was repeated three times (starting at approximately 40, 60 and 80 kg BW). Feed intake and feed refusals were determined daily whereas BW was determined at the beginning and the end of the experiment (after an overnight fast) and after every change in feeding level. After the third period, animals were slaughtered. During the restriction periods, feed intake averaged 1.66 and 2.90 kg/d for groups R and A, respectively. During the re-feeding periods, feed intake was equivalent for both groups during the first two periods (average 2.95 kg/d) but was considerably higher for group R during the third period (3.86 vs 3.27 kg/d). For the complete experiment (35 to 100 kg), average feed intake was significantly higher for group A (2.90 kg/d) than for group R (2.70 kg/d) but average daily gain was not different between groups (1.08 kg/d). Periods of feed restriction and re-feeding caused considerable variation in gut fill for group R and biased the calculated growth rates. These (average) growth rates for respectively R and A were 0.22 and 1.18 kg/d during the restriction periods, and 1.51 and 1.11 kg/d during the re-feeding periods. Due to the increased feed intake in the last period, animals in group R had greater gut fill and tended to have lower carcass weights (79.9 vs 82.5 kg). There was little difference in carcass composition between treatments. These results indicate that (partial) compensatory growth exists in fast growing pigs, but compensatory feed intake may only be effective in the later stages of growth.

Key Words: Pigs, Compensatory Growth, Compensatory Feed Intake

880 Effects of soybean meal from different sources on sow and litter performance during gestation and lactation.

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An experiment was conducted to study effects of the differently originated-soybean meals during gestation and lactation periods on sow and litter performance. One hundred and twenty crossbred multiparous sows (Yorkshire Landrace) were assigned to three dietary treatments and fed corn-soybean meal based diets containing the U.S. dehulled (USDH), Brazil, and India soybean meal (SBM) as a major protein source. Diets were formulated to meet the nutrient requirements (NRC, 1998). Sows were fed different diets during gestation, lactation and from weaning to estrus, according to physiological status. The ADG, ADFI and G/F did not differ ($P > .05$) among treatments in gestation period. In lactating period, ADFI, backfat change, and days of weaning-to-estrus were not different but body weight change was significantly different ($P < .10$). Number of born alive in the USDH treatment was higher ($P < .10$) than that in Brazil treatment. Also, litter weight at birth of the USDH treatment was greater ($P < .05$) than that of Brazil treatment. Litter weaning weights of the USDH, Brazil and India treatments were 56.10 kg, 52.93 kg and 54.42 kg, respectively. This experiment concludes that feeding a diet with the USDH to sows exhibits a better litter performance than feeding diets with Brazil or India SBM.

Item	USDHSBM	Brazil SBM	India SBM	SEM
Gestation				
ADFI, kg	3.07	3.06	3.08	0.005
ADG, kg	0.47	0.44	0.44	0.025
Gain/Feed, g/kg	153	152	147	9.452
Lactation				
ADFI, kg	5.02	4.90	4.93	0.125
Body weight change, kg	-22.18^{a}	-15.29^{b}	-15.53^{ab}	2.090
Backfat change, cm	−0.38	−0.24	−0.28	0.046
Re-estrus interval, d	6.08	5.79	5.86	0.334
Litter performance				
Number of born alive	10.03^{a}	8.72^{b}	9.38^{ab}	0.346
Birth weight, kg	14.33^{c}	11.86^{d}	13.02^{cd}	0.503
Weaning weight, kg	56.10	52.93	54.42	1.352

^{a,b} $P < .10$; ^{c,d} $P < .05$

Key Words: Sows, Soybean meal, Litter performance

881 Effects of dietary supplementation with mannan oligosaccharides on sow and litter performance in a commercial production system.

