

Effects of Increasing PEP-NS on Nursery Pig Performance¹

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Summary

A total of 180 nursery pigs (PIC 1050, initially 14.2 lb and 28 d of age) were used in a 24-d study to evaluate the effects of increasing PEP-NS on nursery pig performance. PEP-NS is a combination of porcine intestinal mucosa and by-products of corn wet-milling. There were 5 pigs per pen and 6 pens per treatment. There were 6 dietary treatments: a negative control containing no specialty proteins, the negative control diet with 3, 6, 9, or 12% PEP-NS, or the negative control with 6% select menhaden fish meal (SMFM). The diet with 6% SMFM contained the same amount of soybean meal as the diet with 6% PEP-NS. A common pretest diet was fed in pellet form for the first 7 d post weaning. Experimental diets were fed in meal form from d 0 to 14, and a common diet was fed from d 14 to 24. From d 0 to 14, increasing PEP-NS increased (quadratic, $P < 0.01$) ADG, ADFI, and F/G, with the greatest response observed in pigs fed 9% PEP-NS. There were no differences ($P > 0.10$) between pigs fed 6% PEP-NS or 6% SMFM. When pigs were fed a common diet from d 14 to 24, there were no differences in performance between treatments. Overall, from d 0 to 24, pigs fed increasing PEP-NS had improved (quadratic; $P < 0.01$) ADG and F/G, with the greatest improvement seen as PEP-NS increased from 3 to 6%. These results suggest that feeding 6% to 9% PEP-NS in Phase 2 nursery pig diets is suitable replacement for 6% SMFM

Key words: fish meal, PEP-NS, nursery pig

Introduction

Previous research conducted at Kansas State University (Myers et al., 2010⁵) found that diets containing Peptone products can be used as specialty protein sources to replace select menhaden fish meal in Phase 2 nursery pig diets. Previously tested mucosal products have utilized either enzymatically processed vegetable proteins or soy proteins as carriers. A new and more economical mucosal product, PEP-NS, has recently been developed. It uses by-products from corn wet-milling as its carrier. Despite the different carrier, PEP-NS has shown similar results to those of previously tested mucosal products, PEP2+ and Peptone 50 (Myers et al., 2010⁵). Because PEP-NS is a relatively new mucosal product, little is known about the ideal dietary level to optimize growth performance. Therefore, the objective of this study was to evaluate the effects of increasing PEP-NS on nursery pig performance.

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⁵ Myers et al., Swine Day 2010, Report of Progress 1038, pp 35-43.

Procedures

The Kansas State University (K-State) International Animal Care and Use Committee approved the protocol used in this experiment. The study was conducted at the K-State Segregated Early Weaning Facility in Manhattan, KS.

Diets were formulated with NRC (1998⁶) values for the SMFM and values provided by the manufacturer for the PEP-NS (Table 1). Samples of the SMFM and PEP-NS were collected and analyzed for amino acid profile, and values were similar to formulated values.

A total of 180 nursery pigs (PIC 1050, initially 14.2 lb and 28 d of age) were used in a 24-d study to evaluate the effects of SMFM and PEP-NS on nursery pig performance. After arrival at the nursery facility, pigs were fed a common pretest diet (Table 2) for the first 7 d after weaning. Pigs were then allotted to 1 of 6 dietary treatments. There were 5 pigs per pen and 6 pens per treatment. Pigs were provided ad libitum access to feed and water via a 4-hole dry self-feeder and a cup waterer in each pen (4 × 4 ft).

The 6 dietary treatments included: negative control containing no specialty protein products, the negative control diet with 3, 6, 9, or 12% PEP-NS, or the negative control with 6% SMFM (Table 3). Treatment diets were fed in meal form from d 0 to 14. From d 14 to 24, all pigs were fed a common diet. Average daily gain, ADFI, and F/G were determined by weighing pigs and measuring feed disappearance on d 0, 7, 14, and 24.

Data were analyzed as a completely randomized design with pen as the experimental unit. Analysis of variance was performed using the MIXED procedure in SAS (SAS Institute, Inc., Cary, NC). Contrast statements used were: (1) linear and quadratic effects of increasing PEP-NS, and (2) 6% PEP-NS vs 6% SMFM.

Results and Discussion

From d 0 to 14, pigs fed increasing PEP-NS had improved (quadratic; $P < 0.01$) ADG, ADFI, and F/G, with the greatest improvement observed in pigs fed 9% PEP-NS. There were no differences observed between pigs fed the diet with 6% SMFM and 6% PEP-NS. From d 14 to 24, there were no differences in ADG, ADFI, or F/G observed in pigs previously fed increasing PEP-NS.

