Triiodothyronine Uptake Test in Which Antibody-Coated Tubes are Used Compared to Two Other Tests in Which Precipitation Separations are Used

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A triiodothyronine uptake test in which antibody-coated tubes are used (Clinical Assays) was compared to two other such tests in which silicate tablets (Nuclear-Medical Laboratories, Inc.) or macroaggregated albumin (Diagnostic Corporation of America) are used to separate the bound from the free fraction. The Clinical Assays test showed good linear correlation with the values obtained by the other two tests on 67 samples. The interassay coefficient of variation was 4.8%. The correlation between the values obtained and the clinical evaluation on 60 patients also was essentially the same as for the other two tests, 80%.

One of the most useful tests for evaluating thyroid function is the triiodothyronine (T3) uptake determination, which primarily reflects the unsaturated binding capacity of thyroxine-binding globulin. When the T3 uptake test is used in conjunction with a total thyroxine (T4) assay, a free thyroxine index (FTI) can be calculated, which generally is a more accurate indicator of thyroid function than are data on the T3 uptake or total T4 alone (1).

One major differentiating factor among T3 uptake tests is the method for separating the labeled free T3. In the Clinical Assays (Cambridge, Mass. 02139) T3 uptake test, a T3 antibody-coated tube is used to achieve this separation.

We assayed sera from 60 patients and seven controls by the Clinical Assays method and the results for these same individuals were compared to those obtained by using the T3 uptake tests of Nuclear-Medical Laboratories (Dallas, Tex. 752547) and Diagnostic Corporation of America (Arlington, Tex. 76011).

Materials

The following materials are provided in each kit:

Clinical Assays: 125I-labeled T3 (1 mCi/liter, 1600 KCl/mol) in phosphate-buffered physiological saline (10 mmol/liter, pH 7.0), tubes coated with rabbit anti-T3 serum, barbital buffer (50 mmol/liter, pH 8.0), euthyroid reference serum, hypothyroid control serum, and hyperthyroid control serum.

Nuclear-Medical Laboratories, Inc.: 125I-labeled T3 (0.02 mCi/liter) in barbital buffer (pH 8.6), silicate adsorbent tablets (10–25% silicate), and euthyroid reference serum.

Diagnostic Corporation of America: 125I-labeled T3 (0.04 mCi/liter) and macroaggregated albumin (2.66 g/liter) in barbital buffer (30 mmol/liter, pH 7.3–7.5) and euthyroid reference serum.

Methods

Clinical Assays: All reagents, samples, and controls were brought to room temperature. To each coated tube were added 25 μl of patient serum, standard, or control, and 1.0 ml of "tracer-buffer" (0.048 mCi/liter) prepared by mixing the 125I-labeled T3 and the sodium barbital buffer. Each tube was gently vortex-mixed and left at room temperature for 50–70 min. Then the fluid in all tubes was aspirated and each tube was rinsed with 2 ml of distilled water, and re-aspirated. The radioactivity in the tubes was counted for 2 min in a Model 1197 gamma counter (Searle Analytic, Des Plains, Ill. 60018).

Nuclear-Medical Laboratories, Inc.: To each test tube were added 100 μl of patient serum, standard, or control and 2.0 ml of 125I-labeled T3. The tubes were shaken simultaneously and 1 silicate adsorbent tablet was added to each tube. At least 1 min after the last tablet was added, the tubes were mixed simultaneously by inversion for 1 min and left at room temperature for at least 5 min. Then the tubes were centrifuged for 10 min at 2000 to 2500 x g. The fluid in each tube was aspirated and the radioactivity in the tubes was counted for 2 min.

Diagnostic Corporation of America: Added to each test tube were 100 μl of patient serum, standard, or control and 1.0 ml of macroaggregated albumin buffer solution which contained 125I-labeled T3. The tubes' contents were vortex-mixed and left at room temperature for at least 5 min. Then the tubes were centrifuged for 10 min at 2000 to 2500 x g. The fluid in each tube was aspirated and the radioactivity in the tubes was counted for 2 min.

Samples of serum from 60 unselected patients included samples from several women receiving estrogens or taking birth-control pills. Seven euthyroid serum controls were run along with the patient samples.

Results and Discussion

The linear regression plots (Figures 1–3) demonstrate good correlation among the three tests. When the manufacturer's normal range of 30 to 40% uptake is used, 80.0% (48/60) of the Clinical Assays values agree with the patient's clinical evaluation. For NML (normal range: 35–45%) the clinical agreement was 81.7% (49/60) and for DCA (normal range: 25–36%) it was also 81.7% (49/60).

Table 1 lists the various situations in which the T3 uptake test did not correspond to the clinical picture.

We emphasize that the T3 uptake test alone is not an adequate indicator of thyroid function and the manufacturers involved in no way imply anything to the contrary. This clinical noncorrespondence may be due to a variety of causes. For example, four of the eight clinically euthyroid patients

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whose serum showed low values for T₃ uptake were on estrogens or birth-control pills, which are known to suppress T₃ uptake (2).

The interassay mean of a euthyroid pool was determined by assaying the pool six times for four consecutive days. The mean (±SD) obtained by Clinical Assays was 36.9 ± 1.8% (CV 4.8%). The means (±SD) obtained by NML and DCA were 41.8 ± 0.9% (CV 2.1%) and 29.9 ± 1.2% (CV 3.9%), respectively.

We conclude that the Clinical Assays T₃ uptake test gives results that agree very well with the uptake tests with which it was compared. The test is simple to perform and the results are reproducible. The Clinical Assays test involves a relatively long incubation period, but this is somewhat offset by the obviation of a centrifugation step.

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References