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Basal Gaseous Metabolism of Giant Rats.

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Gigantism can be produced in rats by the administration of extracts of the anterior lobe of the pituitary.[1] We have determined the basal gaseous metabolism in 4 such giant rats and have compared their metabolic rates with those of 4 control females of the same age and the same Wistar strain.

The rats were approximately 11 months old at the beginning of the metabolism determinations. Since the age of 7 months, each of the experimental animals had received daily parenteral injections of 1 cc. of a neutralized alkaline extract of fresh beef anterior lobe containing the growth promoting principle.[2] During the period of the metabolism determinations the weight range of the injected rats, before being starved, was from 350 to 530 gm. The largest of the control rats were selected in order to obviate as much as possible the effect of size *per se* on metabolism. Their weights ranged from 200 to 270 gm. The increased size and weight of the injected animals is apparently due to the greater bone, muscle and skin development and to the considerable increase in size of most of the viscera, especially the liver. Body fat does not appear to be increased. Despite the obvious general overgrowth, the body lengths of the injected rats averaged less than 10% more than those of the controls.

Metabolic rate determinations were made by the oxygen consumption closed circuit method at weekly intervals. Each determination represents the average rate, in several tests, over a 3 to 4 hour period, and 18 to 22 hours after the last ingestion of food. All tests included were considered satisfactory from a technical standpoint. Body surface was calculated from the formula[3]

$$S = 10.76\, W^{0.31}\left(\frac{0.31}{\frac{W^{1/3}}{L}}\right)$$

Rat 62 was sacrificed for direct measurement of the skin area, which was found to be only 4% greater than that predicted by the for-

[1] Evans and Long, *Anat. Rec.*, 1921, xxi, 62.

[2] Putnam, Teel and Benedict, *Am. J. Physiol.*, 1928, lxxxiv, 157.

[3] Lee and Clark, *Am. J. Physiol.*, 1929, lxxxix, 24.

mula. Respiratory quotients were found to be nearly 0.72 in both the injected and control starved rats.

TABLE I.
Basal Metabolic Rates of Giant Rats.

Rat No.	With Extract			Without Extract		
	Weight range (gm.)	No. of determinations	Cals., day, sq. m.	Weight range (gm.)	No. of determinations	Cals., day, sq. m.
14	479-512	4	703			
62	424-462	5	705	425-370	4	801
94	336-350	3	696			
12	400-403	4	683	354-323	3	787

The average heat production of the 4 injected rats, in 16 determinations, over a period of 5 weeks, was 697 calories per day per square meter, with a standard deviation of ± 21 calories. The 4 control rats in 9 determinations gave a metabolic rate of 805 calories with a standard deviation of ± 50 calories. This rate agrees well with the average of a large number of determinations on other normal rats under the same conditions. Injections in rats 62 and 12 were stopped and after a rest period of 3 weeks the metabolic rates were found to be decidedly higher, in fact within the normal range.

These results in themselves do not prove that the anterior lobe growth hormone is anabolic or metabolism sparing in its action. There may not have been an increase in metabolically active body tissues in the giants to the extent indicated by the increased weight. There is apparently some hydration of the tissues, as indicated by the fact that these rats when starved for 22 hours lost much more weight proportionally than did their controls. There is also a rapid loss in weight during the first few days after cessation of the injections. Further work is in progress to determine more exactly the calorigenic effects of these principles.