Overall, pigs fed increasing PEP-NS had improved (quadratic; $P < 0.01$) ADG and F/G, with the greatest improvement observed in pigs fed 6% PEP-NS. Additionally, pigs fed increasing PEP-NS tended to have increased ($P < 0.10$) ADFI. There were no differences observed between pigs fed 6% PEP-NS and those fed 6% SMFM.

These results suggest that 6 to 9% PEP-NS is a suitable replacement for fish meal in Phase 2 nursery pig diets. The greatest improvement in ADG, feed intake, and F/G were seen as PEP-NS increased from 0 to 6% in the diet.

6 NRC. 1998. Nutrient Requirements of Swine, 10th Ed. Natl. Acad. Press, Washington, D.C.

Table 1. Analyzed nutrient composition of ingredients

| Item | Fish meal | | PEP-NS ¹ | |
|----------------|-----------------------------|----------|-------------------------|----------|
| | Formulated ^{2,3,5} | Analyzed | Formulated ⁴ | Analyzed |
| CP, % | 62.90 | 62.99 | 47.50 | 49.20 |
| Amino Acids, % | | | | |
| Cystine | 0.50 (88) | 0.49 | 0.62 (68) | 0.49 |
| Isoleucine | 2.42 (94) | 2.42 | 2.06 (83) | 2.16 |
| Leucine | 4.27 (94) | 4.28 | 3.44 (72) | 3.78 |
| Lysine | 4.57 (95) | 4.67 | 3.50 (83) | 3.44 |
| Methionine | 1.66 (94) | 1.55 | 0.97 (86) | 0.95 |
| Threonine | 2.32 (88) | 2.56 | 2.06 (77) | 2.05 |
| Tryptophan | 0.59 (88) | 0.56 | 0.59 (83) | 0.67 |
| Valine | 2.82 (93) | 2.78 | 2.56 (81) | 2.60 |

¹ PEP-NS (Tech Mix, Stewart, MN, and Midwest Ag Enterprises, Marshall, MN).

² Diets were prepared using the formulated values.

³ Nutrient values from NRC (1998).

⁴ Nutrient values provided by the manufacturer.

⁵ () indicate standardized ileal digestible amino acid coefficients (%) used in diet formulation.

Table 2. Composition of diets (as-fed basis)^{1,2}

| Ingredient, % | Pre-test diet | PEP-NS | | | | | 6% SMFM | Common diet |
|--|---------------|--------|--------|--------|--------|--------|---------|-------------|
| | | 0% | 3% | 6% | 9% | 12% | | |
| Corn | 38.50 | 53.70 | 53.90 | 53.45 | 38.36 | 38.35 | 38.31 | 62.80 |
| Soybean meal, (46.5% CP) | 25.00 | 31.55 | 28.30 | 25.85 | 22.20 | 22.19 | 22.21 | 32.25 |
| Spray-dried animal plasma | 5.00 | --- | --- | --- | --- | --- | --- | --- |
| Select menhaden fish meal | --- | --- | --- | --- | --- | --- | 6.00 | --- |
| PEP-NS ³ | --- | --- | 3.00 | 6.00 | 9.00 | 12.00 | --- | --- |
| Spray-dried whey | 25.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | --- |
| Soybean oil | 3.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Monocalcium P, (21% P) | 1.18 | 1.20 | 1.18 | 1.15 | 1.10 | 1.08 | 0.43 | 1.25 |
| Limestone | 1.03 | 0.88 | 0.93 | 0.93 | 0.98 | 1.00 | 0.48 | 1.05 |
| Salt | 0.35 | 0.35 | 0.35 | 0.35 | 0.35 | 0.35 | 0.35 | 0.35 |
| Zinc oxide | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Vitamin premix | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Trace mineral premix | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| L-lysine HCl | 0.16 | 0.33 | 0.33 | 0.30 | 0.28 | 0.25 | 0.17 | 0.33 |
| DL-methionine | 0.13 | 1.6 | 0.16 | 0.15 | 0.15 | 0.14 | 0.09 | 0.14 |
| L-threonine | 0.03 | 0.13 | 0.14 | 0.13 | 0.12 | 0.11 | 0.08 | 0.13 |
| Phytase ⁴ | --- | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| Total | | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| Calculated analysis | | | | | | | | |
| Standardized ileal digestible amino acids, % | | | | | | | | |
| Lysine | 1.40 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.26 |
| Isoleucine:lysine | 59 | 61 | 60 | 60 | 60 | 61 | 64 | 61 |
| Methionine:lysine | 29 | 34 | 35 | 35 | 35 | 35 | 35 | 34 |
| Met & Cys:lysine | 58 | 58 | 58 | 58 | 58 | 58 | 58 | 59 |
| Threonine:lysine | 63 | 63 | 63 | 63 | 63 | 63 | 63 | 63 |
| Tryptophan:lysine | 18.9 | 17.4 | 17.1 | 17.1 | 17.1 | 17.1 | 17.6 | 17.5 |
| Valine:lysine | 69 | 66 | 66 | 67 | 68 | 69 | 71 | 68 |
| Total lysine, % | 1.55 | 1.44 | 1.45 | 1.46 | 1.46 | 1.47 | 1.44 | 1.39 |
| CP, % | 22.1 | 20.9 | 20.9 | 21.1 | 21.3 | 21.5 | 21.9 | 20.8 |
| ME kcal/lb | 1,551 | 1,512 | 1,512 | 1,511 | 1,511 | 1,510 | 1,529 | 1,519 |
| Ca, % | 0.90 | 0.75 | 0.76 | 0.75 | 0.75 | 0.75 | 0.75 | 0.76 |
| P, % | 0.79 | 0.69 | 0.69 | 0.68 | 0.68 | 0.67 | 0.68 | 0.66 |
| Available P, % | 0.55 | 0.47 | 0.47 | 0.47 | 0.47 | 0.47 | 0.47 | 0.34 |