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This trial was conducted to evaluate the effects of dietary addition of mannan oligosaccharides (MOS) on sow and litter performance in a commercial production system. The MOS used in this trial (Bio-Mos) was supplied by Alltech, Inc. Sows (n = 509 and 517 for MOS and control sows, respectively) were of PIC genetics with average parity and initial BW of 3.26 and 264 kg, respectively, and were fed MOS starting a minimum of three wk prior to farrowing (0.20% inclusion of Bio-Mos) and throughout the 21-d lactation period (0.10% inclusion of Bio-Mos). Diets were analyzed for mycotoxins: values for aflatoxin, T-2, fumonisin, DON, and ochratoxin were low and similar between diets. Sows were weighed upon entry into the farrowing house (d 112 of gestation) and at weaning, and litters were weighed at processing (approximately 30 h after birth) and at weaning. Addition of MOS did not affect ($P>0.05$) sow weight loss, number born alive, stillborns, or mummified fetuses. Addition of MOS resulted in heavier ($P\leq0.05$) litter birth and weaning weights. Average pig weight gain for the MOS and control pigs was 4.11 and 3.79 kg, respectively. Pre-weaning mortality was reduced ($P<0.01$) by feeding MOS to the sows (9.09 vs 11.27% for the MOS and control sows, respectively). Concentrations of IgA, IgG, and IgM in pre-nursing colostrum samples (n = 48 and 42 for MOS and control sows, respectively) were increased by dietary addition of MOS. Concentrations of IgG showed the greatest response ($P=0.007$; 5,853 vs 4,842 mg/dL) to MOS supplementation, followed by IgM ($P=0.03$; 273 vs 241 mg/dL), and IgA ($P=0.06$; 1,178 vs 1,097 mg/dL). The changes in composition of the pre-nursing colostrum samples may help explain the observed improvements in pig growth performance. In summary, the reduction in pre-weaning mortality coupled with the improvements in litter growth performance indicates that additions of mannan oligosaccharides may be beneficial in commercial sow herds.

Key Words: Sow, Litter, Mannan oligosaccharides

882 Effect of dietary levels of soluble and insoluble fiber on energy digestibility and nitrogen balance in gestating sows.

J.A. Renteria*, L.J. Johnston, and G.C. Shurson, *University of Minnesota, St Paul MN.*

Gestating sows (12 nulliparous, NULL; 12 multiparous, MULT) were used to assess the effect of different levels of soluble (S) and insoluble (IS) fiber on energy digestibility and nitrogen balance. Experimental diets included: Control (C) - corn-soybean meal diet (1.59% S, 7.67% IS); High Soluble Fiber (HS) - corn-soybean meal-oat bran (34% oat bran, 3.19% S, 8.95% IS); High Insoluble Fiber (HIS) - corn-soybean meal-wheat straw (12% wheat straw, 1.46% S, 15.36% IS); and High Soluble/High Insoluble (HS/IS) - corn-soybean meal-sugar beet pulp (16% beet pulp, 3.20% S, 15.31% IS). Sows were randomly assigned to diets, and fed to meet their energy requirements according to the NRC model (1998), assuming 10 pigs per litter and 40 kg gestation gain. Total collections of feces and urine were conducted in 5-d periods at wk 5, 10, and 14 of gestation. Greater apparent digestibility of dietary gross energy (87.1 vs 86.2%; $P < .02$; SE = .34) and nitrogen (85.7 vs 83.1%; $P < .01$; SE = .63) was observed for MULT vs NULL females throughout gestation. There were no interactions between parity group and dietary treatments for the evaluated response criteria. Apparent digestibility of dietary energy throughout the evaluated periods was lowest for females fed HIS (82.7%) vs C (87.9%), HS (89.3%), and HS/IS (86.8%; $P < .01$; SE = .48). Apparent digestibility of dietary nitrogen throughout the evaluated periods was similar between C and HS (86.1 and 86.2%) but greater ($P < .05$; SE = .90) than HIS and HS/IS (82.8 and 82.8%). Apparent nitrogen digestibility but not energy declined ($P < .05$) as time on diet and gestation progressed. In conclusion, multiparous sows demonstrated a greater ability to digest fibrous diets than nulliparous females. Inclusion of insoluble fiber in diets for gestating sows depresses energy digestibility and nitrogen balance, but elevated levels of dietary soluble fiber do not influence these variables. Knowledge of specific dietary fiber components is necessary to accurately predict effects of dietary fiber on digestibility.

