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Effect of a Pellagra-Producing Diet on Herbivora.*

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Investigations have shown that nicotinic acid is effective in the prevention and cure of human pellagra[1] and black tongue in dogs.[2] Recently Chick, *et al.*,[3] and Hughes[4] have shown that nicotinic acid is a dietary essential for pigs. Aside from vitamin B_1, information is lacking on the requirements of Herbivora for various members of the vitamin B complex. Bechdel, *et al.*,[5] obtained normal growth of calves on a ration that provided insufficient vitamin B_1 to support growth in rats. Bacteria present in the rumen of calves fed a B_1 low ration were found to be highly potent in promoting growth of rats maintained on a B_1-deficient ration.[6]

The present paper reports the results of investigations on the rôle of nicotinic acid in the nutrition of Herbivora. Sheep were used as the experimental animal in this investigation.

Six weanling lambs between 2 and 3 months of age and weighing between 13.6 and 18.8 kilos were placed on a ration consisting of regenerated cellulose 20, yellow corn 60, peas *(Vigna sinensis)* 10, unpurified casein 9, dicalcium phosphate 1, and sodium chloride *ad libitum*. Vitamins A and D in addition to that furnished through natural sources were supplied by oleum percomorphum. Since Birch, *et al.*,[7] had produced pellagra-like symptoms in pigs, using unpurified casein, we were prompted to use a similar source of protein in our ration for lambs.

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3 Chick, H., Macrae, T. F., Martin, A. J. P., and Martin, C. J., *Biochem. J.*, 1938, **32**, 10.

4 Hughes, E. H., *Hilgardia*, 1938, **11**, 595.

5 Bechdel, S. I., Eckles, C. H., and Palmer, L. S., *J. Dairy Sc.*, 1926, **9**, 409.

6 Bechdel, S. I., Honeywell, H. E., Dutcher, R. A., and Knutsen, M. H., *J. Biol. Chem.*, 1928, **80**, 231.

7 Birch, R. W., Chick, H., and Martin, C. J., *Biochem. J.*, 1937, **31**, 2065.

All of the lambs made good growth for the first 4 or 5 weeks. Following this there was a rapid decline in weight, with a concomitant decrease in the amount of feed consumed. Some of the animals lost as much at 4.5 kilos, or 24% of their weight. At this point 5 mg of nicotinic acid† per kilo of body weight was administered daily *per os* to Nos. 270 and 300. While there is no information to indicate that vitamin B_1 is necessary for this species, conclusive evidence that it is not, is lacking. In order to eliminate any possibility of B_1 being a limiting factor in the ration, a solution of thiamin was administered *per os* to Nos. 253 and 297 at the rate of 50 micrograms daily per kilo of body weight. Subsequently both the treated and untreated animals recovered with equal rapidity and made satisfactory growth thereafter. Whether this temporary failure reflects a period during which the animal organism was making an adjustment to the deficiency, perhaps through an increase in microörganisms in the rumen that might synthesize nicotinic acid or to some other factor, cannot be answered at present.

The lambs were continued on this ration for a total of 130 days. The lambs that received nicotinic acid or vitamin B_1 made no better gains than those not given a supplement. Therefore, the addenda were discontinued after 44 days.

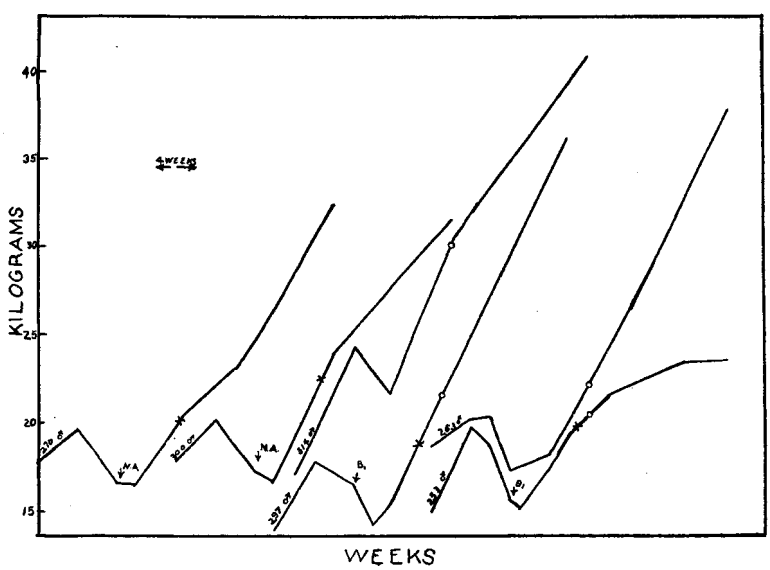

FIG. 1.

Growth curve of lambs on pellagra-producing ration. Nicotinic acid and B_1 discontinued at x. Circle indicates point at which animals were changed to a ration containing purified casein.

† Supplied through the courtesy of Merck & Company.

At the end of the 130-day period the 4 lambs that had not received nicotinic acid were changed to a ration in which the unpurified casein was replaced by "Labco Vitamin-free Casein." These lambs were fed this ration for 90 days, while Nos. 270 and 300 were continued on the ration containing unpurified casein. During this period all of the lambs except No. 253 made excellent gains of between 114 and 164 g per day. Since No. 253 made no improvement after being placed on a standard fattening ration at the conclusion of the experiment it is believed that his failure to make as good growth as the others was due to causes other than the nature of the ration fed. There was no significant difference in the performance and rate of growth between the lambs fed the ration containing the unpurified casein and those fed the ration containing the purified casein, which is a typical pellagra-producing ration. The gains made by the lambs in both groups were comparable with the gains of lambs of similar weight on a well-balanced fattening ration.

Summary. Lambs developed normally on a ration that causes cessation of growth and produces pellagra-like symptoms in pigs and black tongue in dogs. From this it appears that nicotinic acid is either not a dietary essential for this species or that the requirements are much lower than for the pig, dog, or human.

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A New Fibrinogen Preparation.*

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In a recent presentation of a series of standardized procedures for the *in vitro* study of coagulation reactions,[1] it was noted that the essential thrombin components (prothrombin, calcium, cephalin) could all be obtained in stable form and readily converted into appropriate solutions. The fibrinogen, on the other hand, was always freshly prepared, consuming much valuable time and risking a poor preparation from denaturation and other causes. In searching for a method of obtaining a stable "stock" preparation of this labile

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1 Ferguson, J. H., *J. Lab. and Clin. Med.*, 1938, **24**, 273.