¹ A total of 180 nursery pigs (initial BW 14.2 lb) were used in a 24-d trial to determine the effects of increasing PEP-NS on nursery pig growth performance.

² The pretest diet was a common diet fed the first 7 days post weaning.

³ Tech Mix, Stewart, MN, and Midwest Ag Enterprises, Marshall, MN.

⁴ Phyzyme 600 (Danisco Animal Nutrition, St. Louis, MO) provided 231 FTU/lb, with a release of 0.10% available P.

NURSERY PIG NUTRITION

Table 3. Effects of increasing PEP-NS on nursery pig performance¹

| Item | PEP-NS | | | | | | SEM | Probability, <i>P</i> < | | |
|------------|--------|------|------|------|------|---------|-------|-------------------------|-----------|-----------------------|
| | 0% | 3% | 6% | 9% | 12% | 6% SMFM | | Linear | Quadratic | 6% PEP-NS vs. 6% SMFM |
| d 0 to 14 | | | | | | | | | | |
| ADG, lb | 0.44 | 0.64 | 0.78 | 0.82 | 0.72 | 0.77 | 0.026 | <0.0001 | <0.0001 | 0.91 |
| ADFI, lb | 0.79 | 0.88 | 0.96 | 1.00 | 0.90 | 0.99 | 0.030 | 0.01 | 0.01 | 0.52 |
| F/G | 1.83 | 1.39 | 1.24 | 1.22 | 1.26 | 1.28 | 0.035 | <0.0001 | <0.0001 | 0.38 |
| d 14 to 24 | | | | | | | | | | |
| ADG, lb | 1.18 | 1.12 | 1.19 | 1.12 | 1.12 | 1.20 | 0.049 | 0.44 | 0.95 | 0.89 |
| ADFI, lb | 1.67 | 1.59 | 1.68 | 1.63 | 1.61 | 1.73 | 0.052 | 0.61 | 0.95 | 0.63 |
| F/G | 1.42 | 1.44 | 1.41 | 1.46 | 1.44 | 1.44 | 0.040 | 0.64 | 0.99 | 0.51 |
| d 0 to 24 | | | | | | | | | | |
| ADG, lb | 0.81 | 0.88 | 0.99 | 0.97 | 0.92 | 0.99 | 0.030 | 0.01 | 0.01 | 0.95 |
| ADFI, lb | 1.23 | 1.24 | 1.32 | 1.32 | 1.26 | 1.36 | 0.036 | 0.27 | 0.10 | 0.46 |
| F/G | 1.52 | 1.42 | 1.35 | 1.36 | 1.37 | 1.38 | 0.029 | 0.01 | 0.01 | 0.41 |

¹A total of 180 nursery pigs (initial BW 14.2 and 28 d of age) were used in a 24-d trial to determine the effects of increasing PEP-NS on nursery pig growth performance. There were 5 pigs per pen with 6 pens per treatment.