Key Words: Sow, Fiber, Digestibility

883 Reproduction, conceptus growth and plasma reduced folates in sows in response to dietary supplementation with oxidized and reduced sources of folic acid. A. F. Harper*[1], J. W. Knight[1], E. Kokue[2], Y. Toride[3], and J. L. Usry[4], [1]*Virginia Polytechnic Institute & State University,* [2]*Tokyo University of Agriculture & Technology,* [3]*Ajinomoto Company Incorporated,* [4]*Ajinomoto Heartland Incorporated.*

The study was conducted to determine the response of sows to oxidized and reduced forms of supplemental folic acid in the diet. Yorkshire x Landrace gilts were mated and fed a standard corn-soy diet (0.57 ppm folacin) with no supplemental folic acid. On d 105 of gestation gilts were randomly assigned to one of four dietary treatments for the remainder of the study. Treatments included a diet with no supplemental folate (control), a diet with 2.1 ppm added folate from an oxidized monoglutamate form (MG), a diet with 2.1 ppm added folate from N5-Formyl-5,6,7,8,-THFA (leucovorin) and a diet with 2.1 ppm added folate from a commercial organic source (Ajinomoto-PG). Breeding-gestation diets were fed at a rate of 1.8 kg/sow/d and lactation diets were fed ad libitum. Plasma samples for HPLC determination of reduced plasma folates were collected on d 105, at weaning, at mating and when the sows were sacrificed on d 45 after mating for the second parity. There were 19, 18, 18 and 22 sows for the control, MG, leucovorin and Ajinomoto-PG treatments, respectively. Supplementing folacin just prior to farrowing and during lactation had no effect on measures of sow and litter performance during the first parity ($P>0.18$). Live fetuses at d 45 of gestation in parity 2 were 10.06, 12.23, 10.87, and 11.07 for the control, MG, leucovorin and Ajinomoto-PG treatments, respectively. Due to variability in the data the litter size advantage with added folate was not significant (added folates vs. control, $P=0.15$). Fetal survival and placental size and protein content was generally unaffected by folate treatment. Reduced folates in sow plasma were 13.50, 13.58, 22.50, and 17.79 nM at weaning and 12.55, 19.29, 18.96, and 21.88 nM at mating for the control, MG, leucovorin and Ajinomoto-PG treatments, respectively, with the leucovorin treatment elevated sigificantly above the controls at weaning ($P<0.05$) and the Ajinomoto-PG treatment greater than controls at mating ($P<0.05$). In this study folate supplemetation from oxidized or reduced sources of folate did not impact sow reproductive performance but the reduced sources (leucovorin and Ajinomoto-PG) appeared to increase circulating reduced folates at mating and weaning time.

Key Words: Sows, Folic acid, Reproduction

884 Evaluation of pea ingredients for rainbow trout (*Oncorhynchus mykiss*) diets. D.L. Thiessen*[1], G.L. Campbell[1], and P.D. Adelizi[2], [1]*University of Saskatchewan, Saskatoon, SK, Canada,* [2]*Whitewater Trout Co., Whitewater, CA, USA.*

While nutrient digestibility data is available for whole peas (*Pisum sativum*), data is lacking for further processed pea ingredients in rainbow trout diets. Air classification of dehulled peas produces a concentrated product (50% CP, 20% starch) that may be beneficial in the continuing search for alternative feedstuffs suitable for salmonid diets. This study was undertaken to determine the effects of various milling and heat treatments on the nutrient and energy digestibility of pea ingredients in rainbow trout. The apparent crude protein, amino acid, acid ether extract, starch, energy and dry matter digestibility of raw/whole pea, raw/dehulled pea, extruded/dehulled pea (145°C, 620-740 psi) and autoclaved air-classified pea protein (125°C, 15 min) was determined. The ADC of each test ingredient was determined on diets in which 30% of a reference diet was replaced by each test ingredient. Experimental diets contained 1% acid insoluble ash as the indicator. Eighteen fish (300±15 g) per tank were adapted to the test diet (n=4) for 7 days with subsequent fecal collection for 4 days using a settling column. Results indicate that raw/whole pea protein was highly digestible (90.0%) in rainbow trout but the large starch component was essentially indigestible (14.3%), resulting in an ingredient with poor digestible energy (54.6%). Removal of the fibre-rich hull through dehulling had no significant effect on digestibility of raw peas ($P>0.05$). Extrusion of dehulled peas increased crude protein, starch and energy digestibility (93.5, 100.7 and 78.4%, respectively; $P<0.05$). Subsequent air classification and autoclaving of dehulled peas proved to be beneficial by concentrating the protein and removing the majority of the indigestible starch, ultimately producing an ingredient with exceptional protein and energy digestibility (94.6 and 87.0%, respectively; $P<0.05$). Based on digestibility it was concluded that autoclaved air-classified pea protein is an appropriate aquafeed ingredient for salmonid fish.

