**140 Combinations of select menhaden fish meal and spray-dried porcine plasma in the transition diet (fed to pigs from 5 to 7 kg) for the segregated early weaned pig.** J.R. Bergstrom*, J.L. Nelssen, M.D. Tokach, R.D. Goodband, K.Q. Owen, W.B. Nessmith, Jr., B.T. Richert, J.W. Smith II, and S.S. Dritz, Kansas State University, Manhattan

A 33 d growth trial, utilizing 300 12-d to 16-d old pigs (PIC, C15 X 326, initially 4.0 ± .9 kg), was conducted to determine the degree of complexity required in a transition diet (typically fed to pigs from 5 to 7 kg) to obtain optimal growth performance in the segregated early weaned pig. Pigs were housed in an environmentally-regulated, off-site nursery with 5 pigs per pen and 5 replicate pens per treatment. Pigs were blocked by weight and placed on a common segregated early weaning diet from d 0 to 5 postweaning. From d 5 to 19, pigs (4.8 ± .9 kg) were fed one of twelve experimental diets. Pigs were fed a common diet from d 19 to 33. Experimental treatments consisted of 3 levels of spray-dried porcine plasma and 4 levels of select menhaden fish meal in a 3 × 4 factorial arrangement. A corn-soybean meal basal diet containing 20% dried whey and 2.5% spray-dried blood meal was formulated to 1.6% lysine and at least .44% methionine. Select menhaden fish meal (0, 2.5, 5, and 7.5%) and spray-dried porcine plasma (0, 2.5, and 5%) replaced soybean meal in the basal diet on a lysine basis. Pig weights and feed disappearance were collected on d 5, 12, 19, 26, and 33 postweaning to calculate ADG, ADFI, and feed efficiency (G/F). There were no plasma × fish interactions for any of the response criteria. From d 5 to 19 postweaning, ADG and ADFI were not affected by the various levels of plasma or fish in the diet. However, G/F improved with increasing levels of plasma (linear, P < .01) and fish meal (linear, P < .07). During d 19 to 33, when all pigs were fed a common diet, no differences in ADG, ADFI, or G/F were observed. For the overall experiment (d 5 to 33 postweaning), G/F was improved (linear, P < .04) by increasing the level of plasma in the diet. These data suggest that replacing a portion of the soybean meal in a transition diet (corn-soybean meal diet containing 20% dried whey, 2.5% spray-dried blood meal, and formulated to 1.6% lysine) with either spray-dried porcine plasma, select menhaden fish meal, or both will improve G/F. The high health, segregated early weaned pigs in this trial showed no improvement in ADG or ADFI due to the addition of fish meal or plasma to the transition diet. This may be a result of the high level of ADFI for pigs fed the control diet. Based on this experiment, feed cost per unit of gain may be reduced for high health pigs, without sacrificing growth performance, by feeding a transition diet which does not contain plasma or fish meal.

| | 0% Plasma | | | | 2.5% Plasma | | | | 5.0% Plasma | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fish, % | 0.0 | 2.5 | 5.0 | 7.5 | 0.0 | 2.5 | 5.0 | 7.5 | 0.0 | 2.5 | 5.0 | 7.5 | CV |
| d 5 to 12 | | | | | | | | | | | | | |
| ADG,g | 254 | 259 | 263 | 232 | 277 | 281 | 263 | 295 | 309 | 245 | 268 | 281 | 15.4 |
| G/F | .85 | 89 | .91 | .83 | 92 | .88 | .98 | .96 | 1.00 | .91 | .98 | .97 | 12.7 |
| d 5 to 19 | | | | | | | | | | | | | |
| ADG,g | 341 | 331 | 336 | 331 | 341 | 354 | 336 | 363 | 350 | 336 | 331 | 341 | 7.1 |
| G/F[a,b] | .85 | .81 | .82 | .83 | 83 | .81 | .86 | .89 | .86 | .86 | .88 | .87 | 4.3 |

[a] Linear effect of plasma (P < .01)
[b] Linear effect of fish meal (P < .07)

Key Words: Pigs, Growth performance, Fish meal, Plasma.

**141 Influence of buffered propionic and fumaric acid on starter pig performance.** J.R. Bergstrom*, M.D. Tokach, R.D. Goodband, J.L. Nelssen, and T.L. Signer, Kansas State University, Manhattan, KS, and Gary Lynch, BASF, Mount Olive, NJ.

