10422 P

Blood Hormone Iodine and Iodide Reserve in Relation to Basal Metabolic Rate.*

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Five women diagnosed as having toxic adenoma were given 2 grains of desiccated thyroid per day with the results on the basal metabolic rate shown in Table I.

TABLE I.

Age	Basic Metabolic Rate % Before Thyroid	Basic Metabolic Rate % After Thyroid	Days Treatment
52	+19	+34	14
29	+33	+22	10
38	+25	+27	50
41	+42	+55	41
40	+40	+25	60
Average 40	+31.8	+32.6	35

From this it is seen that the average basal metabolic rate was not appreciably increased. The same treatment was given to 11 patients with exophthalmic goiter and the results were as shown in Table II.

This shows that there is no increase in the average basal metabolic rate of exophthalmic goiter patients on feeding 2 grains of desiccated thyroid per day. This contained 0.2% of iodide; thus 2 grains

TABLE II.

Age	Sex	Basal MetabolicRate % Before Thyroid	Basal MetabolicRate % After Thyroid	Days Treatment
50	Female	+ 19	+ 3	14
50	Male	+ 36	+47	21
25	Female	+ 85	+81	42
55	Male	+ 53	+43	16
31	Female	+ 36	+82	30
48	Male	+ 39	+42	24
31	Female	+101	+63	42
18	Female	+ 49	+35	37
47	Female	+ 61	+66	21
47	Female	+ 25	+25	14
57	Male	+ 66	+75	15
Average 41		+ 51.8	+51	25

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contain 0.26 mg of iodine whereas iodized salt contains 0.02% iodine, and the average daily intake of 10 g would contain 1.5 mg or nearly 6 times as much iodine as is present in the desiccated thyroid. Such a dose of iodized salt is not considered sufficient to lower the basal metabolic rate as much as 2 grains of thyroid would be expected to raise it. Therefore it seems probable that in the patients being fed thyroid there was, on an average, a lessening of the secretion equal to the dosage. At any rate, some chemical means of determining thyroid hormone in the blood seemed desirable.

We define *iodide reserve* as the iodine extractable from blood with methanol followed by acetone, and *hormone iodine* as the non-extractable iodine. The assumption that this non-extractable iodine is thyroid hormone iodine is supported by the fact that (statistically) the basal metabolic rate is directly dependent on the hormone iodine in the blood: since the micrograms of hormone iodine in 5 cc of blood $= 0.01 \times$ (the calories per square meter per hour —20). The remarkable statistical finding, in this region at least, on persons not receiving iodine medication, is that the iodide reserve is $0.01 \times$ (60 — calories per square meter per hour). We explain this by assuming that in this region the iodine intake averages a constant and that with an increase in basal metabolic rate there is an increased transformation of iodide reserve into hormone iodine on the one hand and an increased elimination of iodide in the sweat and urine on the other.

Although we have not shown in a specific case that the patient is in great danger on loss of the iodide reserve, it is true in general that patients in the class in which we find (statistically) a loss of the iodide reserve are severely toxic unless they receive iodide medication.

The fact that the blood "hormone iodine" varies directly with the basal metabolic rate indicates that it is an actual measure of thyroid hormone. Such a demonstration has not been made by previous workers. The injection of 1000 micrograms of thyroxine-iodine raises the B.M.R. about 1.8 calories per square meter per hour. The increase of 0.01 micrograms of hormone iodine in 5 cc of blood raises the B.M.R. 1 cal./sq. m./hour. If this were uniformly distributed in a 75 litre person, it would represent 150 micrograms (or 270 micrograms for 1.8 cal). Since this is only ⅓ the injected dose, it seems probable that the concentration in the muscles is 3 times that in the blood. This was found in an autopsy.