on patients with Kala-azar respectively. By comparing the figures in these 2 series it will be seen that euglobulin in Kala-azar serum is increased 3 to 13 times and amounts to 30 to 63% of the total serum globulin; the pseudo-globulin I is nearly twice, in some cases more than twice, as much as in normal serum. There is a considerable increase of total serum globulin and an absolute decrease of serum albumin, so that the globulin:albumin ratio, which is normally about 0.49, is greatly raised, being in some cases over 4. Findings somewhat similar to these were made by Lloyd and Paul[6] who found, in 8 cases of Kala-azar, euglobulin to be 1.5 to 2.5 gm. per 100 cc. of serum, but apparently without change in pseudo-globulin. In view of these results such a precipitation in the globulin test may be considered as due to increase of euglobulin, or some special euglobulin, in the Kala-azar serum.

4705

Cytological Changes in Thyroid Apparatus and Spinal Ganglia of Rats Treated With Thallium.

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Buschke[1] and others believe that thallium acetate acts chiefly on the thyroid gland and the nervous system. Balbi,[2] however, is of the opinion that it does not have such action. Since the Golgi apparatus and the mitochondria are the most vital cellular elements known so far, it is suggested that a study of the action of thallium acetate on these elements in the 2 tissues in question should yield more definite information than ordinary histological examination of the tissue as a whole. The following observations have been made:

Eighteen albino rats of about the same age (3.25 to 3.5 months) and sex (male) were injected with a single injection of 8 mg. of thallium acetate per kilo of body weight and killed at weekly in-

[6] Lloyd, R. B., and Paul, S. N., *Indian J. Med. Res.*, 1928, xvi, 529.

[1] Buschke, A., Langer, E., and Peiser, B., *Dermat. Wchnschr.*, 1926, lxxxiii, 971.

[2] Balbi, E., *Gior. ital. di dermat. e. sifil.*, 1928, lxix, 28. (Abstract, *Brit. J. Dermat. and Syph.*, 1929, xli, 78.)

tervals thereafter for the study of the Golgi apparatus, mitochondria and other cellular elements in various organs and tissues. For each experiment, 3 animals were employed.

Normally, the spinal ganglion cells contain a network-like Golgi apparatus and long and short, rod-like mitochondria interspersed with Nissl bodies concentrically around the nuclei. In the thyroid cells the network-like Golgi apparatus lies on the luminal side of the nucleus and the mitochondria run parallel along the long axis of the cells in the basal portions. The colloid substance in the thyroid vesicles exhibits a basophilic staining reaction.

The cellular changes after the administration of thallium acetate are summarized as follows: *One week* after the injection the Golgi apparatus in some of the thyroid cells is changed from network into droplets, the mitochondria from filaments into segmented granules, and the staining property of the colloid substance from basophilic to an acidophilic reaction. *Two weeks* after the injection the droplets and granules of the Golgi apparatus and mitochondria became much finer in all the cells and were found dispersed in the distal portions of the cells. The colloid substance in the thyroid vesicles was more acidophilic in staining reaction. *Three weeks* after the injection the changes in both the Golgi apparatus and the mitochondria were still more marked and these elements were also reduced in number. The thyroid cells became definitely flattened with very poorly stained nuclei. Many vacuoles were found in the acidophilic colloid substance. *Four weeks* after the injection both the Golgi apparatus and the mitochondria tended to exhibit a normal appearance, inasmuch as these elements could be clearly stained in the form of short rods and granules. The colloid secretion, however, still remained acidophilic. *Six weeks* after the injection complete recovery of all the cellular structures was observed.

The changes in the Golgi apparatus and the mitochondria occurring in the spinal ganglion cells were more or less similar to those observed in the thyroid cells. Marked chromatolysis was noticed 3 weeks after the injection and complete disappearance of the Nissl substance in many of the cells 4 weeks after the injection. Recovery of all the cellular structures commenced to appear 6 weeks after the injection.

Summary. From the above observations, it is clearly indicated that the administration of 8 mg. of thallium acetate per kilo of body weight to albino rats produced definite changes in the Golgi apparatus and mitochondria of the thyroid and spinal ganglion cells and in the Nissl substance of the spinal ganglion cells, and altered the stain-

ing property of the colloid secretion of the thyroid vesicles from basophilic to acidophilic reaction over a period of 5 weeks after the injection. These findings, however, gradually began to disappear and complete recovery took place 6 weeks after the injection.

4706

Effect of Thallium Acetate on the Basal Metabolism of Rats.

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Leigheb[1] and others have observed that the administration of thallium acetate to rats and guinea-pigs produces extensive degenerative changes in the thyroid gland. In view of these observations, the following experiments were undertaken to study the basal metabolism of animals treated with the drug.

Four white rats of the same breed and of approximately the same age were injected subcutaneously with thallium acetate in aqueous solution. Three of the animals received 12 mg. of the thallium salt per kilo of body weight and one, 8 mg. per kilo. Before the administration of the thallium acetate, 4 observations were made on the basal metabolism of each animal at intervals of 3 or 4 days. After the administration of the drug, the basal metabolism was studied at similar intervals, until the basal metabolic rate returned to normal. The technic used for determining the basal metabolism was that described by Wu and Chen.[2] For each experiment there were from 6 to 8 determinations. The average of only those determinations (usually 3) taken at the time the animal was quiet was used as the final result of the experiment.

All of the rats showed diminution of their basal metabolic rates, in parallel with which, defluvium of hair on the back and less briskness of the animals were noticed. In the 3 rats injected with 12 mg. of thallium acetate per kilo of body weight, the basal rates began to diminish from the 8th to the 15th day after the administration of the thallium salt. One of the animals died at the end of the experiment on the 21st day after the injection of the drug, at

[1] Leigheb, V., *Gior. ital. di dermat. e. sifil.*, 1928, lxix, 960. (Abstract, *Brit. J. Dermat. and Syph.*, 1929, xlvi, 129, and *Arch. Dermat. and Syph.*, 1929, xix, 295.)

[2] Wu, H., and Chen, T. T., *Chin. J. Physiol.*, 1929, iii, 307.