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Relation of Anterior Pituitary to the Volume of Islet Tissue in the Male Rat.*

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The importance of the pituitary gland in carbohydrate metabolism has been generally recognized since the publication of the work of Houssay and his associates.[1] They reported that the removal of the hypophysis in toads and dogs considerably ameliorated the hyperglycemia which followed pancreatectomy, and their results have been amply confirmed by Barnes and Regan,[2] by Lucke,[3] and by others. The antagonistic action of the hormone from both the anterior pituitary and the islets of Langerhans on blood sugar levels is well known. The former tends to increase while the latter decreases blood sugar levels. The determination of morphological relationships, if any, existing between these 2 endocrine glands was thought to be of interest.

In this preliminary study, a comparison was made of the ratio of the total volume of islet tissue in the pancreas to the body weight. The findings from 23 male rats are reported here. These were divided into 3 groups. (1) 8 normal controls, (2) 8 hypophysectomized and (3) 7 hypophysectomized pituitary-injected animals. In the last group, injections were begun on the day of operation and were administered 4 times weekly in doses of 0.5 to 1.0 cc. The material used for injection was prepared by the method of Evans and Cornish and a few animals were treated with Phyone obtained from the Wilson Laboratories. All animals of groups 2 and 3 were hypophysectomized from 30 to 60 days before they were sacrificed. Identical conditions for all 3 groups were maintained during the course of the experiment, with a surplus of a standard diet always available. At the end of the experiment, the animals were killed, the entire pancreas removed, fixed in Bouin's solution and serially sectioned at 25 micra. Camera lucida tracings were made of all island tissue in every 10th section, the areas determined

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1 Houssay, B. A., and Biasotti, A., *Endocrinology*, 1931, **15**, 511; Houssay, B. A., Biasotti, A., and Rietti, C. T., *Compt. rend. Soc. de biol.*, 1932, **111**, 479.

2 Barnes, B. O., and Regan, J. F., *Endocrinology*, 1933, **17**, 522.

3 Lucke, H., Heydemann, E. R., and Hechler, R., *Verhandl. d. deutsch. Gesellch., F. inn. Med.*, 1933, **45**, 164.

TABLE I.
Table Showing Ratio of Volume of Island Tissue to Body Weight in Normal, Hypophysectomized and Hypophysectomized Pituitary Injected Male Rats.

	Animal No.	Body Wt. gm.	Vol. of Islands cmm.	Ratio Vol. Islands / Body Wt.	Aver. Ratio
Group I	505	208	5.57	.027	
Normal Controls	507	140	5.31	.038	
	508	174	10.28	.059	
	510	156	7.11	.045	.038
	511	223	7.95	.036	
	513	224	8.91	.040	
	514	219	7.45	.034	
	515	197	6.44	.033	
Group II	501	184	11.09	.060	
Hypophysectomized	502	152	9.63	.063	
	503	125	8.59	.069	
	504	220	11.65	.053	.062
	506	171	9.86	.058	
	509	192	11.82	.061	
	512	141	7.72	.055	
	516	154	11.60	.075	
Group III	517	188	9.51	.051	
Hypophysectomized	518	183	9.35	.051	
Pituitary Injected	519	191	8.31	.043	
	536	201	9.86	.049	.051
	537	159	8.28	.052	
	539	211	10.03	.047	
	540	188	12.04	.064	

with a planimeter and the volumes calculated. Table I indicates the ratio of the volume of island tissue to the body weight in these three groups of animals.

From the data given, it can be seen that the ratio of the volume of island tissue to the body weight in the hypophysectomized animals has increased approximately 63% over that of the normal controls. In the group of hypophysectomized animals receiving 4 injections weekly of a crude alkaline extract of the pituitary beginning on the day of operation (group 3), the ratio is only approximately 34% greater than that of the normal controls. In this last group, it is apparent that administration of anterior pituitary substance inhibited, to a limited degree, the hypertrophy of island tissue that occurred on pituitary removal. These results are not in accord with the conclusions of Koster[4] who found that, although the pancreas of hypophysectomized dogs is usually atrophic, no specific changes occurred in the islands of Langerhans that would indicate a regulating influence of the hypophysis on the hormonal activity of the pancreas.

[4] Koster, S., *Arch. f. d. ges. Physiol.*, 1930, **224**, 212.