

Studies on Determination of Serum Thyroxine Levels by ^{131}I - T_4 Resin Strip Uptake Method (Res-O-Mat T_4 Kit)

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Fundamental and clinical evaluation for Res-O-Mat T_4 , a diagnostic kit for determination of serum thyroxine level by competitive protein binding analysis, were studied and the following results were obtained.

1) Extraction ratio of thyroxine from serum were 0.825 at 10°C and 0.795 at room temperature.

2) Duration of incubation until resin strip is added not influenced the binding of thyroxine to the resin.

3) Rotating incubation time and temperature was considered that the incubation at 26°C was most competent and practical.

4) Results of corrected levels of serum thyroxine in involving 151 subjects in various thyroid status were as follows. 4.6–12.5 $\mu\text{g}\%$ (mean 8.56 $\mu\text{g}\%$) for 34 euthyroid, 10.6–20 $\mu\text{g}\%$ (mean 16.95 $\mu\text{g}\%$) for 54 cases with hyperthyroidism, 1.7–4.96 $\mu\text{g}\%$ (mean 3.53 $\mu\text{g}\%$) for 7 cases with hypothyroidism, 4.5–16

$\mu\text{g}\%$ (mean 8.5 $\mu\text{g}\%$) for 49 cases of non-toxic goiter, 5.84 and 9.8 $\mu\text{g}\%$ for 2 cases with subacute thyroiditis, 4.2–7.8 $\mu\text{g}\%$ (mean 5.97 $\mu\text{g}\%$) for 3 cases with chronic thyroiditis and 8.96–10.8 $\mu\text{g}\%$ for 2 cases of malignant goiter. From these results we arrived at the conclusion that from 5.0 $\mu\text{g}\%$ to 13.7 $\mu\text{g}\%$ was an adequate range for euthyroid. Serum thyroxine levels of hyperthyroidism (54 cases) and hypothyroidism (7 cases) were more than 13.6 $\mu\text{g}\%$ or less than 4.96 $\mu\text{g}\%$ respectively and 3 cases out of 34 euthyroid cases were between 4.6 $\mu\text{g}\%$ and 4.9 $\mu\text{g}\%$.

When ^{131}I - T_3 resin strip uptake values were compared with serum thyroxine values, the correlation between two tests for euthyroid range was good relatively.

4) Res-O-Mat free thyroxine index ranged 4.3–14.1 in euthyroid subjects.

These free thyroxine indices reflected the thyroid function accurately.

Evaluation of Radiostere assay for Determination of Serum Thyroxine

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Three kinds of kit ((a) Tetrasorb-125 Dai-nabot, (b) Res-O-Mat T_4 , Mallinckrodt and (c) Tetralute, Ames) were used and compared for determination of serum thyroxine. The time and temperature were critical factors for separation of bound and free by means of resin sponge (a), resin strip (b) and gel filtration (c). The values of standard deviation of duplicate determinations were 0.6

(a), 0.5 (b) and 0.4 (c) $\mu\text{g}/\text{dl}$ (T_4 iodine) respectively. Following oral administration of 6 tablets of Telepaque, serum PBI was markedly increased but thyroxine levels which were serially determined by these three methods did not change. Normal values of serum thyroxine iodine determined by these methods were 2.5–9.4 (a), 3.0–7.2 (b) and 3.2–6.7 (c) $\mu\text{g}/\text{dl}$ respectively. In hyperthyroid patients,

serum thyroxine iodine concentration was 8.8– and in hypothyroid patients 0–1.1 (a), 3.1–4.3 20.6 (a), 7.8–13.0 (b) and 7.5–14.8 (c) $\mu\text{g}/\text{dl}$, (b) and 1.6–3.6 (c) $\mu\text{g}/\text{dl}$ respectively. When 19 samples were concomitantly determined by these three methods, there were higher correlations between (a) and (b), (a) and (c), and

(b) and (c), although (c) was slightly lower than others.

From these data, it may be concluded that these three tests utilizing radiostereoassay were simple, specific and reliable methods for determination of serum thyroxine.

Studies on Examining Conditions of Res-O-Mat T_4 Kit Test Obtained 450 and over Subjects

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The Res-O-Mat T_4 test system is one of in vitro methods for the determination of total thyroxine in serum.

We reviewed in many respects the conditions of measurement by Res-O-Mat T_4 Kit using 450 and over subjects as follows;

1) Fundamental investigations

a) The distribution of radioactivity in the incubation vials of Res-O-Mat T_4 Kit is evaluated equally.

b) Res-O-Mat T_4 Kit does not seem to need detailed correction for incubation time and temperature, if about 1 hour and within $20 \pm 3^\circ\text{C}$.

c) It seems to be under the influence of the extraction alcohol (0.2 ml).

d) The gradients of standard curve are influenced by the incubation time and tempe-

rate.

e) The fluctuations of T_4 values in same sera, are $\pm 1.0 \mu\text{g}\%$ for hypothyroid, $\pm 1.9 \mu\text{g}\%$ for euthyroid, $\pm 3.4 \mu\text{g}\%$ for hyperthyroid at 1 hour incubation time and 20°C . incubation temperature.

f) The reappearance of T_4 values above $18 \mu\text{g}\%$ is good.

2) Clinical results

a) Res-O-Mat T_4 values are 5.9–15.7 $\mu\text{g}\%$ for 208 cases with euthyroid, below 5.9 $\mu\text{g}\%$ for 68 cases with hypothyroid, and over 15.7 $\mu\text{g}\%$ for 103 cases with hyperthyroid.

b) The correlations between Res-O-Mat T_4 values and Tetrasorb values or Triosorb values in the same sera, are good.

The Res-O-Mat T_4 test has been proved to be valuable as clinical thyroid function test.