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EFFECT OF THREONINE SUPPLEMENTATION OF
A LOW PROTEIN, CORN-SUNFLOWER MEAL
DIET FOR YOUNG GROWING PIGS

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Of the ten essential amino acids required by swine, lysine, tryptophan and threonine have been reported by many researchers as being the first three limiting amino acids in cereal based swine diets. Research reported in the 1984 Swine Field Day Proceedings suggested supplementation of threonine to an amino acid fortified, low protein, corn-sunflower meal diet improves weanling pig performance.

This trial was conducted as a continuation of the study of the effects of threonine supplementation of an amino acid fortified, low protein, corn-sunflower meal diet and to estimate the dietary requirement of threonine of young growing pigs.

(Key Words: Starter Pigs, Threonine Requirement, Sunflower Meal.)

Experimental Procedure

Ninety-six crossbred pigs weaned at approximately three to four weeks were allowed a two week adjustment period prior to the initiation of this trial during which they were fed an 18% protein, corn-soybean meal based diet. Following the 14 day adjustment period, pigs averaging 21.3 lb were allotted to six dietary treatments on the basis of sex, litter and weight. Each treatment was replicated four times with four pigs allotted to each pen. Pigs were housed in an environmentally controlled room located in the Animal Science Complex. Feed and water were provided ad libitum during the 28 day trial and pig weights and feed weighbacks were taken weekly. Blood samples were obtained on day 28 for serum urea nitrogen, calcium, phosphorus and zinc determinations.

The composition of the diets is shown in table 1. Experimental treatments were as follows:

1. 12% C.P. sunflower meal basal plus .81% L-lysine, .1% L-tryptophan, .2% L-isoleucine and .1% DL-methionine
2. Diet 1 plus .07% L-threonine
3. Diet 1 plus .14% L-threonine
4. Diet 1 plus .21% L-threonine
5. Diet 1 plus .28% L-threonine
6. 18% C.P. sunflower meal basal plus .6% L-lysine

Table 1. Composition of Experimental Diets (%)

Ingredient	12% C.P.	18% C.P.
Yellow corn	86.11	68.23
Sunflower meal	10.20	29.23
Dicalcium phosphate	1.25	.33
Ground limestone	.80	1.18
Salt, white	.30	.30
Trace mineral premix	.05	.05
Vitamin premix	.03	.03
Aurofac - 50 ^a	.05	.05
L-lysine	.81	.60
L-tryptophan	.10	--
L-isoleucine	.20	--
DL-methionine	.10	--

a

Aureomycin.

Results

Performance and blood analysis data are summarized in table 2. Addition of .07% increments of L-threonine (.07, .14, .21, .28%) to the low protein, basal diet resulted in improvements in average daily gain, feed efficiency and serum urea nitrogen. Pigs fed the 18% protein diet gained faster than pigs fed the unsupplemented 12% protein diet, while gains of pigs fed threonine supplemented diets were intermediate and were not statistically different from those of pigs fed either the 18 or 12% protein control diets. Feed to gain ratios were lower for pigs consuming the threonine supplemented diets than for pigs fed the unsupplemented low protein diet. Feed efficiency did not differ among pigs fed the low protein diet supplemented with .14, .21 or .28% L-threonine and pigs fed the 18% protein diet. Serum urea nitrogen decreased as L-threonine was supplemented to the low protein diet. Pigs fed diets supplemented with .14, .21 or .28% L-threonine had lower serum urea nitrogen than pigs on all other treatments. Serum calcium was lower while serum phosphorus and zinc were higher in pigs fed the 12% protein diets compared to pigs fed the 18% protein diet.

The results of the trial reported in the 1984 Swine Day Proceedings and the trial reported herein indicate supplementation of threonine to a 12% protein, corn-sunflower meal diet is required for pigs to exhibit maximum performance. We estimate the dietary threonine requirement of the young weaned pig (17 to 45 lb) to be approximately .63%.

Table 2. Effect of Dietary Threonine Levels on Performance of Young Weaned Pigs

Diet	12% C.P.				18% C.P.	
	0	.07	.14	.21	.28	0
Supplemental L-threonine, %	0	.07	.14	.21	.28	0
Dietary Threonine, %	.50	.57	.64	.71	.78	.71
Initial wt, lb	21.3	21.3	21.3	21.3	21.3	21.2
Final wt, lb	43.8 ^a	45.8 ^{a,b}	47.4 ^{a,b}	46.3 ^{a,b}	46.1 ^{a,b}	48.5 ^b
Avg daily gain, lb ^e	.80 ^a	.88 ^{a,b}	.94 ^{a,b}	.90 ^{a,b}	.89 ^{a,b}	.98 ^b
Avg daily feed, lb	2.16	2.13	2.09	1.96	1.98	2.09
Feed/gain ^f	2.68 ^a	2.45 ^b	2.23 ^{b,c}	2.19 ^c	2.23 ^{b,c}	2.15 ^c
Serum urea nitrogen, mg/dl ^g	13.14 ^a	10.68 ^c	7.63 ^c	7.68 ^c	7.71 ^c	16.23 ^d
Serum calcium, mg/dl ^f	9.45 ^{a,b}	9.35 ^b	9.79 ^{a,b,c}	9.92 ^c	9.66 ^{abc}	10.41 ^d
Serum phosphorus, mg/dl ^e	9.92 ^{a,b}	9.93 ^{a,b}	10.23 ^a	9.88 ^{a,b}	9.46 ^b	7.50 ^c
Serum zinc, ppm ^h	.88 ^a	.71 ^b	.76 ^b	.74 ^b	.79 ^{a,b}	.56 ^c

^{a,b,c,d} Means without a common superscript differ (P<.05).

^e Cubic threonine response.

^f Linear, cubic (P<.005) quadratic (P<.05) threonine response.

^g Linear, quadratic, cubic threonine response (P<.005).

^h Quadratic (P<.025) cubic (P<.005) threonine response.

Summary

Ninety-six five to six week old pigs were utilized in a 28 day trial to estimate the dietary threonine requirement of the young growing pig fed an amino acid fortified, 12% protein, corn-sunflower meal diet.

Average daily gains were improved with supplementation of threonine to the basal diet and were not different from the gains of pigs fed 18% protein diets; however, only pigs fed the 18% protein diet gained significantly faster than pigs fed the unsupplemented, 12% protein diet.

Addition of .14, .21 or .28% L-threonine to the basal diet improved feed efficiency. These values were similar to those of pigs fed the 18% protein diet. Serum urea nitrogen decreased in pigs fed diets containing supplemental L-threonine. Serum calcium was lower while serum phosphorus and zinc were higher in pigs fed the 12% protein diets. The dietary threonine requirement is estimated to be .63%.