

into groups of three and given either no Fe injection, or injections of 100 mg Fe from iron dextran on d 10 or d 0. No differences were detected in pig growth, survival, hematocrit, serum iron, total iron binding capacity (TIBC), or percent Fe saturation due to sow gestation diet. Growth over a 20-day lactation period was suppressed in pigs given no Fe injection or an Fe injection on d 10 compared with injections on d 0 (177, 197 and 230 g/d respectively), but pig survival was not compromised (91.4, 91.0, and 92.2%). Pigs given Fe injections on d 0 had higher ($P \leq 0.05$) hematocrit and plasma Fe on d 10 and d 20 than pigs not given Fe injections, but TIBC was not different ($P \geq 0.10$). Hematocrit and plasma Fe values of pigs not given Fe injections until d 10 recovered by d 20 to equal values as those given Fe injections on d 0. In conclusion, the sources nor amounts of supplemental iron fed to sows during the last trimester of gestation altered the piglet's ability to sequester iron injections.

Pig Fe	Hematocrit, %			Plasma Fe, $\mu\text{g/dL}$			TIBC, $\mu\text{g/dL}$		
	d 0	d 10	d 20	d 0	d 10	d 20	d 0	d 10	d 20
No Fe	31.7	18.0	14.7	94.0	63.7	54.1	357	707	735
Day 10	31.6	18.9	26.1*	89.3	64.7	72.7	354	701	784
Day 0	31.7	28.9*	25.8*	95.0	107.9*	77.7	352	759	779
SD	5.6	6.5	4.8	45.9	53.1	77.5	153	162	210

* denotes difference ($P \leq 0.05$) within a column from No Fe treatment.

Key Words: Iron, Sow, Hematocrit

127 Assessment of the feeding value of South Dakota grown field peas for growing pigs. H. H. Stein*, R. A. Bohlke, V. Rayadurg, D. Peters, and R. C. Thaler, *South Dakota State University*.

Five experiments were conducted to evaluate the feeding value of South Dakota grown field peas (variety Carnival) for growing pigs. In exp. 1 and in exp. 2, 96 growing crossbred pigs (initial BW: 22.3 ± 1.48 kg and 26.7 ± 1.18 kg, respectively) were allotted to one of four treatment groups. In exp. 1, diets containing 0, 6, 12, or 18% peas were fed during the initial 6 wk of the experiment while 0, 12, 24, or 36% field peas were included in the finishing diets. In exp. 2, 0, 12, 24, or 36% peas were included in both the grower and the finisher diets. In both exp., ADG, ADFI, and GF were similar ($P > 0.1$) between the four treatment groups. At slaughter, larger ($P < 0.05$) loins were harvested from pigs fed diets containing 12% field peas in the finishing ration (exp. 1) or 12, 24, or 36% field peas (exp. 2). In both exp., the calculated lean meat percentage was similar ($P > 0.10$) between treatment groups. In exp. 3 and 4, field peas were included in phase 2 diets for nursery pigs (initial BW: 7.88 ± 0.72 kg and 7.36 ± 0.57 kg, respectively) at levels of 0, 6, 12, or 18% (exp. 3) or 0, 12, 24, or 36% (exp. 4). These diets were offered to the pigs during wk 3-5 post-weaning. In both exp., ADG, ADFI, and GF were similar ($P > 0.05$) between treatment groups. In exp. 5, the apparent (AID) and standardized (SID) ileal digestibility coefficients of crude protein and amino acids were determined for field peas and soybean meal in six growing barrows (Initial BW: 36.5 ± 2.1 kg). AID for Met, Trp, Cys, and Ser were lower ($P < 0.05$) in field peas than in soybean meal. When calculating SID, only Met was lower ($P < 0.05$) for field peas than for soybean meal. Based on the results of these exp., it is concluded that South Dakota grown field peas provide a highly digestible source of amino acids that can replace soybean meal in diets for pigs. In phase 2 diets for nursery pigs and in diets for growing and finishing pigs, at least 36% field peas can be included without adverse effects on performance or carcass quality.