A 28 d growth trial was conducted to determine the effects of adding organic acids to a phase I starter diet on pig performance. At weaning, 300 pigs (13 ± 2 d of age and 4.03 kg) were blocked by weight and allotted to each of five experimental diets, with 10 pigs per pen and six pens per treatment. The five experimental diets were fed from d 0 to 14 postweaning. The control diet was corn-soybean meal based, contained 20% dried whey, 7.5% spray-dried porcine plasma, and 1.75% spray-dried blood meal, and was formulated to 1.5% lysine. Luprosil NC (.4%; a buffered liquid propionic acid), Luprosil Salt (.4%; a buffered dry propionic acid), fumaric acid (1.5%), and a combination of Luprosil NC (.4%) and fumaric acid (1.5%) replaced corn in the control diet to provide the four additional experimental treatments. From d 14 to 28 postweaning, all pigs were fed a common, corn-soybean meal diet without acid. This diet contained 10% dried whey and 2.5% spray-dried blood meal and was formulated to 1.25% lysine. During d 0 to 7 postweaning, feeding pigs an acidified diet improved (P < .01) ADG when compared with the pigs fed the control diet. Pigs fed the diet containing Luprosil NC had improved (P < .06) ADG when compared with those fed the diet containing a combination of Luprosil NC and fumaric acid. Pigs fed the Luprosil NC diet had the greatest ADFI, which was different (P < .02) from those pigs fed either the diet containing fumaric acid or the diet containing the combination of Luprosil NC and fumaric acid. Pigs fed either the control diet or Luprosil Salt diet had intermediate ADFI. Feeding pigs any of the acidified diets improved (P < .01) G/F, with no differences in G/F being observed among pigs fed the various acid sources. During phase I (d 0 to 14 postweaning), ADG was greatest (P < .02) for pigs fed acidified diets. There were no differences in ADFI, but G/F was improved (P < .01) by including an acid source in the diet. Among the acid sources, the greatest improvement in G/F resulted from feeding the diet containing fumaric acid, when compared with pigs fed the diet containing Luprosil Salt (P < .03). During phase II (d 14 to 28 postweaning), when all pigs were fed a common diet without acid, no differences in growth performance were observed. Thus, from d 0 to 28, ADG (P ≤ .13) and G/F (P < .10) tended to be improved by feeding an acidified diet from d 0 to 14. These results suggest that adding organic acids (buffered propionic or fumaric acid) to a diet containing 20% dried whey and 7.5% porcine plasma enhances growth performance from d 0 to 14 postweaning.

| Item | | Control | Lup. NC | Fum. acid | Combined | Lup. Salt | C.V. |
|---|---|---|---|---|---|---|---|
| d 0 to 7 | ADG, g[a,b] | 127 | 163 | 150 | 145 | 159 | 11.1 |
| | G/F[a] | .66 | .78 | .82 | .78 | .79 | 9.7 |
| d 0 to 14 | ADG, g[c] | 209 | 241 | 236 | 222 | 222 | 7.8 |
| | G/F[a,d] | .74 | .83 | 88 | .83 | .79 | 8.8 |
| d 0 to 28 | ADG, g | 263 | 286 | 277 | 277 | 281 | 8.4 |
| | G/F[e] | .59 | .62 | .62 | .62 | .62 | 5.0 |

[a,c,e] Acidified diets vs control (P < .01, .05, .10, respectively)
[b] Luprosil NC vs Combined (P < .06)
[d] Fumaric acid vs Luprosil Salt (P < .05)

Key Words: Pig, Performance, Organic Acids

**142 Comparision of Norse LT-94 (herring meal) to other protein sources in early weaned starter pig diets.** B.T. Richert*, J.W. Smith II, M.D. Tokach, R.D. Goodband and J.L. Nelssen. Kansas State University, Manhattan.

Two growth trials were conducted to compare Norse LT-94 (herring meal) to other protein sources in starter pig diets. In Exp. 1, 270 weanling pigs (initially 6.2 kg and 20 d of age) were used to compare Norse LT-94, select menhaden fish meal, and spray-dried blood meal as protein sources in the phase II diet. Pigs were blocked by weight with 6 replications of three treatments and 15 pigs per pen. During phase I (d 0 to 7 post-weaning), all pigs were fed the same high nutrient density diet that contained 10% plasma protein, and 25% dried whey and was formulated to 1.6% lysine and .44% methionine. During phase II (d 7 to 28 postweaning), pigs were fed one of three experimental diets. All phase II diets contained 10% dried whey and were formulated to 1.25% lysine and .34% methionine. The positive control diet contained 2.5% spray-dried blood meal. Norse LT-94 (4.06%), and select menhaden fish meal (4.87%) replaced blood meal on an equal lysine basis to form the other experimental diets. There were no differences in pig performance during phase II (P>.12) indicating that Norse LT-94, spray-dried blood meal, and select menhaden fish meal are interchangeable as protein sources when substituted on an equal lysine basis. In Exp. 2, 230 pigs (initially 18 d of age and 5.0 kg) were used to examine the influence of various combinations of spray-dried porcine plasma and Norse LT-94 on starter pig performance. Pigs were allotted by weight to 6 replicates of five treatments with 6 to 10 pigs per pen. Pigs were assigned to one of five dietary treatments with 0, 25, 50, 75, or 100% of the spray-dried porcine plasma replaced with Norse LT-94 on an equal lysine basis. Therefore, diets contained 8, 6, 4, 2, or 0% spray-dried porcine plasma and 0, 2.14, 4.29, 6.43, or 8.58% Norse LT-94, respectively. All phase I diets were formulated to contain 20% dried whey, 1.5% lysine, and .44% methionine. These diets were fed from d 0 to 14 postweaning. From d 14 to 28 (phase II), all pigs were fed a common diet containing 10% dried whey and 2.5% spray-dried blood meal which was formulated to 1.25% lysine and .35% methionine. Replacing spray-dried porcine plasma with Norse LT-94 resulted in a linear decrease in ADG (P<.001) and ADFI (P<.002) during phase I and for the overall trial. This response became magnified when greater than 25% of the plasma was replaced with Norse LT-94. Feed efficiency (G/F) responded in a quadratic manner for phase I (P<.13) and for the overall trial (P<.10) with pigs fed the diet containing 6% spray-dried porcine plasma and 2.14% Norse LT-94 having the best feed efficiency. These trials indicate that Norse LT-94 can replace spray-dried blood meal and select menhaden fish meal in phase II starter pig diets. However, Norse LT-94 (herring meal) can not be used as a replacement for spray-dried plasma protein in the phase I diet.

