

II. Effect of Thyroidectomy and Suprarenalectomy on Muscle Tissue Respiration.

J. E. DAVIS AND A. B. HASTINGS.

From the Lasker Foundation for Medical Research and the Department of Medicine, University of Chicago.

In a previous paper¹ it was shown that suprarenalectomy increased the respiration of excised abdominal muscle of mice. This increase was shown to obtain only from about the fifty-fifth to the seventieth day after suprarenalectomy. Further experimentation has shown that this period probably begins nearer the fiftieth day so that in this paper comparisons are made for a period extending from about the fiftieth to the seventieth day after suprarenalectomy. To determine the rôle of the thyroids in this increased respiration a series of mice was first thyroidectomized and then about 3 weeks later suprarenalectomized. The operated mice were kept on a bread and buttermilk diet about 6 weeks, 3 weeks before and 3 weeks after thyroidectomy. After this period the diet was changed to dry bread and grains, the buttermilk being retained as the only drink allowed. The control litter mates received similar treatment. After thyroidectomy the operated mice received subcutaneous injections of one-tenth of a milligram of thyroxin* solution 3 times weekly. The respiration of the excised abdominal muscle of both normal and operated mice (50 to 70 days after suprarenalectomy) was measured using the same technique as reported previously, namely, a modification of the Warburg differential method.

The respiration values obtained in 13 such experiments are shown in Table I which is self-explanatory and similar to Table I of the previous paper.¹ It will be remembered that the last 4 columns express the quantity of lactic acid produced both aerobically and anaerobically in accordance with the Warburg method in terms of cubic millimeters of carbon dioxide produced during the first hour of respiration per milligram of dried tissue.

The 13 experiments represented in this table show in most cases little difference between the respiration values of the normal and of the operated mice. This table shows that the difference of the means of the oxygen consumption values of the 2 groups is only 0.21 with

¹ Davis, J. E., and Hastings, A. B., *PROC. SOC. EXP. BIOL. AND MED.*, 1931, **28**, 378.

* Natural thyroxin from British Drug House, London, England.

TABLE I.
A Comparison Between the Respiration of Excised Abdominal Muscle of 13 Pairs of Normal and of Operated Mice Having Thyroids and Suprarenals Removed.

No. of Exp.	Days after suprarenal-ectomy	Cu. mm. of O ₂ consumed per mg. of dried tissue per hr.		Cu. mm. of Extra CO ₂ produced aerobically per mg. per hr.		Cu. mm. of CO ₂ produced anaerobically per mg. per hr.	
		Normal	Operated	Normal	Operated	Normal	Operated
1	50	6.10	6.68	3.28	3.40	7.89	9.68
2	53	5.82	5.85	3.58	3.63	5.90	5.65
3	54	5.80	5.75	3.04	3.24	7.38	7.40
4	54	5.80	5.75	3.04	3.24	7.38	5.60
5	56	5.03	4.95	2.87	2.74	4.72	7.68
6	58	5.90	4.60	3.46	3.86	6.97	8.94
7	60	5.32	4.85	3.22	3.38	6.00	7.51
8	62	5.57	5.78	3.44	2.87	7.42	7.00
9	63	6.49	6.40	3.21	3.45	5.35	9.53
10	66	5.57	5.31	3.44	2.21	7.42	8.42
11	68	6.59	6.79	3.78	3.96	8.26	9.94
12	70	6.41	6.11	3.24	3.16	5.90	8.26
13	71	6.37	5.20	3.43	3.25	6.05	5.78
Means		5.90	5.69	3.31	3.26	6.66	7.80
Difference of means		0.21		0.05		1.14	
Probable error of difference of means		0.17		0.10		0.34	

a probable error of the same magnitude, whereas it was previously found that, when suprarenalectomy was not preceded by thyroidectomy, the difference was 1.76, which was 9 times the probable error. Likewise, this table shows that the difference of the means of the values of the extra carbon dioxide produced aerobically is only 0.05 with a probable error even greater, whereas it was previously found that, when suprarenalectomy was not preceded by thyroidectomy the difference was 0.59, which was 4 times the probable error. This table also shows that the difference of the means of the values of the carbon dioxide produced anaerobically is 1.14 which is 3 times the probable error, and may possibly be of significance. It was previously found, however, that this difference rose to 2.55 which was 9 times the probable error when suprarenalectomy was not preceded by thyroidectomy. Thus, it is to be noted that suprarenalectomy produced an increase of both aerobic and anaerobic metabolism, an increase which was considerably diminished or even destroyed when suprarenalectomy was preceded by thyroidectomy.