Key Words: Field Peas, Growing Pigs, Amino Acid Digestibility

128 A comparison of swine performance when fed diets containing Roundup Ready® (event NK603) or conventional corn lines. G. Bressner¹, Y. Hyun*¹, E. Stanisiewski², G. Hartnell², and M. Ellis¹, ¹University of Illinois at Urbana-Champaign, ²Monsanto Company, St. Louis.

The objective of this study was to compare growth performance and carcass characteristics of growing-finishing pigs fed diets containing a Roundup Ready® corn hybrid (event NK603; line A), compared with a parental control line (line B) and two commercial lines of non-genetically modified corn (lines C and D). The study was carried out as a completely randomized design and compared four corn-line dietary treatments. A three-phase dietary program was used. Diets for the growing phase (30 to 50 kg BW) contained 1.02% total lysine; 18.5 % CP, and 3,370 kcal

ME/kg. For the early- (50 to 80 kg) and late - (80 to 120 kg) finishing phases diets were formulated to contain 0.78 and 0.67 % lysine, 15.0 and 13.5% CP, and 3,383 and 3,395 kcal ME/kg, respectively. All diets were formulated with a fixed level of corn inclusion which was 65, 74, and 77% for the growing and early- and late-finishing phases, respectively. A total of 160 commercial hybrid pigs (equal numbers of barrows and gilts) were reared from 29.9 ± 3.08 to 119.4 ± 5.96 kg BW in single-sex groups of five pigs and given ad libitum access to feed and water throughout the study. Pigs were raised in a controlled environment finishing facility having part-slatted, part-solid concrete floors and a floor space allowance of 0.89 m^2 . At the end of the test period, pigs were slaughtered at a commercial plant and standard carcass measurements were taken. Pigs fed the four corn lines had similar ($P > 0.05$) ADFI (2.45 to 2.54 kg; SEM 0.042), ADG (943 to 986 g; SEM 14.4), and gain:feed ratio (0.37 to 0.39; SEM 0.004). In addition, carcass measures (dressing percentage, carcass length, backfat thickness, and longissimus muscle area) were not different ($P > 0.05$) among corn lines. Subjective scores for longissimus muscle color, firmness, and marbling taken at the 10th rib, were similar ($P > 0.05$) among the corn lines. Gilts compared to barrows had lower ($P < 0.01$) feed intake, growth rate, and backfat thickness but greater gain:feed ratio ($P < 0.01$). The results of this study, carried out with growing-finishing swine, suggest that the Roundup Ready® (event NK603) corn hybrid tested is essentially equivalent in terms of nutrient composition and effects on growth and carcass characteristics to conventional corn hybrids.

Key Words: Roundup Ready® Corn, Growth Performance, Carcass Quality

129 Evaluation of copper chloride and copper sulfate as growth promoters in swine finishing diets. C.W. Hastad*, S.S. Dritz, J.L. Nelssen, M.D. Tokach, and R.D. Goodband, *Kansas State University, Manhattan*.

