In so far as thyroid metabolism is concerned, cortisone reduces the weight of the gland and inhibits its protein synthesis[24]; on the other hand, it is well known that ACTH, as well as cortisone, has a goitregenic action[25] with lower iodine uptake by thyroid gland.

Thus, the increase in TCT thyroid content may be considered a result of (a) calcium negative balance due to hypercorticism, and/or (b) the inhibiting action of cortisone or ACTH on thyroid metabolism. In fact, a decrease in thyroid function is probably generally followed by an increased TCT content[7]. On the other hand, thyroxine is directly involved in calcium metabolism[26-29], increases bone catabolism in intact rats without modifying calcemia[30] and enhances the hypocalcemic effect of exogenous TCT[31-34]. It is likely that in our experimental conditions thyroid metabolism had been inhibited by hormonal treatment resulting in a decreased thyroxine production and increased TCT content of the gland. If this assumption is correct, a reduction in bone catabolism and subsequent reduction in TCT demand should be expected.

It should be emphasized that experimentally induced hypercorticism is likely to affect, at one time, calcium, thyroid and bone metabolism thus producing the very sharp and significant increase in TCT content of the thyroid which we were able to demonstrate. In our opinion, the accumulation of TCT is probably ascribable to a sharp decrease in its output, since its synthesis was presumably inhibited[24] by corticoids. From a practical viewpoint, our results suggest that, during cortisone therapy, the administration of TCT might delay the onset of osteoporosis.

Riassunto. Il trattamento con ATCH o cortisone causa un aumento del contenuto in tirocalcitonina delle tiroidi di ratto. Vengono discusse le possibili implicazioni dei risultati ottenuti.

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[24] N. B. YATVIN, R. W. VANNEMACHER and N. V. BROWN, Endocrinology *79*, 1079 (1966).
[25] M. SONENBERG, Vitam. Horm. *16*, 205 (1958).
[26] H. L. MONEY, Brokhaven Symposium Biology *7*, 137 (1955).
[27] P. ADAMS and J. JOWSEY, Endocrinology *81*, 735 (1967).
[28] R. F. GITTES and G. L. IRVING, Endocrinology *79*, 1033 (1966).
[29] A. D. CARE, Fedn Proc. *27*, 153 (1968).
[30] G. MILHAUD, L. T. MING and M. S. MOUKHTAR, C. r. Acad. Sci. *264*, 846 (1967).
[31] H. MILHAUD, A. M. PERAULT and M. S. MOUKHTAR, C. r. Acad. Sci. *261*, 813 (1965).
[32] C. C. JOHNSTON and W. P. DEISS, Endocrinology *78*, 1139 (1966).
[33] A. W. WASE, A. PETERSON, E. RICKES and J. SOLEWSKI, Endocrinology *79*, 687 (1966).
[34] G. MILHAUD and M. S. MOUKHTAR, Proc. Soc. exp. Biol. Med. *123*, 207 (1966).

Oxygen Consumption of Genetically Obese Rats[1]

Oxygen consumption is significantly reduced in 2 strains of gentically obese mice when compared to their lean littermates (obese[1] and A^{y}[2]). This finding in genetically obese mice led us to investigate the uptake of oxygen in genetically obese rats[3]. Obesity in these rats is inherited as a Mendelian recessive trait and the affected members of each litter can be detected within the first few weeks of life. We found that the oxygen consumption of these genetically obese rats was reduced when compared to littermates which became fat following hypothalamic lesions.

Materials and methods. Animals: Obese female rats of the Zucker Strain and their lean female littermates[2] were housed in a room with controlled light and temperature and given Purina Laboratory Chow and tap water. In the first experiment oxygen consumption was determined on 12 rats from 6 litters, there being one lean and one obese rat from each litter. At the end of this experiment bilateral lesions were placed in the ventromedial nuclei of each of the 6 lean littermates[4]. These lesions were made using the coordinates of DEGROOT[5] and applying a 2 mAmp current through the tip of an insulated platinum needle for 15–30 sec. All 6 rats became hyperphagic but only 3 became as obese as their genetically obese littermates. The second experiment utilized these 3 rats and their genetic obese littermates for the measurement of oxygen consumption. Experimental procedures were conducted on rats at 2 and 8 months of age.

Oxygen consumption of obese and thin rats

Experiment No.	Animals	No. of rats	Age (month)	Body weight (g)		Oxygen consumption ml O_2/g per h		ml O_2/$g^{0.7}$ per h	
1	Obese-genetic	6	2	314 ± 5[a]	< 0.01	1.11 ± 0.025[a]	< 0.05	6.22 ± 0.45[a]	n.s.
	Lean	6	2	207 ± 6		1.48 ± 0.029		7.35 ± 0.47	
2	Obese-genetic	3	8	550 ± 22	n.s.	1.03 ± 0.042	< 0.05	7.15 ± 0.29	< 0.05
	Obese-lesioned	3	8	517 ± 27		1.22 ± 0.038		7.95 ± 0.25	

[a] Mean ± S.E.M.

[1] J. MAYER, R. E. RUSSELL, M. W. BATES and M. M. DICKIE, Endocrinology *56*, 318 (1952).
[2] A. BARTKE and A. GORECKI, Am. J. Physiol. *214*, 1250 (1968).
[3] L. M. ZUCKER and T. F. ZUCKER, J. Heredity *52*, 275 (1961).
[4] G. A. BRAY, J. Lipid Res. *9*, 681 (1968).
[5] J. DEGROOT, *The Rat Brain in Stereotoxic Coordinates* (N.V. Noord-Hollandsche Uitgevers Maatschappij, Amsterdam 1963).

Oxygen consumption was determined on individual rats on several occasions following an overnight fast. A closed circuit technique similar to that described by MACLAGEN and SHEAHAN[6,7] was used and the data are expressed in terms of body weight and of surface area (body weight)$^{0.7}$.