| Exp. 2 | Plasma Protein, % : Norse LT-94, % | | | | | | P Values | |
|---|---|---|---|---|---|---|---|---|
| Item | 8:0 | 6:2.14 | 4:4.29 | 2:6.43 | 0:8.58 | CV | Linear | Quadratic |
| d 0 to 14 | | | | | | | | |
| ADG, g | 230 | 216 | 195 | 167 | 142 | 16.7 | .001 | .43 |
| G/F | .90 | .95 | .89 | .80 | .74 | 12.8 | .004 | .13 |
| d 0 to 28 | | | | | | | | |
| ADG, g | 326 | 319 | 316 | 288 | 276 | 8.1 | .001 | .36 |
| G/F | .72 | .73 | .73 | .69 | .67 | 4.9 | .009 | .10 |

Key Words: Pigs, Starter, Fish meal, Plasma protein

**143 Effect of chelated trace minerals on nursery pig growth performance.** B.T. Richert*, L.J. Kats, R.D. Goodband, J.L. Nelssen, and M.D. Tokach, Kansas State University, Manhattan, and D.E. Nuzback, Albion Laboratories, Inc., Atlantic, IA.

A total of 442 weanling pigs (22 d of age and 6.5 kg initial BW) were used in a 28-d growth assay to evaluate a chelated trace mineral premix compared to an inorganic trace mineral premix. Minerals evaluated in the premixes provided; 16.5 ppm Cu, 165 ppm Fe, 40 ppm Mn, and 165 ppm Zn from copper sulfate, ferrous sulfate, manganous oxide, and zinc oxide. The chelated trace mineral premix provided the following fractions of these minerals as amino acid chelates: 109.7% of Cu, 75.8% of Fe, 78.1% of Mn, and 47.0% of Zn, with the balance coming from the previous inorganic sources to make the diets similar in added trace mineral content. All pigs were fed a phase 1 diet (d 0 to 14) containing 7.5% spray-dried porcine plasma, 1.75% spray-dried blood meal (SDBM), and 25% dried whey. The phase one diets were formulated to 1.5% lysine, .42% methionine, .9% Ca, and .8% P. The phase two diets (d 14 to 28) contained 10% dried whey and 2.5% SDBM and were formulated to 1.25% lysine, .35% methionine, .9% Ca, and .8% P. All diets also contained copper sulfate, providing an additional 188 ppm Cu. Pigs were housed 14 or 15 pigs per pen with 15 pens per treatment. Pigs fed the chelated trace minerals had increased ADG (P<.03), ADFI (P<.07) and gain to feed (G/F; P<.09) for d 0 to 7. However, there were no differences (P>.18) between treatments in ADG or ADFI for d 7 to 14. For this same period, pigs fed the inorganic trace minerals had greater (P<.03) G/F than pigs fed the chelated trace minerals. For the entire phase 1 period (d 0 to 14), pigs fed the chelated trace minerals had greater (P<.07) ADFI. There were no differences in ADG or G/F for the phase 2 period (d 14 to 28), however pigs fed the inorganic trace minerals had increased (P<.02) ADFI. For the entire nursery period (d 0 to 28), there were no differences between treatments in ADG, ADFI and G/F. Based on the improved performance observed from d 0 to 7, chelated trace minerals may have been more available which benefitted the weanling pig during the stressful first week post-weaning. However, for the entire nursery period, there were no differences in growth performance for pigs fed either trace mineral source.

| Item | Chelated Mineral | Inorganic Mineral | CV | P Value |
|---|---|---|---|---|
| d 0 to 7 | | | | |
| ADG, g | 153 | 123 | 24.6 | 0.031 |
| G/F | .84 | .73 | 18.2 | 0.048 |
| d 7 to 14 | | | | |
| ADG, g | 256 | 269 | 10.1 | 0.196 |
| G/F | .85 | .93 | 8.5 | 0.015 |
| d 0 to 14 | | | | |
| ADG, g | 204 | 196 | 13.0 | 0.394 |
| G/F | .85 | .85 | 9.6 | 0.880 |
| d 0 to 28 | | | | |
| ADG, g | 249 | 253 | 7.6 | 0.629 |
| G/F | .70 | .69 | 4.0 | 0.388 |

Key Words: Chelated trace minerals, Weanling pigs, Growth