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The thyroid and specific dynamic action. Preliminary report.

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The preponderance of experimental data on specific dynamic action of food in thyroid diseases, reported during the last decade by six investigators from as many laboratories, indicates that there is no change from the normal (DuBois,[1] Aub and Means,[2] Undeutsch,[3] Rolly,[4] Plaut,[5] and Liebesny.[6]) Weiss and Adler,[7] however, found an increased specific dynamic action in one case of Graves' disease, while in one case of myxedema it was also increased.

One never finds surviving cases of myxedema in infants or adults without active thyroid tissue. In Graves' disease thyroid activity while usually greater than normal, may be normal or subnormal. Since clinical conditions obtaining in thyroid diseases are so complex and variable, it seemed worth while to study the relation of thyroid to specific dynamic action of food under conditions more simplified and limited.

If the thyroid, and hence probably its secretion, were necessary for specific dynamic action to manifest itself then no specific dynamic action should result in completely thyroidectomized animals. If the thyroid gland is not a factor in this phenomenon, then there should not be much difference in the specific dynamic action before and after thyroidectomy.

Rabbits were chosen for the experimental animal because their thyroids can be completely removed without interfering with the inferior parathyroid glands. The greatest disadvantage of using an herbivorous animal for metabolism experiments in

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[1] DuBois, E. F., *Arch. Int. Med.*, 1916, xvii, 915.

[2] Aub, J. C., and Means, J. H., *Arch. Int. Med.*, 1921, xxviii, 173.

[3] Undeutsch, quoted by Weiss and Adler, *Inaug. Dissertation*, Leipzig, 1913.

[4] Rolly, *Deut. med. Woch.*, 1921, xlviii[2], 887 and 917.

[5] Plaut, R., *Deut. Arch. klin. Med.*, 1922, cxxxix, 285.

[6] Liebesny, P., *Bioch. Z.*, 1924, cxliv, 308.

[7] Weiss, R., and Adler, E., *Klin. Woch.*, 1922, I, 1592.

which a basal level is at times desired, lies in the fact that it is difficult to empty completely their alimentary canals, even after a four day fast, and yet have the animal otherwise in a physiological condition. By starving rabbits 36 to 48 hours their R Q's were usually below 74 which we regarded as satisfactory for our purpose. Under these conditions, the specific dynamic action of 25 gm. of glucose was found to average about 5 calories in six normal animals in the four hours following the administration of the sugar. The extreme variations were 2.4 and 7.4 calories although in the same animal closely agreeing results were obtained on different days, as a rule.

The specific dynamic action of glucose was studied in six thyroidectomized animals, and in some of these it was determined before as well as after the thyroids were removed. In three of these animals the specific dynamic action gradually fell to zero. In the other three, after a drop in the extra heat produced, the specific dynamic action increased slightly. In each of these latter animals regenerated thyroid tissue was found at autopsy, while in the three animals which showed no specific dynamic action, no thyroid tissue could be found at autopsy.

The experiments, though limited in number, clearly indicate that the thyroid is an important factor in the development of the extra heat following ingestion of food. In the absence of thyroid secretion, there is no specific dynamic action, while in the presence of a small fragment of physiologically active thyroid tissue—less than 1/20 of the total amount of thyroid tissue of a normal animal—some specific dynamic action occurs.

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