

nation of motor and sensory fibers may represent a central continuation of extramedullary mixed rootlets. Some support for this view is obtained from the description by Chase and Ranson of a mixed type of rootlet in the peripheral vagus of the dog.

In view of Ranson's<sup>3</sup> recent demonstration that the sensory rootlets of the first 3 cervical nerves contribute many fibers to the nucleus intermedius of the cat, and in view of DuBois'<sup>4</sup> description of degenerated fibers of the vagus terminating in the nucleus intercalatus of the opossum, these 2 nuclei were carefully studied. In both types of preparations (intracranial section and nodose ganglionectomy) the majority of the myelinated sensory fibers of the vagus nerve terminate in the nuclei of the solitary tract and the commissural nucleus. None were observed to enter either the nucleus intermedius or nucleus intercalatus. In this respect our findings in the cat are in accord with those of Van Gehuchten<sup>5</sup> in the rabbit and Allen<sup>6</sup> in the guinea pig.

## 6576

## Rôle of the Thyroid and of Iodine in Nutritional Anemia.

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The experiments here described were undertaken to ascertain whether different functional levels of the thyroid gland as induced by the administration of iodine play any part in the development or severity of the anemia produced by milk feeding.

Kunde, Green and Buno<sup>1</sup> have shown that hypothyroidism is accompanied by mild anemia and Drennan, Malcolm and Cox<sup>2</sup> produced thyroid hyperplasia in rats on a diet of white bread and fresh milk. This hyperplasia was easily corrected by the addition of a small amount of iodine. The iodine content of milk is low but

<sup>3</sup> Ranson, S. W., Davenport, H. K., and Doles, E. A., *J. Comp. Neur.*, 1932, **54**, 1.

<sup>4</sup> DuBois, F. S., *J. Comp. Neur.*, 1929, **47**, 189.

<sup>5</sup> Van Gehuchten, A., *Le Neuraxe.*, 1900, **1**, 173.

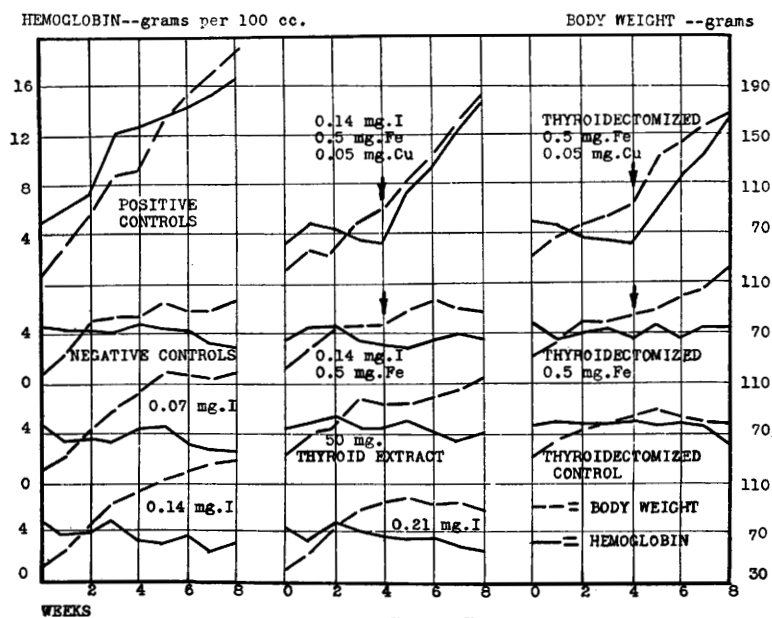
<sup>6</sup> Allen, W. F., *J. Comp. Neur.*, 1923, **35**, 171.

<sup>1</sup> Kunde, M. M., Green, M. F., and Buno, G., *Am. J. Physiol.*, 1932, **99**, 469.

<sup>2</sup> Drennan, A. M., Malcolm, J., and Cox, G. A., *Brit. J. Exp. Path.*, 1931, **12**, 430.

varies considerably in different samples,<sup>3</sup> thus suggesting that lack of iodine and consequent thyroid hypofunction may complicate the nutritional anemia in some instances.

Male rats, chosen from litters made anemic by the method of Elvehjem and Kemmerer,<sup>4</sup> were weaned and continued on whole milk powder (Klim) until 6 weeks of age. They were then placed in individual screen bottom cages and for the succeeding 8 weeks were fed the various supplements indicated in the accompanying chart. The group designated as positive controls represents rats



fed the stock diet (Bal-Ra). The negative controls received whole milk powder only, in which no iodine could be detected by the standard methods used.<sup>5</sup> Iodine was given in the form of KI, the unit dose of 0.07 mg. daily being that found by Drennan, Malcolm and Cox<sup>2</sup> to produce (in rats on a diet of white bread and fresh milk) small, colloid glands with a rich iodine content. The amount of thyroid extract fed contained about 0.15 mg. of iodine and represents the maximum amount tolerated without loss of weight. Two groups were given 0.14 mg. iodine daily for 4 weeks, at which time

<sup>3</sup> Krauss, W. E., and Moore, C. F., *J. Biol. Chem.*, 1930, **89**, 581.

<sup>4</sup> Elvehjem, C. A., and Kemmerer, A. R., *J. Biol. Chem.*, 1931, **93**, 189.

<sup>5</sup> Kendall, E. C., *J. Biol. Chem.*, 1914, **19**, 251. Leland, J. P., and Foster, G. L., *J. Biol. Chem.*, 1932, **95**, 165.

the diet of one group was further supplemented with 0.5 mg. iron (as  $\text{FeCl}_3$ ) and that of the other group with 0.5 mg. iron plus 0.05 mg. copper (as  $\text{CuSO}_4$ ). Fifteen of the rats were thyroidectomized at the age of 3 weeks and continued on the milk diet. At the end of 7 weeks, the diet of 5 animals was supplemented with iron, and that of 5 others with iron and copper, the remaining 5 serving as thyroidectomized controls. Water distilled from glass was used throughout and rigid precautions observed to prevent metallic contamination. Hemoglobin was determined weekly in tail blood with a Newcomer hemoglobinometer, calibrated by oxygen capacity determinations in the Van Slyke and Neill manometric apparatus.

The curves given in the chart are the average values of at least 4 animals in each group. They indicate that various functional levels of the thyroid as induced by the addition of iodine in organic or inorganic combination, and even the complete absence of the thyroid, in no way modify the development or severity of the anemia produced by milk feeding or the hematopoietic response to iron and copper. The results with iron and iodine alone and in combination with copper further substantiate the specific stimulating effect of copper demonstrated by Hart and his co-workers.<sup>6</sup>

Sections of the thyroid glands made at the conclusion of the experiments failed to show any significant abnormalities. Slight hyperplasia was present in several of the negative controls, which, however, in no case exceeded that commonly found in supposedly "normal" animals.

## 6577

### Relation Between Toxicity, Resistance, and Time of Survival.\*

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With collective phenomena it has been often observed that the curve describing the frequency of the occurrence of an event is asymmetrical and not symmetrical as should be expected if the occurrence of the event depended merely on chance. (Gauss's proba-

<sup>6</sup> Hart, E. B., Steenbock, H., Waddell, J., and Elvehjem, C. A., *J. Biol. Chem.*, 1928, **77**, 797.

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