Results. Oxygen consumption was measured in 2 experiments (Table). In the first, the genetically obese rats weighed significantly more than their lean littermates but the lean littermates consumed significantly more oxygen per g of body weight. When these uptakes of oxygen were corrected for surface area (body weight)$^{0.7}$ the difference was not statistically significant ($t = 1.8$). In the second experiment the oxygen consumption of 3 genetically obese rats was compared with that of the 3 littermates which became fat following hypothalamic lesions. In this experiment the body weight of the genetically obese rats was not significantly different than their obese lesioned littermates. However, oxygen consumption per g of body weight, or per unit surface area, was significantly higher in the lesioned obese rats.

Comment. The genetic obese rats and their lean littermates consumed nearly identical quantities of oxygen per unit of surface area. However, when the lean littermates became obese following hypothalamic lesions, they consumed significantly more oxygen than their genetically obese siblings. In this respect the Zucker rats are similar to the obese yellow (A^y) and the obese hyperglycemic mice (obob) in which hypometabolism has been noted[1,2] but they differ from the New Zealand obese mice[8] which consume normal or increased quantities of oxygen when compared to lean littermates[9,10].

Zusammenfassung. Der Sauerstoffverbrauch genetisch fettleibiger Ratten ist auffallend niedriger als derjenige von Normalratten (littermates), die nach Hypothalamusverletzung fettleibig wurden.

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[6] N. F. MACLAGEN and M. M. SHEAHAN, J. Endocrin. *6*, 456 (1950).
[7] G. A. BRAY, J. clin. Invest. *43*, 285 (1964).
[8] K. SUBRAHAMANYAM, Biochem. J. *76*, 548 (1960).
[9] Supported in part by Grant No. AM 09897 from the National Institutes of Health.
[10] Rats were provided through the kindness of Dr. LOIS ZUCKER, Harriet Bird Memorial Laboratory, Stow (Massachusetts, USA).
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Hemodynamic Changes in Rats Without Adrenal Medula Submitted to Hypovolemic Shock[1]

As reported previously, rats without adrenal medulla had a longer survival time than normal controls, when submitted to irreversible hypovolemic shock[2]. Furthermore, continuous i.v. injection of epinephrine decreased survival time while norepinephrine continuous injection increased survival time in rats with irreversible hypovolemic shock[2]. It is well known that the autonomic nervous system plays a role in the regulation of circulatory function and that the medullary portion of the adrenal gland secretes mainly epinephrine, while the sympathetic nerve endings liberate mainly norepinephrine[3,4]. In consequence it seemed interesting to study the hemodynamic changes induced by irreversible hypovolemic shock in rats without adrenal medulla.

Material and methods. Studies were carried on 42 rats from the strain bred at the 'Instituto de Fisiología'. They had free access to water and were fed with the usual mixed diet of the Institute. All animals were anesthetized i.p. with sodium pentobarbital (4 mg/100 g body wt.). Hypovolemic shock was induced by permanent occlusion of the portal vein, as described previously[5]; sham occlusion of the portal vein consisted in dissection of the vessel and placing a loose thread around it, without actual occlusion of the vein. Adrenal medullectomy and sham adrenal medullectomy were done following the technique reported previousley by us[2]. Blood volume, cardiac output and mean arterial blood pressure were measured in each animal 45 min after occlusion (or sham occlusion) of the portal vein, but no studies were carried out before 4 weeks had elapsed from the adrenal medullectomy or sham adrenal medullectomy. Blood volume and cardiac output were measured by dilution of radioiodinated human serum albumin labelled with Iodine-131, as described elsewhere[6,7]. Mean arterial blood pressure was measured with a critically damped mercury manometer connected with the right carotid artery; total peripheral resistance was calculated from cardiac output and mean arterial blood pressure and expressed in dyn. sec. $cm^{-5} \times 10^{-4}$ per 100 g body wt.

Four groups of animals were studied:

(A) Normal controls, 10 rats (sham adrenal medullectomy and sham occlusion of the portal vein). (B) Hypovolemic shock, 10 rats (sham adrenal medullectomy plus occlusion of the portal vein). (C) Medullectomized controls, 12 rats (adrenal medullectomy and sham occlusion of the portal vein). (D) Hypovolemic shock in medullectomized rats: 10 animals (adrenal medullectomy plus occlusion of the portal vein). Results obtained were expressed as mean $\pm$ S.E.; the significance of the differences was assessed with Student's *t*-test, as suggested by BANCROFT[8].

Results. The statistical analysis of the data obtained (Table) showed no difference between normal controls (group A) and medullectomized controls (group C). In relation to control groups, hypovolemic shock provoked a sharp decrease ($p < 0.001$) in blood volume, cardiac output and mean arterial blood pressure, either in sham medullectomized (group B) or in medullectomized rats

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[2] R. H. MEJIA, M. RENNIS and H. J. BOLO, Acta physiol. lat.-am. *18*, 151 (1968).
[3] O. CELANDER, Acta physiol. scand. *32*, supp. 116, 1 (1954).
[4] B. FOLKOW, B. LOFVING and S. MELLANDER, Acta physiol. scand. *37*, 363 (1956).
[5] R. H. MEJIA, Acta physiol. lat.-am. *14*, 77 (1964).
[6] O. RETTORI, R. H. MEJIA and L. A. FERNANDEZ, Acta physiol. lat.-am. *14*, 215 (1964).
[7] O. RETTORI, R. H. MEJIA and M. S. HALPERN, Rev. Soc. argent. Biol. *38*, 106 (1962).
[8] H. BANCROFT, *Introduccion a la bioestadistica* (Eudeba, Buenos Aires 1960).