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## Effect of a select menhaden fish meal in starter diets for pigs

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## EFFECT OF A SELECT MENHADEN FISH MEAL IN STARTER DIETS FOR PIGS

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and M.E. Johnston

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### Summary

A growth study was conducted to evaluate the effect of a select menhaden fish meal (SMFM) as a protein source in starter diets for pigs. A total of 150, 3-week old weaned pigs were utilized. Diets were formulated by replacing soy protein with protein from SMFM. The replacement of soy protein with SMFM elicited a quadratic response in average daily gain (ADG) and average daily feed intake (ADFI) by the end of week 5. Inclusion of SMFM at 8% yielded the maximum observed ADG, whereas ADFI was maximized with the 12% SMFM diet. Addition of SMFM did not affect feed conversion. These results suggest that SMFM may have potential as a protein source in starter diets for the early weaned pig.

### Introduction

Fish meal has been promoted as a feed ingredient for farm animals in this country for more than 100 years. Many studies have been conducted demonstrating beneficial results from including fish meal in the diets of several domestic animals. In the scientific literature, one can find numerous studies with swine from various countries in which fish meal has generally exerted a substantial growth promoting effect as well as improving feed efficiency (F/G) and ADFI. In contrast, however, other workers have found no differences in performance of pigs fed either fish meal or plant protein sources.

Inconsistencies in response resulting from fish meal supplementation are indicative of the variation that exists in the quality of different fish meals. Fish meal is actually a general term for a number of different products that vary in type of raw material and method of production. The proximate composition of fish varies widely from species to species and is correlated with such factors as season, geographical area, as well as, fish age, sex, size and feed intake. Different methods of fish processing would include oil removal, heat treatment, and drying. Some fish meals may be objectionable because they are not fresh or contain excessive fat or moisture.

Fish meal is a protein source; consequently, the ultimate value of fish meal in a diet will depend on its quality and its effect on the total amino acid balance of the diet. A better evaluation of fish meal quality should be based on source and chemical analysis to determine protein level, quality, and amino acid availability. With this objective in mind, an effort is being made by fish meal manufacturers to identify high quality fish meal through chemical analysis and ultimately market a selected product of consistent quality. It was one such product that we evaluated.

In considering fish meal for use in practical diets, it is of extreme importance to recognize that values derived from standard tables giving

compositions of feed ingredients refer to averages, and that the range associated with these averages may be considerable. The analysis of SMFM used in this study is given in Table 1.

Table 1. Select Menhaden Fish Meal Analysis.

| Item                 | Amount       |
|----------------------|--------------|
| Protein              | 61.6%        |
| Oil                  | 11.9%        |
| Lysine               | 4.7%         |
| Methionine           | 1.9%         |
| Methionine + Cystine | 2.5%         |
| Calcium              | 5.4%         |
| Phosphorus           | 3.2%         |
| Salt                 | 1.0%         |
| Digestible Energy    | 1868 kcal/lb |

### Experimental Procedure

One hundred fifty pigs averaging 3 weeks of age and 10.6 lb. were moved from a total confinement, environmentally controlled, farrowing facility into one room of an environmentally controlled nursery. Pigs were housed in pens (4 ft. x 5 ft.) with woven wire floors over a Y-flush gutter, with one nipple waterer and one four-hole self-feeder per pen. Temperature and air flow were adjusted to maintain optimum comfort for the pigs.

Table 2. Composition of Experimental Diets.

| Ingredients                   | % SMFM |       |       |       |       |       |
|-------------------------------|--------|-------|-------|-------|-------|-------|
|                               | 0      | 4     | 8     | 12    | 16    | 20    |
| Corn                          | 33.05  | 36.11 | 40.92 | 44.95 | 49.05 | 52.30 |
| Soybean Meal (44% CP)         | 30.50  | 25.00 | 19.00 | 13.00 | 6.00  |       |
| SMFM                          |        | 4.00  | 8.00  | 12.00 | 16.00 | 20.00 |
| Dried Whey                    | 25.00  | 25.00 | 25.00 | 25.00 | 25.00 | 25.00 |
| Fat (Soybean Oil)             | 6.70   | 5.80  | 4.00  | 3.00  | 2.30  | 1.50  |
| L-Lysine HCL (Feed grade 98%) | 0.20   | 0.25  | 0.15  | 0.10  | 0.10  | 0.05  |
| DL Methionine                 | 0.10   | 0.07  | 0.03  |       |       |       |
| Selenium                      | 0.15   | 0.15  | 0.15  | 0.15  | 0.15  | 0.15  |
| Copper Sulfate                | 0.10   | 0.10  | 0.10  | 0.10  | 0.10  | 0.10  |
| Dicalcium Phosphate           | 3.00   | 2.30  | 1.70  | 0.80  | 0.30  | 0.30  |
| Limestone                     | 0.40   | 0.50  | 0.30  | 0.30  | 0.40  |       |
| Trace Mineral Premix          | 0.10   | 0.10  | 0.10  | 0.10  | 0.10  | 0.10  |
| Vitamin Premix                | 0.25   | 0.25  | 0.25  | 0.25  | 0.25  | 0.25  |
| Salt                          | 0.20   | 0.12  | 0.05  |       |       |       |
| Antibiotic                    | 0.25   | 0.25  | 0.25  | 0.25  | 0.25  | 0.25  |

