

## XIV. T<sub>4</sub>

### A Trial in Measuring the High Concentration of Serum Thyroxine over 25 $\mu\text{g}/100\text{ ml}$ by Tetrasorb Resin Sponge Uptake in the Hyperthyroidism

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Recently, although thyroxine (T<sub>4</sub>) concentration has been measured by tetrasorb resin sponge uptake, when the concentration of T<sub>4</sub> was over 25  $\mu\text{U}/100\text{ ml}$  in the patient with hyperthyroidism, this method can not be applied. Therefore, we tried to measure such high concentration of T<sub>4</sub> using diluted serum. In the present experiment, various concentration of T<sub>4</sub> in the serum from hypothyroidism to hyperthyroidism was diluted by physiological saline as followed; serum: physiological

saline = 1:1 (1/2 diluted serum) and 1:2 (1/3 diluted serum). Since in either 1/2 diluted or 1/3 diluted serum with less than 25  $\mu\text{U}/100\text{ ml}$  of T<sub>4</sub>, T<sub>4</sub> concentration measured by tetrasorb resin sponge uptake was clearly corresponded to the value by the original method, it was thought that T<sub>4</sub> concentration more than 25  $\mu\text{U}/100\text{ ml}$  in the serum could be measured by tetrasorb resin sponge uptake using 1/2 or 1/3 diluted serum.

### Clinical Evaluation of the Res-O-Mat T<sub>4</sub> Test

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The Res-O-Mat T<sub>4</sub> test, which fundamentally concerned with the competitive protein-binding analysis, was studied as a link in a series of clinical evaluation studies of the thyroid function tests. Patients with hyperthyroidism or hypothyroidism, as well as normal control subjects, patients with simple goiter and pregnant women, were subjected to the study, and the results were compared with the results of other thyroid function tests, i.e., basal metabolic rate (BMR), protein-bound iodine (PBI), <sup>131</sup>I-triiodothyronine resin sponge uptake rate (T<sub>3</sub> RSU) and serum thyroxine level

as estimated with the Tetrasorb-125 Kit. In addition, the results were compared with serum levels of  $\beta$ -glucuronidase activity, the association of which with functional state of the thyroid has been reported from this institute.

1) Effects of either oral or intravenous administrations of radiological contrast media containing organic iodine, effects of long-term freezing of serum samples, and the effects of changes in incubation period were studied, and it was found that these did not affect the results of the Res-O-Mat T<sub>4</sub> test.

2) The mean and standard deviation in each group are listed below:

euthyroid	$8.6 \pm 2.9$ mcg/100 ml
hyperthyroid	$20.9 \pm 7.1$ mcg/100 ml
hypothyroid	$6.9 \pm 1.2$ mcg/100 ml
nontoxic goiter	$9.3 \pm 3.2$ mcg/100 ml
pregnancy	$9.8 \pm 1.3$ mcg/100 ml

3) The results were compared with other thyroid function tests and the following co-

efficients of correlation were obtained:

BMR	$r=0.59$ ( $P<0.001$ )
PBI	$r=0.73$ ( $P<0.01$ )
$\beta$ -glucuronidase activity	$r=0.70$ ( $P<0.001$ )
T <sub>3</sub> RSU	$r=0.41$ ( $P<0.01$ )
Tetrasorb-125 Kit	$r=0.75$ ( $P<0.001$ )

4) From these results it is concluded that this test is sufficiently reliable in estimating the functional states of the thyroid.

## Determination of Serum Thyroxine Using Res-O-Mat T<sub>4</sub> Kit

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Some fundamental and clinical experiments were performed in the determination of serum thyroxine by competitive protein binding analysis using Res-O-Mat T<sub>4</sub> Kit.

Variation of radioactivity in each vial was very small.

Res-O-Mat T<sub>4</sub> value was not influenced by the length of mixing time on a vortex mixer.

It was desirable to centrifuge at 2500 rpm for 5 minutes, but it does not appear that it needs to centrifuge exactly so.

At 15°C and 30°C, Res-O-Mat T<sub>4</sub> value was greatly influenced by the length of incubation period and the standard curve was not useful. Therefore, it was required to measure at relatively constant room temperature between 20°C to 25°C.

Neither radioactive nor non-radioactive iodine was proved to affect this test, since the alcohol-extract of serum was not contaminated by radioactive iodine.

Therefore, this test can be done even after administration of <sup>131</sup>I-NaI, while triosorb test is impossible to be performed under such a condition.

As there was a good correlation between 0.3 ml and 0.2 ml of alcohol-extract, we decided to use alcohol extract of 0.2 ml instead of 0.3 ml in hyperthyroidism and as a result we were able to measure thyroxine level up to 27 µg%.

Res-O-Mat T<sub>4</sub> test showed remarkably less overlapped data among hyperthyroid, euthyroid and hypothyroid conditions than triosorb test.

T<sub>7</sub> value was a more accurate diagnostic aid than Res-O-Mat T<sub>4</sub> or triosorb test alone in various thyroid diseases.

These results proved that Res-O-Mat T<sub>4</sub> test could be used as a routine clinical diagnostic test.