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AMINO ACID SUPPLEMENTATION OF LOW PROTEIN CORN-SOY DIETS FOR YOUNG WEANED PIGS

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Problems with feeding high protein diets to young weaned pigs have been reported by some swine producers. Therefore, interest exists in the possibility of reducing the protein content of starter diets and supplementing with amino acids to keep them nutritionally balanced. Corn-soybean meal diets are most limiting in lysine. Methionine and tryptophan are thought to be next most limiting.

The objectives of this experiment were to determine the need for tryptophan supplementation of low protein starter diets supplemented with lysine and methionine and to determine the value of N-acetyl-DL-tryptophan as a source of tryptophan.

Experimental Procedure

Two trials were conducted with 96 crossbred pigs in each trial. Pigs were weaned at an average age of 4 to 5 weeks and placed directly on the experimental diets. Pigs averaged 17.5 and 18.7 lb. initially in trials 1 and 2, respectively. Allotment was made to six treatments in each trial on the basis of weight and ancestry. The trials were conducted for 4 weeks in the environmentally controlled swine lab in the Animal Science Complex.

Corn-soybean meal diets fortified with minerals, vitamins and antibiotics were formulated as shown in table 1.

The treatment groups in trial 1 were:

1. 18% protein diet
2. 13% protein diet + lysine + methionine
3. Treatment 2 + .05% N-acetyl-DL-tryptophan
4. Treatment 2 + .05% DL-tryptophan
5. Treatment 3 + 3.36% L-glutamic acid
6. Treatment 3 - methionine

Treatments imposed in trial 2 were:

1. 18% protein diet
2. 13% protein diet + lysine + methionine
3. Treatment 2 + .02% DL-tryptophan
4. Treatment 2 + .04% DL-tryptophan
5. Treatment 2 + .08% DL-tryptophan
6. Treatment 5 - methionine

Results

The average daily gain, feed consumption and feed/gain data for trial 1 are shown in table 2. Pigs fed the 18% protein gained significantly faster than pigs fed the 13% protein diet which had been supplemented with lysine and methionine, treatment 2, and also faster than those pigs fed the 13% protein diets supplemented with .05% N-acetyl-DL-tryptophan. However, there was no significant difference in gains between pigs fed the 18% protein diet and the 13% protein diet supplemented with .05% DL-tryptophan, treatment 4. Pigs fed this diet, treatment 4, also gained significantly faster than all other pigs receiving the 13% protein diets. These data suggest that the 13% protein diet supplemented with lysine and methionine was improved by DL-tryptophan, but that N-acetyl-DL-tryptophan was not of benefit to the pig. Likewise, L-glutamic acid did not improve the low protein diet containing N-acetyl-DL-tryptophan and methionine did not appear to be of any benefit in this ration.

Feed consumption was significantly less by pigs fed treatment 3, the low protein diet supplemented with N-acetyl-DL-tryptophan, than for pigs fed the 18% protein diet or the low protein diet plus DL-tryptophan, treatment 4.

The performance data from the second trial are summarized in table 3. There were no significant differences among treatments for either average daily gain or average daily feed. Feed/gain was significantly less for pigs fed the higher protein diet. It was noted that pigs fed the 18% protein diet consumed less feed and gained more slowly than pigs fed this diet in trial 1. Also, pig performance did not improve significantly when DL-tryptophan was supplemented to the 13% protein diet, as occurred in trial 1. Again, there was no benefit from the addition of methionine to the low protein diet.

Summary

Two trials involving a total of 192 pigs were conducted to study the need of tryptophan supplementation to low protein pig starter diets. In trial 1, it was shown that N-acetyl-DL-tryptophan was not as available to the young pig as DL-tryptophan. The addition of .05% DL-tryptophan to a 13% protein corn-soy diet containing added lysine and methionine resulted in pig performance similar to that of pigs fed an 18% protein diet. There were no significant differences in gain or feed consumption among treatments in trial 2. Pigs fed the 18% protein diet were more efficient than those fed the low protein diets. Supplementation of the 13% protein diet with .02, .04 or .08% DL-tryptophan did not improve pig performance in this trial.

Table 1. Composition of Diets (Percent)

Ingredients	18% protein diet	13% protein diet + lysine + methionine
Ground yellow corn	72.1	84.03
Soybean oil meal (48%)	24.5	11.84
Dicalcium phosphate	2.0	2.2
Limestone	0.6	0.6
Trace mineral salt	0.3	0.3
Premix[a]	0.5	0.5
L-lysine monohydrochloride	--	0.46
DL-methionine	--	0.07

[a] Supplied per lb. of diet: vitamin A, 2000 IU; vitamin D, 200 IU; vitamin E, 3 mg; vitamin K, 1.2 mg; pantothenic acid, 6 mg; niacin, 9.6 mg; choline, 30 mg; vitamin B_{12}; 6 mcg; aureomycin, 50 mg; penicillin, 25 mg and sulfamethazine, 50 milligrams.

Table 2. Effects of N-Acetyl-DL-Tryptophan in Low Protein Pig Starter Diets Fed For 28 Days

Crude protein, %	18%	13% + lysine + methionine				
Amino acids	--	--	.05% N-acetyl-DL-tryptophan	.05% DL-tryptophan	As 3 + L-glutamic acid	As 3 - methionine
Treatment no.	1	2	3	4	5	6
No. of pigs[a]	16	16	16	16	16	16
Avg. daily gain, lb.[b]	.77	.56	.52	.74	.59	.54
Avg. daily feed, lb.[c]	1.46	1.26	1.10	1.45	1.29	1.23
Feed/gain	1.90	2.27	2.12	1.98	2.23	2.29

[a] Four lots of four pigs each per treatment. Average initial weight, 17.5 pounds.

[b] Pigs on treatments 1 and 4 gained significantly faster ($P<.01$) than those on treatments 3 and 6 and those ($P<.05$) on treatments 2 and 5.

[c] Pigs on treatment 3 gained significantly less ($P<.05$) than those on treatments 1 and 4.

Table 3. Effect of DL-Tryptophan Supplementation of Low Protein Pig Starter Diets

Crude protein	18%	13% + lysine + methionine				13% + lysine
DL-tryptophan, %	--	--	.02	.04	.08	.08
Treatment no.	1	2	3	4	5	6
No. of pigs[a]	16	16	16	16	16	16
Avg. daily gain, lb.	.62	.52	.54	.52	.54	.61
Avg. daily feed, lb.	1.15	1.37	1.27	1.20	1.24	1.42
Feed/gain[b]	1.87	2.60	2.34	2.35	2.31	2.33

[a] Four lots of four pigs each per treatment. Average initial weight, 18.7 pounds.

[b] Treatment 1 significantly ($P<.01$) less than all other treatments.