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Inhibiting Effect of Thyroidectomy on Adrenal Cortex Hypertrophy Following Injections of Anterior Pituitary Extract.

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The rôle of the thyroid gland in the hypertrophy of the adrenal cortex following administration of anterior pituitary substance has been a subject of considerable investigation with reports that are conflicting. Some experimenters[1, 2, 3] have concluded that this hypertrophy of the adrenal cortex is mediated largely or entirely through the thyroid gland. Others[4, 5, 6, 7, 8] have found that the presence of the thyroid gland is not necessary for this reaction. In view of these conflicting reports we carried out similar experiments on the guinea pig.

Twenty-three young guinea pigs of both sexes were used in 2 series of experiments. In the first there were 12 animals (6 males and 6 females) ranging in age at the beginning of injections from 28 to 34 days, and in weight from 213 to 364 g. Four were thyroidectomized, 3 gonadectomized, 3 thyroidectomized and gonadectomized, and 2 unoperated. Gonadectomy was performed 11 days before, and thyroidectomy 7 days after, beginning injections. All animals received daily intraperitoneal injections of anterior pituitary extract for 48 days, and were sacrificed 2 to 5 days after the last injection. In the second experiment there were 11 guinea pigs (6 males and 5 females) ranging in age at the beginning of injections from 32 to 38 days, and in weight from 251 to 380 g. Littermate pairs of the same sex were chosen, one of each pair being thyroidectomized 8 days before beginning treatment. All animals received daily intraperitoneal injections of anterior pituitary extract, and were sacrificed in pairs after 7, 8, 9, 19 and 20 days. The extract used was a 0.5% acetic acid extract of dried beef anterior pituitary prepared, with slight modifications, according to the

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TABLE I.

G.P. No.	Sex	Total dosage ant. pit. extr. dried gland equivalent, g	Duration of exp., days	Body wt at end, g	Gain or loss in body wt, g	Adrenal wt, g	Thyroid wt, g	Gonads wt, g	Prostate and seminal vesicles or uterus wt, g
478	F	3.9	7	314	+ 20	.132		.073	1.026
479	F	3.9	7	245	— 6	.158	.102	.064	.785
484	M	4.5	8	320	+ 24	.117	Frag. 3.5 × 1.5 × 1 mm	.734	1.413
485	M	4.5	8	278	— 13	.113	.137	.585	.942
480	M	5.5	9	314	+ 34	.161	2 Frag. 1.5 mm	1.2	2.0
481	M	5.5	9	312	— 21	.143	.099	2.0	1.6
474	F	8.4	19	341	+ 9	.183	Frag. 1 mm	.083	.764
475	F	8.4	19	348	+ 2	.235	.208	.089	.408
482	M	8.6	20	363	+ 43	.174		2.1	4.2
483	M	8.6	20	352	+ 5	.201	.220	1.018	4.1
477	F	8.6	20	388	— 19	.238	.270	.080	.429
469	F	20.9	50	373	+ 84	.174	Frag. 1 mm	.075	.742
468	F	20.9	53	407	+ 88	.265	Frag. 5 × 3 × 1.5 mm	.080	1.520
467	F	20.9	52	376	— 43	.253	.071	.047	.369
464	M	20.9	51	404	+143	.165		2.703	3.5
465	M	20.9	52	442	+141	.175	Frag. microscopic	1.406	6.4
466	M	20.9	50	468	— 22	.302	.136	2.0	3.9
459	M	3.5	7	232	— 27	.117	.140		.565
458	M	20.9	50	420	+100	.223	.148		.443
460	M	20.9	51	331	+114	.163			.325
463	F	20.9	52	371	+103	.250	.089		.223
462	F	20.9	50	265	+ 52	.184			.392
461	F	20.9	53	401	+152	.191			.268

The first 10 guinea pigs are grouped as littermate pairs of the same sex, one of each pair being thyroidectomized. The last 12 pigs are grouped according to sex and operative procedure.

method of Loeb, and concentrated so that one cc was equivalent to 0.1 to 0.5 g of dried gland. The daily dose was 1 or 2 cc.

The principal data of the experiments are given in Table I.

The adrenal glands of completely thyroidectomized guinea pigs and of those in which only minute fragments of thyroid were found were considerably and consistently smaller than the adrenals of the controls. This was true of both sexes. The greatest differences in adrenal weights of thyroidectomized and control animals were observed in the pigs injected for the longest time. In 3 instances where large thyroid fragments were found in thyroidectomized guinea pigs the weights of their adrenals were similar to those of the controls. The same observation was made by Emery and Winter.[2]

Gonadectomy had little or no effect on the hypertrophy of the adrenals caused by injection of anterior pituitary extract. This confirms reports in the literature.[2, 4, 9] Thyroidectomy and gonadectomy had essentially the same effect as thyroidectomy alone.

Thyroidectomy, or subtotal thyroidectomy, tended to increase the weight response of the gonads and accessory reproductive organs to injections of anterior pituitary extract. This increased response was consistent and marked in the case of the uterus, but was not so consistent in the case of the prostate and seminal vesicles, or the gonads. The exceptions could not be correlated with other findings. Also, larger accessory reproductive organs in the thyroidectomized animals were not always associated with larger gonads. Most evidence in the literature indicates that thyroidectomy increases the response of the gonads and accessory reproductive organs to anterior pituitary stimulation.[10, 11, 12]

The thyroid gland clearly plays an important part in the hypertrophy of the adrenal cortex induced by anterior pituitary extract. The frequently observed hypertrophy of the adrenal cortex following the administration to animals of desiccated thyroid or thyroxine emphasizes this relationship of thyroid to adrenals.[13] Other experimental evidence indicates the reciprocal nature of the thyroid-adrenal relationship. A rise in respiratory metabolism following sublethal injury of the adrenals was reported by Marine and Baumann[14] in rabbits, and was confirmed by Davis and Hastings[15] in

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10 Schockaert, J. A., *Comp. Rend. Soc. Biol.*, 1931, **108**, 431.

11 Leonard, S. L., Proc. Soc. Exp. Biol. and Med., 1936, **34**, 599.

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15 Davis, J. E., and Hastings, A. B., *Am. J. Physiol.*, 1933, **105**, 110.

mice. Previous thyroidectomy, when complete, prevented this rise in metabolism in rabbits.[16] On the other hand, feeding a glycerol emulsion of fresh beef adrenal cortex to rabbits lowered the respiratory metabolism.[17] Oehme[18] obtained a similar lowering of metabolism with an adrenal cortex extract in thyroxine treated guinea pigs. Also significant are the observations that feeding a residue of whole beef adrenal to dogs caused a marked increase in iodine content of the thyroid gland,[19] and that administering corticotropic hormone to dogs definitely lowered the blood iodine and caused involution of the thyroid gland to the colloid state.[20]

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Electrical Anesthesia in Rats.

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Electrical anesthesia in mammals, produced by means of an interrupted direct current, is reported by Leduc,[1] Robinovitch,[2] von Neergard,[3] and Ivy and Barry,[4] and denied by Sack and Koch.[5] Von Haareveld and Kok[6] obtained narcosis in the dog with a sinusoidal current and Scheminzky and others[7] in the frog with a constant one. Conflicting results may have prevented the use of electro-narcosis in the clinic, yet it seems to offer much promise. This is a preliminary report of the successful production of anesthesia in rats by a constant direct current.

Large dry cells (145 volts), a graphite rheostat, a milliammeter, and a reversing switch are connected in series with a rat through

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5 Sack, G., and Koch, H., *Z. f. d. g. Exp. Med.*, 1933, **90**, 349.

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