The compositions of the experimental diets are given in Table 2. These diets were formulated to contain 19.50% crude protein, 1673 kcal/lb digestible energy, 1.40% lysine, 0.72% methionine + cystine, 1.30% calcium, and 1.00% phosphorus. Treatments were formulated by substituting fish meal protein for soy protein. Levels of select menhaden fish meal inclusion were 0, 4, 8, 12, 16, and 20%. It should be noted that 20% SMFM totally replaced soybean meal in the diet. All treatments were formulated to contain the same levels of crude protein, digestible energy, lysine, methionine + cystine, calcium, phosphorus, and salt.

Pigs were blocked by weight and randomly assigned to pens, with 5 pigs/pen and 6 pens/treatment. Each pen was randomly assigned to a treatment. The study was conducted for 5 weeks. Criteria measured were ADG, ADFI and F/G. Pigs were fed ad libitum. Feeders were checked twice daily, and feed was weighed out and added or weighed back and recorded as necessary. Individual pig weights were collected at the end of each 7-day period. Animal health was excellent throughout the trial period.

### Results and Discussion

Results are given in Table 3. Addition of a select menhaden fish meal did not affect ADG by the end of week 2 of the study. However, by the end of week 5, a quadratic ( $P=.01$ ) effect in ADG was observed with the 8% SMFM diet yielding maximum ADG of 0.92 lb/day. This represents an 11.5% increase in ADG over pigs on the basal diet, which were gaining 0.82 lb/day.

The 20% SMFM diet, in which all the soybean meal was replaced by SMFM, yielded ADG not different from the basal diet, which contained no SMFM and utilized soybean meal as the main protein component. This suggests that complete

removal of soybean meal from the diet of the young pig did not improve pig performance.

Examining ADFI, again no differences between treatments were observed by the end of week 2. However, by the end of week 5, a quadratic effect ( $P=.01$ ) was observed in ADFI. Maximum ADFI of 1.31 lb/day was observed with the 12% SMFM diet. This represents approximately a 17% improvement in ADFI over the basal diet response of 1.12 lb/day.

Inclusion of SMFM at all levels yielded no differences in F/G at the end of 2 weeks. By the end of week 5, pigs on the basal diet were returning a very acceptable F/G of 1.34. Substitution of SMFM did not result in F/G different from the basal diet.

Table 3. Effect of SMFM Additions to Starter Diets for Pigs.

| Item                         | % SMFM |      |      |      |      |      | SE   |
|------------------------------|--------|------|------|------|------|------|------|
|                              | 0      | 4    | 8    | 12   | 16   | 20   |      |
| ADG, lb wk 0-2               | .45    | .46  | .52  | .46  | .52  | .45  | .026 |
| ADG, lb wk 0-5 <sup>a</sup>  | .82    | .89  | .92  | .90  | .89  | .88  | .022 |
| ADFI, lb wk 0-2              | .52    | .52  | .52  | .52  | .56  | .47  | .023 |
| ADFI, lb wk 0-5 <sup>a</sup> | 1.11   | 1.12 | 1.29 | 1.31 | 1.20 | 1.16 | .035 |
| F/G wk 0-2                   | 1.14   | 1.16 | 1.00 | 1.13 | 1.08 | 1.07 | .032 |
| F/G wk 0-5                   | 1.34   | 1.31 | 1.40 | 1.44 | 1.36 | 1.32 | .062 |

<sup>a</sup>Effect of SMFM quadratic ( $P=.01$ )