Two trials were conducted to determine the effects of added copper from copper sulfate or copper chloride on performance of growing-finishing pigs. In Exp 1, 1,100 pigs (initially 33.7 kg) were weighed and randomly allotted to one of five dietary treatments. Diets were fed on a feed budget from d 0 to 115. Within each phase, treatment diets consisted of diets with no added copper (control), 50, 100, or 200 ppm of added copper from copper chloride or 200 ppm of added copper from copper sulfate. In Exp 2, 1,177 pigs (initially 31.2 kg) were weighed and randomly allotted to one of seven dietary treatments in a randomized complete block design with seven pens per treatment. Diets were fed in two phases from d 0 to 27 and d 27 to 56. Treatments consisted of a control diet with no added copper or 50, 100, or 200 ppm of added copper from either copper chloride or copper sulfate. In Exp 1, adding either copper source to the diet reduced ($P < 0.02$) ADFI and improved ($P < 0.05$) gain/feed (G/F) from d 0 to 31. When copper chloride was added to the diet, the greatest response in ADFI and G/F occurred with the first 50 ppm of copper. Adding copper to the diets also reduced ($P < 0.05$) ADFI and improved G/F from d 58 to 86. Overall, pigs fed either copper source had reduced ($P < 0.06$) ADFI and improved ($P < 0.003$) G/F. Pigs fed copper sulfate had improved ADG ($P < 0.003$) and pigs fed copper chloride had a trend ($P < 0.07$) for improved ADG compared to pigs fed the control diet. In Exp 2, pigs fed either copper source had greater ADG ($P < 0.01$) during the first two weeks of the experiment compared to pigs fed the control diet with no differences observed between copper levels or sources. Adding copper sulfate to the diets reduced ADFI ($P < 0.03$) and copper chloride tended ($P < 0.07$) to improve G/F for d 0 to 14. From d 14 to 27 and d 27 to 56, ADG, ADFI or G/F were not improved with copper additions to the diet. Adding low levels (50 to 100 ppm) of copper during the first four weeks of the growing-finishing phase provide increase gain and improve feed efficiency.

Key Words: Copper, Pigs

130 Evaluation of ground corn germ as an energy source in nursery pig diets. C.W. Hastad*, M.D. Tokach, J.L. Nelssen, R.D. Goodband, and S.S. Dritz, *Kansas State University, Manhattan*.

Two hundred eighty nursery pigs (initially 14.0 kg) were used in a 21 d growth assay to compare ground corn germ as an energy source relative to corn oil in nursery pig diets. Pigs were blocked by weight and allotted to one of seven treatments. There were five pigs per pen and eight pens per treatment. Treatments included a corn-soybean meal control diet

with no added fat, additional diets included increasing amounts of oil (2, 4, and 6%) provided by either corn oil or corn germ. All diets were formulated to contain 3.82 g lysine/Mcal of ME. In diet formulation, corn germ was assumed to contain 50% of its weight as fat for an energy source. Pigs fed diets containing corn oil had improved ($P < 0.04$) ADG, ADFI, and feed efficiency (G/F) compared to those fed diets containing ground corn germ. For the overall period, a fat source by level interaction was observed for G/F with G/F improved linearly when increasing levels of corn oil were added to the diet, whereas increasing fat from ground corn germ had no effect on performance. Pigs fed diets containing corn oil had decreased ($P < 0.005$) ADFI and improved ($P < 0.001$) G/F compared with pigs fed the control diet, however, ADG was not influenced ($P > 0.10$). Pigs fed diets containing ground corn germ meal had growth performance similar to those fed the control diet with no added fat. These findings suggest that the energy in ground corn germ meal is not as available as the energy in corn oil for nursery pigs. Although corn germ would be expected to have a high energy value because of its fat content, its high fat content appears to be offset by a high fiber content (23.85% ADF and 43.36% NDF).

Fat Source Level	Corn Oil				Corn Germ			
	0	2	4	6	2	4	6	
ADG, g	742	758	758	765	745	733	751	
ADFI, g	1125	1139	1102	1077	1136	1124	1133	
Gain/Feed	0.66	0.67	0.69	0.71	0.66	0.65	0.66	

Key Words: Corn Oil, Corn Germ, Pigs

131 Growth performance and carcass characteristics of pigs fed diets containing a corn germ-corn bran product. S. J. Kitt*, P. S. Miller, and R. L. Fischer, *University of Nebraska, Lincoln*.