Key Words: Peas, Digestibility, Rainbow trout

885 Apparent nutrient digestibility of fishmeal and feather meal diets for juvenile Pacific white shrimp (Litopenaeus vannamei). Zongjia Cheng*[1], K.C. Behnke[2], and W.G. Dominy[3], [1]*University of Idaho, Hagerman, ID,* [2]*Kansas State University, Manhattan, KS,* [3]*The Oceanic Institute, Waimanalo, HI.*

A 35.8% CP shrimp diet containing 24.5% fishmeal (LT-94) was modified by substituting regular hydrolyzed feather meal (FTM), or a high digestible feather meal (FTMHD), at 33.3, 66.7 and 100% replacement for fishmeal on w/w basis. Additionally, synthetic amino acids (AA), L-lysine and DL-methionine, were added to FTM and FTMHD so that their total lysine and methionine contents were the same as in fishmeal. The modified FTM diets also were formulated to replace fishmeal at 33.3, 66.7 and 100% levels on w/w basis. Thirteen diets (including a fishmeal control diet) were fed to 936 shrimp (initial BW 1.77.75 g) for 20 d. Three aquaria/diet and 24 shrimp/aquarium were used. Cr_2O_3 was used as an inert marker. Results showed that the apparent protein digestibility (APD) for fishmeal diet was higher than FTM or FTMHD based diets for shrimp ($P<.05$). However, the apparent dry matter digestibility (ADMD) and apparent fat digestibility (AFD) of fishmeal were lower than those FTM or FTMHD based diets ($P<.05$). The APD, ADMD and AFD were 81.6%, 70.9% and 93.5%, respectively, for shrimp fed fishmeal diet. For those FTM or FTMHD diets, APDs varied from 51.7% for shrimp fed FTMHD plus AA replacing 100% fishmeal diet to 77.3% for shrimp fed FTMHD plus AA replacing 33.3% fishmeal diet ($P<.05$). ADMDs ranged from 63.7% for shrimp fed FTMHD plus AA replacing 100% fishmeal diet to 75.7% for shrimp fed FTMHD replacing 100% fishmeal diet ($P<.05$). AFDs ranged from 93.5% for shrimp fed FTMHD plus AA replacing 100% fishmeal diet to 96.8% for shrimp fed FTMHD replacing 66.7% fishmeal diet ($P<.05$).

Key Words: Apparent nutrient digestibility , shrimp, Fishmeal and Feather meal

886 Apparent nutrient digestibility of fishmeal and poultry by-product meal diets for juvenile Pacific white shrimp (Litopenaeus vannamei). Zongjia Cheng*[1], K.C. Behnke[2], and W.G. Dominy[3], [1]*University of Idaho, Hagerman, ID,* [2]*Kansas State University, Manhattan, KS,* [3]*The Oceanic Institute, Waimanalo, HI.*

A 35.5% CP shrimp diet containing 24.5% fishmeal (FM, LT-94) was modified by replacing FM with two types of poultry by-product meal (regular, PBM; and petfood grade, PBMPG) at 33.3, 66.7 and 100% on w/w basis. Additionally, the PBM and PBMPG were defatted and fish oil was added back so that their oil contents were the same as the original samples. These modified meals were also used to replace FM at 33.3, 66.7 and 100% levels on w/w basis. Thirteen diets (including FM control diet) were fed to 936 shrimp of average BW 1.77.75 g for 20 d. Shrimp were stocked into 3 aquaria per treatment (diet) and 24 shrimp per aquarium. During the first 3 d, shrimp consumed their respective test diets, feces were collected on the 4th d of the Exp. Cr_2O_3 was used as an inert marker. Results showed that the apparent dry matter digestibility (ADMD), apparent protein digestibility (APD) and apparent fat digestibility (AFD) were 76.9%, 86.1%, and 94.9%, respectively, for shrimp fed FM diet. For the PBM diets, ADMDs ranged from 63.4% for shrimp fed PBM replacing 100% FM diet to 78.6% for shrimp fed defatted PBMPG replacing 66.7% FM diet ($P<.05$), APDs varied from 66.7% for shrimp fed PBM replacing 100% FM diet to 84.2% for shrimp fed defatted PBMPG replacing 66.7% FM diet ($P<.05$), and AFDs ranged from 94.8% for shrimp fed PBMPG replacing 33.3% FM diet to 97.2% for shrimp fed defatted PBMPG replacing 100% FM diet ($P>.05$).

Key Words: Apparent nutrient digestibility, Shrimp, Fishmeal and poultry by-product meal