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14565

**Development of Thiamine Deficiency in the Cat on a Diet of Raw Fish.**

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Foxes fed a nutritionally adequate diet mixed with pieces of raw carp develop signs of thiamine deficiency within 20 days (Green, Carlson, and Evans<sup>1</sup>) due to the presence of an anti-thiamine factor present in the tissues. The enzymatic nature of this factor is indicated by its destruction on cooking, a possibility greatly strengthened by the success of Sealock, Livermore, and Evans<sup>2</sup> in extracting from carp tissues a dried powder with protein characteristics having anti-thiamine activity.

Previous studies in this laboratory (Everett<sup>3</sup>) on cats fed a diet of autoclaved canned rabbit meat supplemented with B vitamins other than thiamine led us to investigate the effects of raw fish diet in this species. This was done by feeding cats a diet consisting exclusively of either raw carp, herring, catfish, butter-fish, or spots, all purchased in the local markets. The animals were weighed

weekly and a close watch was kept on their behavior. Carp and herring alone of the fish tried produced thiamine deficiency symptoms within the expected time. The results of the raw carp diet are summarized in Table I. On such a diet the cats developed all the signs of thiamine deficiency, including convulsions, within 23 to 40 days, with the exceptions noted later. The weight curve of cat 5 in Fig. 1 is typical of those animals succumbing to the diet. Several animals given subcutaneous injections of thiamine (as shown in Table I) when signs of deficiency were well advanced recovered without exception. Cat 7 in Fig. 1 is such an example. The deficiency symptoms developed as a result of eating raw carp are identical in every respect with those seen on the carefully controlled thiamine-free diet of autoclaved canned rabbit meat described by Everett<sup>3</sup> and in our opinion the two conditions are identical. The first sign of deficiency is anorexia with weight loss, followed within 10 to 20 days by the appearance of a staggering gait due to ataxia of the hindlegs, increasing weakness, circus movements, head ventro-

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<sup>1</sup> Green, R. G., Carlson, W. E., and Evans, C. A., *J. Nutrition*, 1942, **23**, 165.

<sup>2</sup> Sealock, R. R., Livermore, A. H., and Evans, C. A., *J. Am. Chem. Soc.*, 1943, **65**, 935.

<sup>3</sup> Everett, G. M., *Am. J. Physiol.*, 1944, **141**, 439.

## THIAMINE DEFICIENCY AND RAW FISH

TABLE I.  
Results of Feeding Cats on Exclusive Diet of Raw Carp.

| Cat No. | Days on diet | Initial wt, kilo | Minimal wt, kilo | % change in body wt | Remarks                                     |
|---------|--------------|------------------|------------------|---------------------|---------------------------------------------|
| 1       | 38           | 2.8              | 1.85             | 34                  | Convulsive, killed                          |
| 2       | 32           | 3.0              | 2.18             | 27                  | " died                                      |
| 3       | 66           | 3.1              | 3.1              | 0                   | No signs of B <sub>1</sub> deficiency       |
| 4       | 34           | 2.25             | 1.95             | 13                  | Convulsive, recovery on B <sub>1</sub> inj. |
| 5       | 36           | 3.1              | 2.50             | 19                  | " killed                                    |
| 6       | 29           | 2.2              | 1.75             | 20                  | " "                                         |
| 7       | 35           | 2.3              | 1.6              | 31                  | " recovery on B <sub>1</sub> inj.           |
| 8       | 40           | 3.7              | 2.9              | 21                  | " killed                                    |
| 9       | 28           | 3.87             | 2.6              | 33                  | " died                                      |
| 10      | 23           | 2.78             | 1.7              | 39                  | " killed                                    |
| 11      | 37           | 2.50             | 1.85             | 26                  | " "                                         |
| 12      | 37           | 2.67             | 1.6              | 40                  | " "                                         |
| 13      | 31           | 3.05             | 2.1              | 31                  | " "                                         |
| 14      | 36           | 2.90             | 2.07             | 28                  | " "                                         |
| 15      | 77           | 4.02             | 2.91             | 25                  | " "                                         |