The objective of this experiment was to determine the feeding value of a corn germ-corn bran mixture. A total of 34 (initial BW = 23.5 kg) barrows were used in a randomized complete block design experiment. Pigs were assigned to corn-soybean meal (C-SBM; $n = 11$), corn-soybean meal-tallow (C-SBM-T; 4% Tallow; $n = 11$), or corn-soybean meal-corn germ-corn bran (C-SBM-GB; 8% corn germ-corn bran; $n = 12$) dietary treatments. Diets were formulated to contain a similar digestible lysine:NE ratio. Pigs were individually fed during the experimental period (93 d) in four phases (Phase 1, 23.5 to 37.5 kg; Phase 2, 37.5 to 59.5 kg; Phase 3, 59.5 to 86.5 kg; Phase 4, 86.5 kg to 112.0 kg). The true ileal digestible lysine:NE ratios (g/Mcal) were 4.40, 3.90, 3.14, and 2.31 for Phases 1 through 4, respectively. Diets were provided in meal form and pigs had ad libitum access to feed and water. For the entire experimental period, pigs fed the C-SBM-T diet had greater ADG than pigs fed the C-SBM-GB ($P \leq 0.05$; 0.98 kg vs 0.92 kg, respectively). No differences ($P \geq 0.26$) among treatments were observed for ADFI. Feed efficiency (ADG/ADFI) was different ($P \leq 0.001$) among treatments and was greatest for pigs fed C-SBM-T (0.43), intermediate for pigs fed C-SBM (0.40), and lowest for pigs fed C-SBM-GB (0.38). Longissimus muscle area of pigs fed C-SBM-T was greater ($P \leq 0.08$) than pigs fed C-SBM-GB. Pigs fed C-SBM tended to have greater ($P \leq 0.10$) backfat depth than pigs fed C-SBM-T (21.2 vs 18.1 mm). Pigs fed C-SBM-T and C-SBM-GB had greater ($P \leq 0.05$) lean percentage than pigs fed C-SBM. Fat-free lean gain was greater ($P \leq 0.05$) in pigs fed C-SBM-T than pigs fed C-SBM or C-SBM-GB (402 g, 369 g, 355 g, respectively). These data suggest that pigs consuming diets containing a corn germ-corn bran product have reduced growth performance compared to pigs consuming C-SBM and C-SBM-T diets. The reduction in performance was likely due to the greater fiber concentration in the C-SBM-GB diets.

Key Words: Corn Germ-Corn Bran, Growth Rate, Pigs

132 Use of poultry byproduct meal as an alternate protein source in swine starter rations. C. Zier*, M. Froetschel, R. Jones, and M. Azain, *University of Georgia, Athens, GA*.

A total of 200 crossbred pigs (initial wt = 6.5, kg) were weaned (21 d) and randomly allotted to four treatment groups in two replicates. In each replicate, pigs were placed into 20 pens with five pigs per pen, based on sex, weight, and litter. Treatments were designed to test inclusion of poultry by-product meal (PBM) in place of more commonly used animal protein sources. The phase I diets (1.5% lysine) included a basal diet containing both fish meal (FM, 5%) and spray dried porcine plasma (SDPP, 3%), and three test diets made to substitute SDPP, FM, or both

with PBM. Phase II diets (1.375% lysine) included a control diet with 2.5% blood meal (BM) and diets replacing BM, FM, or both with PBM. The phase I pelleted diets were fed for 5 days, the phase II pelleted diets were fed for 14 days, and a common phase III ground diet (1.25% lysine) was fed for 7 days. In phase I, ADG (211 vs. 158 g/d, $P < 0.01$), BW (7.61 vs. 7.34 kg, $P < 0.01$), and intake (205 vs. 175 g/d, $P < 0.001$) in pigs fed diets containing the SDPP were greater than those fed PBM. Average daily gain from d 5 -12 was greater in pigs fed PBM than BM (191 vs. 152 g/d, $P < 0.01$). Thus, differences in ADG for SDPP vs. PBM noted for phase I were negated by the end of the first week on the phase II diets. Overall (d 0-26), there was no difference in performance of pigs fed PBM in place of SDPP and BM. Substitution of PBM for FM in phase I or II had no effect on performance. These results indicate that PBM can be used in nursery diets in place of blood meal and fishmeal without affecting performance, but may not be equivalent to SDPP in phase I diets.

