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A thyroid-adrenal interrelationship.

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Evidence has accumulated during the last few years that the cortical portion of the suprarenal complex of mammals is essential for life. This has been clearly demonstrated by the work of Houssay and Lewis,[1] Wislocki and Crowe,[2] and the present writer.[3] In a series of experiments performed upon forty cats, the writer was able to show clearly the great importance of cortical tissue for the maintenance of life. The following points were brought out: (1) Cats, from which the adrenals have been removed (in two stages 7 days apart), die within three days. (2) Unilaterally operated animals remain perfectly normal. (3) Total extirpation of one adrenal, and removal of the medullary portion of the other (after 7 days), leaving only the cortex, does not induce symptoms, the animals remain normal. (4) Removal of the remaining cortical tissue after an interval of 21 days to three months, causes death within three days. (5) Histological examination of the removed cortex showed no medullary tissue to be present in the majority of cases. (6) Transplantation of pieces of the cortex into animals with both adrenals removed, prolonged the life of the animals. During the course of the experiments mentioned, an interesting functional interrelationship between the suprarenal cortex and the thyroid gland was established. It was observed that thyroidectomized cats survived removal of the suprarenal glands much longer than animals with intact thyroid apparatus. In experiments on twenty animals this point was thoroughly investigated.

The thyroid glands and the left adrenal were removed at one operation, ten days later the right adrenal was extirpated. Following thyroid removal the parathyroids were dissected free from their investing membranes in a medium of sterile Ringer's

[1] Houssay, B. H., and Lewis, J. T., *Am. J. Physiol.*, 1923, lxiv.

[2] Wislocki, G. B., and Crowe, S. J., Johns Hopkins Hosp. Bull., 1924, xxxv.

[3] Zwemer, R. L., *Anat. Record*, 1924, xxix.

solution and blood serum[4] and transplanted into the neck muscles, to prevent tetany.

The life of animals from which the thyroids and adrenals had been removed was considerably prolonged over that of similarly operated cats in which the thyroids were left undisturbed. The average survival period of cats with the adrenals removed (in two stages 7 days apart) is three days, whereas the average survival of thyro-adrenalectomized cats is three times as long, or about nine days. One of these animals survived 22 days.

In order to determine the effects of feeding thyroid to normal animals, four adult cats were each fed four grains of dessicated thyroid (Parke, Davis & Co.) per day. Two animals received the thyroid for two weeks, two for one week. All showed an increased appetite and a decrease in weight, but no unfavorable symptoms of any kind were observed. The next step was to test the effect of feeding thyroid to adrenalectomized animals. The thyroid glands and left adrenal were removed, and, during the ten day interval between the removal of the left and right adrenals, the animals received four grains of dessicated thyroid per day. At the end of ten days the remaining adrenal was removed. Death resulted within 12 to 23 hours. This short survival period cannot be attributed to faulty technique, because in all cases the cats recovered from the anesthetic and behaved normally for some hours after the operation. Autopsies showed the wound areas to be clean, and the gross appearance of the viscera to be normal.

One animal developed typical symptoms of adrenal insufficiency and died 9 days after the first operation, although still retaining one adrenal gland. This case was complicated, however, by the occurrence of transient tetany on the third and fourth day after thyroid removal.

These experiments demonstrate a functional interrelation between the thyroid and adrenal glands, in that the life of animals deprived of their adrenals, can be greatly prolonged or shortened by absence or excess of the thyroid hormone.

[4] Swingle, W. W., and Nicholas, J. S., *Am. J. Anat.*, 1925, xxxvi.