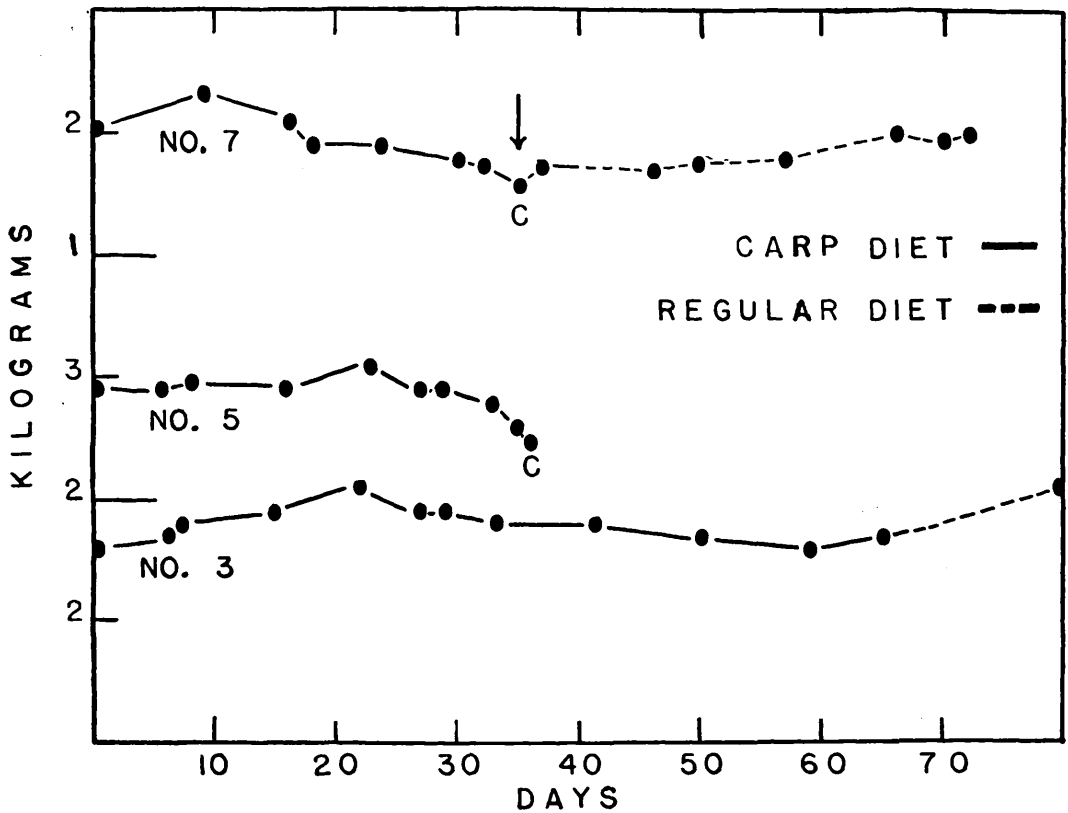


FIG. 1.  
Weight changes in cats fed a diet of raw carp. ↓—thiamine injection; C—convulsions.

flexion, loss of righting reactions, convulsions, prostration, and death. Unless given thiamine the cats invariably died within 2 to 3 days after developing locomotor difficulties. Two cats were unusually resistant to the diet and

remained alive 66 and 77 days, respectively, on raw carp. One of these was Cat 3. This animal was returned to the regular stock diet on the 66th day, having failed to develop any signs of thiamine deficiency. Cat 15, the

other one in this group, became convulsive on the 77th day of the carp diet and was killed. The behavior of these 2 animals suggests the possibility that in some cats the anti-thiamine factor is either partially destroyed by intestinal action or the animals for some time obtain thiamine from a source beyond the reach of the anti-thiamine factor, either by coprophagy or refection of the sort known to occur in the rat.<sup>4,5</sup>

Six cats fed an exclusive diet of salt water herring also developed thiamine deficiency in

<sup>4</sup> Guarrant, N. B., and Dutcher, R. H., *J. Biol. Chem.*, 1935, **110**, 233.

<sup>5</sup> Kelly, E., and Parsons, H. T., *J. Nutrition*, 1937, **13**, 453.

exactly the same manner as those on carp. However, the cats fed perch, cat-fish, butterfish, or spots either maintained their usual weights or else gained during the course of the experiment. The feeding was discontinued after there was no longer any reasonable expectancy that thiamine deficiency would develop. These findings support the conclusion of Deutsch and Hasler<sup>6</sup> that the anti-thiamine factor is not found in all fishes.

*Summary.* Cats fed an exclusive diet of raw carp or raw herring develop all the signs of thiamine deficiency characteristic for this species.

<sup>6</sup> Deutsch, H. F., and Hasler, A. D., *Proc. Soc. Exp. Biol. and Med.*, 1943, **53**, 63.

## 14566

### Influence of Pantothenic Acid Deficiency on Resistance of Mice to Experimental Poliomyelitis.\*

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The relation of the nutritional status of a host to resistance in infectious diseases has received more detailed attention in recent years, largely because advances in the science of nutrition have made possible the study of the effects of an uncomplicated deficiency. Because of the intimate relation of the vitamins of the B-complex to cellular metabolism we have been investigating the influence of different levels of these vitamins on the incidence of experimental poliomyelitis. We<sup>1</sup> have previously reported the effect of thiamine deficiency on the resistance of Swiss mice to both Lansing strain poliomyelitis virus and

Theiler's encephalomyelitis virus. In this paper similar studies are presented for pantothenic acid.

*Experimental.* Swiss mice (21-23 days old), bred in our laboratory, were used in all experiments and were kept in individual screen bottom cages supplied with a water bottle and an ointment jar containing the ration. Split litter technic, with consideration for sex and weight of mice, was employed. The synthetic pantothenic acid-low basal ration 503, employed in these studies, was composed of the following parts per 100: sucrose 73, vitamin-free casein 18, salt mixture 4,<sup>2</sup> and corn oil 5. The vitamin supplements per 100 grams of diet were: nicotinic acid 0.5 mg, riboflavin 0.3 mg, pyridoxine 0.3 mg, inositol 100 mg, para amino benzoic acid 100 mg, biotin (crude conc.) 0.01 mg, and choline 300 mg. This diet was supplemented with 0.05-0.1

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<sup>1</sup> Rasmussen, A. F., Jr., Waisman, H. A., Elvehjem, C. A., and Clark, P. F., *J. Infect. Dis.*, 1944, **74**, 41.

<sup>2</sup> Phillips, P. H., and Hart, E. B., *J. Biol. Chem.*, 1935, **109**, 657.