Key Words: Nursery, Pig, Poultry Byproduct Meal

133 Evaluation of pet food by-product as an alternative feedstuff in nursery pig diets. E.A. Jablonski*, R.D. Jones, and M.J. Azain, *University of Georgia, Athens, GA*.

Early-weaned pigs ($n = 288$, 5.2 kg at 14 days) were used in 2 replicates to evaluate pet food by-product (PFB) in nursery starter diets on growth performance. Pigs were allotted by sex, ancestry, and weaning weight to one of 4 dietary treatments in 32 pens with 8-10 pigs per pen, yielding a total of 8 pens per treatment. Using phase I and phase II diets, PFB (CP=22.1%, EE=8.29%, Ca=0.82%, P=0.84%) was substituted for more expensive animal-origin ingredients (plasma protein, fish meal, blood cells) at 0%, 10%, 30%, and 50% inclusion levels. Experimental diets were formulated to specific lysine requirements (1.50% and 1.35% for phase I and II, respectively) and to maintain relatively constant lysine to energy ratios, although protein increased with higher inclusion levels of PFB. Pigs were creep-fed a commercial pre-starter prior to phase I diets which were fed from days 0-7 post-weaning. Phase II diets were fed from days 14-21. On day 21, pigs were placed on a common phase III diet for 10 days. All experimental diets were fed in meal form. Blood samples were drawn from a total of 96 pigs in both replicates on day 14 and day 28. Serum was assayed for blood urea nitrogen levels to determine protein status. There were no treatment interactions across performance parameters. There was no effect of phase I diets on pig performance. In phase II diets, pigs that were fed PFB diets showed increased daily gain ($P < 0.0001$) compared to the control. Average daily gain was 180, 249, 240 and 223 g/d for 0%, 10%, 30%, and 50%, respectively. Feed intake was also significantly increased ($P < 0.0001$) during phase II (339, 431, 409, and 410 g/d for 0%, 10%, 30%, and 50%, respectively). There was a trend for improved feed/gain ($P < 0.10$) with values of 1.89, 1.74, 1.71, and 1.84 for 0%, 10%, 30%, and 50%, respectively. There was no effect of dietary treatment on blood urea nitrogen levels. It appears that substituting PFB into nursery diets to replace more expensive animal protein products typically used is feasible.

Key Words: Nursery Pigs, By-Products, Growth Performance

134 Efficacy of Luctaplus® in improving performance of conventionally and segregated early-weaned pigs fed simple or complex diets. M.E. Davis*¹, C.V. Maxwell¹, Z.B. Johnson¹, B.Z. de Rodas², D.C. Brown¹, M.L. Gibson³, and E. Roura³, ¹University of Arkansas, Fayetteville, ²Land O'Lakes, Fort Dodge, IA, ³Lucta USA, Northbrook, IL.

Two experiments were conducted to determine the response of pigs reared in a conventional nursery (C) and segregated early-weaned (SEW) pigs to the addition of Luctaplus® (a combination of inorganic and organic acids, enzymes, and flavor) to diets varying in complexity. In Exp. 1, 216 barrows (5.7 kg BW; 19 d of age) were weaned, transported to off-site nursery facilities, blocked based on initial BW and penned in groups of six (9 pens/treatment). In Exp. 2, 96 pigs (6.7 kg BW; 19 d of age) were weaned in a C, blocked based on BW and sex and penned in groups of two (12 pens/treatment). In each experiment, treatments consisted of a 2 x 2 factorial arrangement of two levels of Luctaplus® (0 and 0.5%) added to either a simple or complex nursery diet. Treatments were fed throughout Phase 1 (10 d; 1.6% Lys), Phase 2 (14 d; 1.4% Lys), and Phase 3 (14 d; 1.25% Lys) of each experiment. In Exp. 1, G:F during Phase 1 improved ($P < 0.05$) when pigs were fed the simple diet with