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## Oxygen Consumption of Brain Cortex in Thyrotoxic Guinea Pigs.

MORRIS A. SPIRITES. (Introduced by M. B. Bender.)

*From the Medical Division Laboratories, Montefiore Hospital for Chronic Diseases,  
New York City.*

Cohen and Gerard<sup>1</sup> and Macleod and Reiss<sup>2</sup> reported increased oxygen consumption of thyrotoxic brain, the former using whole minced brain of animals fed dried thyroid gland, the latter brain cortex slices of animals fed thyrotropic hormone.

Studies have been made on non-pregnant, white, female guinea pigs, weighing 250-350 g, which, during a period of one week, were daily fed 2 grains of finely ground dried thyroid mixed with cut lettuce, in addition to their regular diet. At the end of this week they had lost one-quarter to one-third of their original weight. They were then killed by a blow on the neck. Slices of brain, liver and kidney were immersed in Ringer solution to which, in the case of the brain slices, 2 cc of 10% glucose and 5 cc PO<sub>4</sub> buffer pH 7.4 per 100 cc of solution were added; bicarbonate was omitted. Oxygen consumption was measured by the original Warburg<sup>3</sup> method.

TABLE I.  
Average Q<sub>O<sub>2</sub></sub> of Normal and Thyrotoxic Guinea Pig Tissues.

Brain		Liver		Kidney	
Normal	Thyrotoxic	Normal	Thyrotoxic	Normal	Thyrotoxic
12.7	12.0	5.6	8.4	16.4	19.1
13.5	11.8	5.8	8.6	15.2	17.7
13.3	11.8	7.1	9.0	14.7	18.3
11.2	12.9	6.9	8.2	14.4	21.2
10.5	11.9	6.9	10.1	14.0	19.8
10.9	12.8	4.9	8.5	14.5	21.6
11.8	12.6	4.4	8.7	16.4	17.7
12.3	9.6	4.3	9.4	15.4	18.0
11.8	13.6	6.4	9.1	16.4	18.9
11.7	12.4	6.5	7.5	14.9	18.9
12.5	12.3	5.5	7.3	13.8	20.8
11.2	12.2		11.4	12.9	19.3
11.8	11.9		8.8		18.3
	12.0				18.0
	12.9				18.3
					19.0
11.9	12.2	5.8	8.8	14.9	19.1

<sup>1</sup> Cohen, R. A., and Gerard, R. W., *J. Cell. and Comp. Physiol.*, 1937, **10**, 223.

<sup>2</sup> Macleod, L. D., and Reiss, M., *Biochem. J.*, 1940, **34**, 820.

<sup>3</sup> Warburg, Otto, and Minami, Seigo, *Biochem. Z.*, 1923, **142**, 317, 334.

As seen in Table I, brain-cortex slices of thyroid-fed animals showed no increased oxygen consumption, whereas liver and kidney tissues showed a definite rise.

Fairly large differences in the  $Q_{O_2}$  values for one organ in different animals or in the same animal can be found frequently. This error is inherent in the method used and is true especially of organs with low  $Q_{O_2}$ , such as liver. The values for kidney and brain range about 10-15% on either side of the average, whereas for liver the values range as much as 25% to either side of the average value. It can be seen clearly from the table, however, that the normal and thyrotoxic figures for liver and kidney have entirely different ranges, whereas the range is the same for normal and abnormal brain slices. The average thyrotoxic liver  $Q_{O_2}$  is 52% greater than the normal average, that of kidney is 28% higher than the normal average. The average normal and thyrotoxic brain  $Q_{O_2}$  are, however, the same.

The foregoing data are at variance with the results obtained by Cohen and Gerard, and Macleod and Reiss. However, all of their results were obtained with rats, whereas the experiments reported here were with guinea pigs. Cohen and Gerard worked with minced, whole brain, and waited 2 hours after the mincing before taking readings for oxygen consumption. In addition, they used a glucose-free Ringer solution. Macleod and Reiss found a normal brain cortex  $Q_{O_2}$  of 7.3, which is far below the accepted normal of 10 to 11.<sup>4, 5</sup> This makes the validity of their results questionable. Even their values for hyperthyroid brain do not exceed the accepted normal.

To ascertain further whether brain cortex is exceptional in its response to thyroid hormone, experiments are in progress with thyroidectomized guinea pigs.

*Conclusion.* The *in vitro* oxygen consumption of brain-cortex slices from thyrotoxic guinea pigs is not above normal.

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<sup>4</sup> Unpublished figures of the author for rat brain cortex.

<sup>5</sup> Warburg, Otto, *Biochem. Z.*, 1924, **152**, 309.