

THE ACTIVITIES OF D AND L LYSINE FOR TURKEY POULTS

F. H. KRATZER

Division of Poultry Husbandry, University of California, Davis

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It has been demonstrated that growing turkeys require lysine in their ration for optimum growth and for normal feather pigment formation (Fritz et al., '46; German et al., '49; Kratzer et al., '50). Since the unnatural isomers of some amino acids are not active and others have limited activity when fed to avian species (Almquist, '48), it was of interest to determine the value of D-lysine for the turkey poult.

EXPERIMENTAL

The lysine-deficient ration which was used in the present experiment contained the following in grams per 100 gm: sesame seed oil meal, 57.0; cornstarch, 24.1; calcium gluconate, 5.0; oil mixture, 3.5; salt mixture, 2.5; vitamin mixture,¹ 2.0; condensed fish solubles,² 2.0; calcium phosphate (tribasic), 2.0; calcium phosphate (dibasic), 1.5; choline chloride, 0.3; inositol, 0.1; and biotin, 0.00002. The oil mixture supplied soybean oil, 2.5 gm; fish oil (2,000 A, 400 D), 1.0 gm; and alpha tocopherol acetate, 0.002 gm. The salt mixture and vitamin mixture were essentially those described previously (Kratzer et al., '49). Additions of lysine were made at the expense of cornstarch. The basal ration contained approximately 25%

¹ Pteroylglutamic acid was kindly donated by the Lederle Laboratories Division of the American Cyanamid Company, Pearl River, New York, through the courtesy of Dr. T. H. Jukes.

² Kindly donated by the Valley Dehydrating Company, Kingsburg, California, through the courtesy of Mr. E. B. Fishel.

TABLE 1
*The effect of various forms of lysine on the growth and feather
 pigmentation of poult*

SUPPLEMENT	LEVEL	AVERAGE DAILY GAIN			AVE. OF ALL EXPTS.	INCIDENCE OF WHITE BAR	
		Expt. 1	Expt. 2	Expt. 3		Expt. 1	Expt. 2
	%	%	%	%	%	%	
None		3.3	3.2	2.9	3.1	100	86
L-lysine monohydrochloride	0.25	5.1	5.1	4.5	4.9	83	71
L-lysine monohydrochloride	0.5	6.6	6.4	6.1	6.4	0	0
L-lysine monohydrochloride	0.75	7.8	7.0		7.4	0	0
DL-lysine monohydrochloride	0.25	4.0	3.2		3.6	71	86
DL-lysine monohydrochloride	0.5	5.7	4.1	4.1	4.6	100	57
DL-lysine monohydrochloride	0.75	5.4	5.2		5.3	17	25
DL-lysine monohydrochloride	1.00			6.3	6.3		
D-lysine monohydrochloride	0.25		2.8		2.8		86
D-lysine monohydrochloride	0.5		3.3		3.3		100
D-lysine monohydrochloride	0.75		2.9		2.9		83
L-lysine monohydrochloride	0.5						
D-lysine monohydrochloride	1.0			6.2	6.2		

protein. The lysine³ samples used were commercial preparations.

Bronze turkey poult were fed a practical starting ration for from 8 to 16 days before they were divided into groups of

³ Kindly donated by E. I. DuPont de Nemours and Company, Inc., New Brunswick, New Jersey, through the courtesy of Dr. J. Waddell.

7 each and were fed the experimental rations. The first three trials continued for 14 days, 16 days and 13 days successively. The poults were weighed and examined at frequent intervals. The results of the three trials are summarized in table 1. A high incidence of pigmentation failure was caused by feeding the basal ration, which was deficient in lysine. The incidence was reduced by 0.25% L-lysine monohydrochloride and the failure was entirely prevented by 0.5% L-lysine monohydrochloride. DL-lysine monohydrochloride was less effective and even 0.75% did not entirely prevent the pigmentation failure; D-lysine monohydrochloride at a level of 0.75% was ineffective in reducing the incidence of faulty pigmentation.

TABLE 2
The effect of D-lysine added to a practical poult starting ration upon the growth of poults

SUPPLEMENT	LEVEL	AVERAGE DAILY GAIN ¹
	%	%
None	..	5.65
D-lysine monohydrochloride	0.5	5.34
D-lysine monohydrochloride	1.0	5.22
D-lysine monohydrochloride	2.0	4.50

¹ Least difference for significance at 1% level = 0.61.

The growth rates of the poults increased directly as the L-lysine of the ration increased (table 1). Approximately twice as much DL-lysine was required to produce equivalent gains. D-lysine caused no increase in gain above that observed in poults fed the basal ration.

D-Lysine was tested in an adequate ration in experiment 4 to determine whether it would depress growth at relatively high levels. Various amounts of D-lysine were added to a practical poult starting ration, as is indicated in table 2. Eight poults per group were fed the rations for 18 days. There was no significant reduction in growth when the D-lysine was fed at 0.5% and 1.0%. At 2% of the ration growth was depressed significantly, as determined by the analysis of variance method (Snedecor, '46).

DISCUSSION

L-Lysine has been previously shown to be required by the turkey poult for normal growth and for feather pigment formation (Fritz et al., '46; German et al., '49; Kratzer et al., '50). The present work shows that the D-isomer of lysine cannot replace the natural form for these functions. The complete mechanisms by which lysine is used for growth or in the formation of melanin are not known. These two requirements have similar specificity for the isomers of lysine.

There is no indication in the results of these experiments that levels up to 1% of D-lysine are growth inhibiting; however, growth was depressed by 2% D-lysine. Prescott et al. ('49) have shown that D-tryptophan slightly inhibits growth in certain bacteria when it is supplied at relatively low levels.

The turkey poult, like the rat and mouse, is unable to use the D-isomer of lysine for growth (Berg, '36; Totter and Berg, '39).

SUMMARY

Turkey poults are unable to use D-lysine for growth or for the development of normal pigment in the feathers. Levels of D-lysine up to 1% did not depress growth, while 2% caused decreased growth when added to an adequate ration.

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