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Effect of Ethanolamine and Betaine on Perosis in Chicks.*

JAMES MCGINNIS, L. C. NORRIS AND G. F. HEUSER.

From the School of Nutrition and Department of Poultry Husbandry, Cornell University, Ithaca, N.Y.

In the prevention of perosis in chicks and turkey poults it has been shown that manganese,¹ choline,^{2,3} and biotin^{4,5} are required. Stetten⁶ has shown that in the rat ethanolamine and betaine serve as precursors in the biological synthesis of choline. Other studies⁷ show that betaine can effectively replace choline as a donor of methyl groups for use in biological methylations. Jukes⁸ has reported that betaine is ineffective in preventing perosis or promoting growth in turkey poults. Ethanolamine, however, was not fed in the experiments conducted by Jukes. In view of this, experiments were conducted to determine the effect of ethanolamine and betaine in preventing perosis in chicks.

Day-old Rhode Island Red cockerel chicks were divided into 4 groups of 20 chicks each and placed in battery brooders with wire floors. The experimental diet was supplied immediately and fed *ad libitum* thereafter. Individual weights were recorded at weekly intervals at which time any symptoms of perosis were noted. The method used in obtaining the severity index was that described

by Wilgus, Norris and Heuser.⁹ All experiments were terminated at the end of 6 weeks.

The basal diet fed in these studies contained 66.75% degerminated yellow corn meal, 15 peanut meal, 10 purified casein, 3 soybean oil, 0.25 reinforced cod liver oil, and 5 salt mixture.¹⁰ To each 100 g of the basal diet were added 300 μ g of thiamin, 500 riboflavin, 500 pyridoxine and 700 d-calcium pantothenate. A new supply of corn meal, peanut meal and casein was used in preparing the basal diet fed in Experiment 2.

The results of the experiments in which ethanolamine and betaine were used as supplements to the basal diet are summarized in Table I.

In Experiment 1 ethanolamine was slightly effective in reducing the amount of perosis but the same results were not obtained in Experiment 2. No effect upon mortality was observed in either experiment whereas the influence upon growth was variable. The effectiveness of ethanolamine in Experiment 1 may have been due to the presence of more labile methyl groups in the ingredients used in preparing the basal diet fed in this experiment than were present in the ingredients used in Experiment 2.

Betaine, on the other hand, was effective in preventing perosis. It also promoted growth and markedly reduced the chick mortality. These results are not in accord with those obtained by Jukes⁸ in experiments with turkey poults.

The addition of both ethanolamine and betaine to the basal diet was somewhat more effective in reducing perosis than betaine alone. This may have been caused by the biological synthesis of a greater amount of

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¹ Wilgus, H. S., Jr., Norris, L. C., and Heuser, G. F., *J. Nutrition*, 1937, **14**, 155.

² Jukes, T. H., *J. Biol. Chem.*, 1940, **134**, 789.

³ Hogan, A. G., Richardson, L. R., Patrick, H., and Kempster, H. L., *J. Nutrition*, 1941, **21**, 327.

⁴ Jukes, T. H., and Bird, F. H., *Proc. Soc. Exp. Biol. and Med.*, 1942, **49**, 231.

⁵ Richardson, L. R., Hogan, A. G., and Miller, O. N., *Mo. Sta. Res. Bul.* 343, June, 1942.

⁶ Stetten, DeWitt, Jr., *J. Biol. Chem.*, 1941, **140**, 143.

⁷ Chandler, J. P., and du Vigneaud, V., *J. Biol. Chem.*, 1940, **135**, 223.

⁸ Jukes, T. H., *J. Nutrition*, 1940, **20**, 445.

⁹ Wilgus, H. S., Jr., Norris, L. C., and Heuser, G. F., *Poultry Science*, 1937, **16**, 232.

¹⁰ Schumacher, A. E., and Heuser, G. F., *Poultry Science*, 1940, **19**, 315.

TABLE I.
Effect of Ethanolamine and Betaine on Perosis.

Effect of Ethanolamine and Betaine on Perosis				
Supplement to basal diet	Perosis		Avg wt at 6 wk, g	Mortality, %
	Incidence, %	Severity index		
Experiment 1.				
0	87.5	47.5	290 ± 51.8	40
.2% ethanolamine	54.0	28.6	304 ± 58.1	40
.2% betaine hydrochloride	22.2	6.8	396 ± 84.4	10
.2% betaine hydrochloride + 0.2% ethanolamine	10.5	2.6	440 ± 50.3	5
Experiment 2.				
0	87.0	46.0	314 ± 72.9	35
.2% ethanolamine	87.0	41.5	263 ± 33.5	40
.2% betaine hydrochloride	25.0	8.0	383 ± 80.2	0
.2% betaine hydrochloride + 0.2% ethanolamine	15.0	8.6	362 ± 69.2	10

choline in the presence of the added ethanolamine.

The effectiveness of betaine in preventing perosis was nearly as great, if not as great, as choline was found to be in an experiment started 2 weeks earlier than Experiment 1. In the choline experiment the chicks were identical in strain and source with those used in the experiments on betaine and the composition of the basal diet was also identical. The ingredients used in preparing the diet were the same as those used in Experiment 1 on betaine. The incidence of perosis in the choline experiment was 21.0%, the

severity index 6.7, the average weight at 6 weeks of age 421 g and the mortality 5%.

Summary. The occurrence of perosis in chicks was markedly reduced by supplementing the basal diet with betaine hydrochloride. Ethanolamine was slightly effective in one experiment in preventing perosis but not in the other. Supplementing the diet with both ethanolamine and betaine was somewhat more effective in reducing perosis than either one alone. Under the experimental conditions betaine also promoted growth and reduced mortality.

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Effect of Hypophysectomy of Growing Chicks upon Their Basal Metabolism.*

A. NALBANDOV AND L. E. CARD. (Introduced by F. C. Koch.)

From the Department of Animal Husbandry, University of Illinois, Urbana.

In the course of a study dealing with certain fundamental aspects of physiology of reproduction in domestic chickens, young White and Brown Leghorn chicks were hypophysectomized. No reports of basal metabolic rates of hypophysectomized chickens were found in the literature and this fact, together with the finding of complete post-operative regression of the thyroids and ap-

parent apathy of the birds prompted the study summarized in this report.

Since details of the experiments are to be reported elsewhere only an abridged statement of the experimental approach is given here. Both the operated and the normal birds were hatched on April 26, 1941. They were raised under standard laboratory conditions and were operated upon when weighing about 500 g, at an age ranging between 46 and 51 days.

Following the removal of the pituitary

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