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SUPPLEMENTAL LYSINE AND METHIONINE IN FINISHING SWINE RATIONS

B. A. Eason and R. W. Seerley¹

The term "protein requirement" does not suffice any longer for the determination of a well balanced ration, and the term "amino acid requirement" is becoming more standard. Grain and protein feeds vary in their amino acid content and also vary in the availability of the amino acids. When a ration is formulated, the feedstuff amino acid content, amino acid availability and the amino acid requirement of the animal must be considered. These areas, plus amino acid interactions and others, include a broad field and all need extensive clarification. Research has been conducted at several experiment stations to evaluate different protein supplements and crystalline amino acids and their effect on the growth of swine. More amino acid research has been focused on baby and growing pigs, whereas very little research has been conducted with finishing pigs.

Two experiments have been conducted to gain some insight on the value of two crystalline amino acids, lysine and methionine, in the diets for finishing pigs. Evaluation criteria were growth rate, feed conversion, liver ether extract, free amino acid concentration in the blood plasma and certain carcass traits.

Experimental Procedure

Experiment 1. Two trials involving a total of 112 Duroc, Yorkshire, Hampshire and crossbred pigs were utilized. The experimental treatments were:

1. Basal diet (table 1)
2. Same as 1 + 0.125% MHA (methionine hydroxy analog)
3. Same as 1 + 0.25% MHA
4. Same as 1 + 0.05% lysine as lysine monohydrochloride
5. Same as 1 + 0.15% lysine
6. Same as 1 + 0.30% lysine
7. Same as 1 + 0.60% lysine

One trial was started in December, 1962, and the second trial was started in August, 1963. Pigs were selected and allotted on the basis of breed, weight and sex and then randomly assigned to treatment. Pigs were reared in confinement and feed and water were provided ad libitum. Pigs were removed at the end of each trial on a weight constant basis. Blood samples were secured from the anterior vena cava of each pig after a period of fasting, and liver samples were obtained at the slaughter plant. Liver samples were analyzed for ether extract, and the blood plasma was analyzed for free amino acid content.

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Experiment 2. A 3 x 3 factorial design was used to test levels of methionine and lysine and all combinations of the test levels. The levels of methionine added to the basal ration were 0.125% and 0.25% MHA and the two lysine levels were 0.15% and 0.30%. Each level of each amino acid was tested alone and all combinations of the two were tested. Trial 1 was started in the fall of 1963 and trial 2 was started in January, 1964. Eighty-one Duroc and Hampshire pigs were used in these trials. Management of the pigs was the same as in experiment 1. The same basal ration was also used. Carcass measurements were obtained in these trials.

Results

Experiment 1. Although there was 0.23 of a pound range in daily gain between treatments, they were not significantly different. Pigs fed the methionine gained about the same as the control pigs (lot 1), while most groups fed lysine gained a little faster than the control pigs. The treatments did not differ significantly in feed conversion or ether extract.

The 0.6% lysine group of pigs had significantly ($P < 0.05$) more free lysine in the blood plasma than the other groups. Serine and proline were significantly higher in the group fed 0.125% MHA and serine was also significantly higher in the 0.15% lysine group. The treatment groups did not differ in plasma amino acids among the other 17 amino acids analyzed. There was much variation in the values and it is hoped these values will be more meaningful as more research data on amino acid are reported.

Experiment 2. A statistical analysis of the data did not show any statistical difference between the treatments for any of the traits in table 3, except for percent lean cuts. The means for lean cuts were significantly different. Methionine or lysine alone did not show any advantage over the control pigs, but pigs fed the high level of lysine with 0.125 or 0.25% methionine did gain 0.08 and 0.18 pound faster than the control pigs and required 0.22 and 0.37 pound less feed per pound of gain than the control pigs. More research will be necessary to determine the importance of these differences.

Discussion

The specific lysine and methionine requirements of the finishing pig have not been determined. The ration used in these experiments was formulated to contain about 12% crude protein which is the recommended level for finishing pigs. Then the objective was to observe the effects of supplemental lysine and methionine alone and in combination. The data suggest the ration was adequate in both amino acids and lower levels must be used in the basal ration before deficiencies can be shown (establish the requirement). Also, low levels of either amino acid or low levels of combinations in a probably adequate ration have little effect on the pig. However, a high level of lysine or high levels of a combination may have some favorable influence on the finishing pig.

Table 1. Basal Diet

Ingredient	%
Ground yellow corn	89.55
Soybean meal (44%)	6.00
Tankage (60%)	2.00
Dicalcium phosphate	1.00
Limestone	0.30
T. M. salt	0.50
Vitamin-antibiotic premix ¹	+

¹ Premix provided 375 U.S.P. units vitamin A, 210 U.S.P. units vitamin D₂, 1 mg. riboflavin, 2 mg. pantothenic acid, 4.5 mg. niacin, 5 mg. choline chloride, 5 mcg. vitamin B₁₂ and 5 mg. chlortetracycline.

Table 2. Summary of Experiment 1^a

Lot no.	1	2	3	4	5	6	7
Level of MHA, %	--	0.125	0.25	--	--	--	--
Level of lysine, %	--	--	--	0.05	0.15	0.30	0.60
Number of pigs	16	16	16	16	16	16	16
Av. daily gain, lb.	1.79	1.77	1.81	1.88	1.89	1.81	2.00
Feed per lb. gain, lb.	3.78	3.92	3.89	3.77	3.68	3.72	3.65
Liver ether extract, % ^b	12.5	13.0	11.5	11.7	10.5	9.6	10.7

^a Average initial and final weights were approximately 100 and 210 pounds.

^b Expressed as a percent of the total liver on a dry weight basis.

Table 3. Summary of Experiment 2^a

Lot number	1	2	3	4	5	6	7	8	9
Level of MHA, %	--	0.125	0.25	--	--	0.125	0.25	0.125	0.25
Level of lysine, %	--	--	--	0.15	0.30	0.15	0.15	0.30	0.30
Number of pigs	9	9	9	9	9	9	9	9	9
Av. daily gain, lb.	1.99	2.02	2.00	2.06	1.95	2.06	1.94	2.07	2.17
Feed per lb. gain, lb.	3.83	3.68	3.77	3.75	4.00	3.85	3.87	3.61	3.46
Av. dressing percent, %	68.2	70.6	69.8	71.2	69.3	70.3	70.9	69.1	69.4
Av. backfat, in.	1.59	1.70	1.72	1.72	1.61	1.71	1.70	1.58	1.66
Av. length, in.	29.3	29.2	29.3	29.1	29.1	28.8	29.0	29.3	29.2
Av. loin eye area, sq. in.	3.58	3.51	3.46	3.21	3.48	3.49	3.46	3.48	3.55
Av. lean cuts, %	52.8	51.3	51.4	50.1	51.4	50.2	50.4	51.7	51.1

^a Average initial and final weights were approximately 118 and 212 pounds.