

Hyperthyroid Splanchnomegaly After Hypophysectomy.

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Experimental hyperthyroidism causes a considerable splanchnomegaly,¹ the enlargement including heart, liver, spleen, kidneys, and adrenals. The same can be produced by the injection of anterior pituitary extracts.² Moreover, the converse condition, splanchnomicria, occurs after either thyroidectomy or hypophysectomy.³ It is therefore evident that both these glands influence the size of the splanchnic viscera. The same generality holds for somatic growth: in the absence of either of these glands it is deficient and experimental gigantism can be produced with pituitary extracts. Somatic growth appears to be controlled primarily by the hypophysis, however; the lack of growth in the cretin is usually ascribed to defective hypophyseal growth-promoting hormone secretion which follows the thyroidectomy.^{4, 5} Good evidence in favor of this hypothesis is that administered thyroid will not produce somatic growth in the hypophysectomized rat.⁵

In order to determine whether splanchnic visceral growth is controlled by the same sort of mechanisms as somatic growth, hypophysectomized rats were given thyroxin for a period of a month after operation. Normal controls were also injected. The size of the viscera of untreated rats served as standards, the normal size for a given weight being determined in a large series of rats and expressed as 100%. Similar standards were set up for hypophysectomized rats. In Table I the effect of various doses of thyroxin, administered for a month, on the size of some of the splanchnic viscera is shown.

¹ Hoskins, E. R., *J. Exp. Zool.*, 1916, **21**, 295; Herring, P. T., *Quart. J. Exp. Physiol.*, 1917, **11**, 230; Cameron, A. T., and Carmichael, J., *J. Biol. Chem.*, 1920, **45**, 69.

² Putnam, G. J., Benedict, E. B., and Teel, E. M., *Arch. Surg.*, 1929, **18**, 1708; Murphy, R., Lowther, S., and Pagniello, L., 1938, **124**, 110.

³ Smith, P. E., *Anat. Rec.*, 1930, **45**, 205; White, W. E., *Proc. Roy. Soc.*, B, 1933, **114**, 64; Perla, D., *J. Exp. Med.*, 1936, **63**, 599.

⁴ Flower, C. F., and Evans, H. M., *Anat. Rec.*, 1925, **29**, 383; Zeckwer, I. T., Davison, L. W., Keller, T. B., and Livingood, C. S., *Am. J. Med. Sci.*, 1935, **190**, 145; but see Smith, P. E., *Proc. Soc. Exp. Biol. and Med.*, 1933, **30**, 1252; Salmon, T. N., *Endocrin.*, 1938, **23**, 446.

⁵ Smith, P. E., Greenwood, C. F., and Foster, G. L., *Am. J. Path.*, 1927, **3**, 669.

TABLE I.
Effect of Hypophysectomy on Hyperthyroid Splanchnomegaly.

Group No.	Preparation	No. of rats	Dose of Thyroxin, mg/kg given thrice weekly	Individual avg wt, expressed as % of normal				
				Liver	Kidneys	Spleen	Heart	Adrenals
1	Normal	55	0	100	100	100	100	100
2	"	7	0.5	96	114	216	105	237
3	"	8	1.0	135	137	365	118	317
% change in weight of group 3 over normal (group 1)				+35	+37	+265	+18	+217
4	Hypophysectomized	22	0	72	77	93	87	55
5	"	7	0.17	100	122	240	108	41
6	"	4	0.5	122	148	256	131	43
7	"	6	0.75	100	125	217	110	55
8	"	3	1.0	105	118	219	121	50
Avg of groups 5, 6, 7, 8				107	128	233	118	47
% change in wt of above average over hypophysectomized (group 4)				+49	+65	+150	+36	-15

The size of the viscera of untreated hypophysectomized rats underwent considerable reduction (Group 4). But treatment of hypophysectomized rats with thyroxin caused a splanchnomegaly in all organs except the adrenals. If the organ weights are averaged and then compared with those of untreated hypophysectomized rats (last line of Table I), the degree of splanchnomegaly is found to be as great or even greater than that in unoperated hyperthyroid rats. Evidently the thyroid-pituitary mechanisms controlling visceral growth are not the same as those controlling somatic growth. In the latter, the thyroid partially controls the pituitary which then stimulates somatic growth; this same mechanism is here demonstrated to apply for the adrenals. But in the case of the other splanchnic viscera, growth can occur with the pituitary absent; hyperthyroidism causes growth directly, and hyperpituitarism indirectly by its thyrotropic hormone.

The splanchnomegalogenic doses of thyroxin for the hypophysectomized rat were found to be smaller than those for the normal rat, in confirmation of the observation⁵ that hypophysectomized rats are more sensitive to thyroxin than normals. Indeed, 3 mg of thyroxin per kilo weekly were found lethal to almost all hypophysectomized rats.

Summary. The hypertrophy of the liver, kidneys, heart, and spleen caused by hyperthyroidism occurs in the absence of the pituitary; that of the adrenals does not.