VII. Thyroid and Parathyroid

Derivation of a Three Compartment Model Describing Disappearance of Serum ^{131}I-Triiodothyronine in Man

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^{131}I-triiodothyronine was administered intravenously to normal subjects, patients with untreated thyrotoxicosis and to those with untreated hypothyroidism. The declining concentration of trichloroacetic acid (TCA)-precipitable ^{131}I in serum was plotted semilogarithmically as a function of time.

Serum ^{131}I-triiodothyronine disappearance curves were resolved into sums of three exponentials by the method of "peeling", and values for the resultant three slopes and half-lives were determined. A three pool model was formulated to describe the kinetics of serum triiodothyronine disappearance in man, representing serum (pool 1), interstitial fluid (pool 2), and all tissues in which triiodothyronine is utilized and degraded (pool 3).

The mean sum of squares obtained from the data of all subjects for the two compartment model is approximately five times the value obtained for the three pool model, a finding thus indicating the enhanced fit provided by the latter model. Furthermore, the ratio of interstitial fluid volume (V_2) to serum (V_1) for all patients, calculated on the basis of the three pool model and the experimental data, was 2.45 ± 0.44 (mean$\pm$SD), corresponding closely to the ratio V_2/V_1 obtained by independent means.

Patients with thyrotoxicosis were characterized by a increased removal rate of triiodothyronine from pool 3 and those with hypothyroidism by a decreased fractional turnover rate from pool 2 to pool 3.

The findings indicated that the proposed model represented a reasonable description of the kinetics of triiodothyronine distribution and degradation.

Free Thyroxine Index as Determined by Res-O-Mat Methods

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In recent years, Res-O-Mat T_3, and Res-O-Mat T_4 tests have become useful diagnostic procedures for thyroid function. Since August 1970, Res-O-Mat T_3 and Res-O-Mat T_4 tests have been used in our department.

The purpose of this paper is to review our experience with these examinations performed on 96 cases of hyperthyroidism, 195 euthyroidism and 32 hypothyroidism.

In several cases, distribution of the values of Res-O-Mat T_3 test was overlapped between hyper-, eu- and hypothyroidism, and in Res-O-Mat T_4 test there was no overlapping between hyper- and hypothyroidism.

There was good correlation between the values of Res-O-Mat T_3 and T_4 in cases of hypo- and euthyroidism, however, no definite correlation was found in hyperthyroidism.

Overlapping of Res-O-Mat T_3 and T_4 values is decreased by using Free Tyrovine Index (FTI) for thyroid function.