The Studies on the Secretion and Metabolism of Androgens, Especially on the Interconversion Between Dehydroepiandrosterone (DHA) and DHA Sulfate (DHA-S)

F. OSEKO, S. TATSUMI, T. YOSHIMI and T. KONO

Second Division of Internal Medicine, Kyoto University, Kyoto

The studies were made on the secretion and metabolism of androgens, especially on the interconversion between Dehydroepiandrosterone (DHA) and DHA sulfate (DHA-S).

Tracer doses of ^{14}C-DHA and ^{3}H-DHA-S were simultaneously injected intravenously to normal subjects and patients with adrenogenital syndrome, Cushing's syndrome, hyperthyroidism, simple obesity, infectious hepatitis and hypertension.

The secretion rates of DHA and DHA-S were estimated by the method of Vanda Wiele et al. (Recent Progr. Hormon Res., 17, 1963) In four normal subjects (two males and two females), the daily secretion rate of DHA ranged between 1.3~11.8 mg and that of DHA-S 0.7~10.6 mg.

In three cases of adrenogenital syndrome due to congenital adrenal hyperplasia the daily secretion rates of DHA and DHA-S were high. The rate of DHA in a case of Cushing's syndrome was high.

Tracer doses of ^{14}C-DHA, ^{3}H-DHA-S and DHA-^{35}S-sulfate were injected simultaneously to a normal male subject. The blood was withdrawn several times after the injection. The DHA-S in each plasma was isolated on thin layer chromatography and the radioactivities of ^{14}C, ^{3}H, and ^{35}S in the DHA-S were estimated by liquid scintillation counter.

The ratio of ^{3}H/^{35}S in the DHA-S increased gradually as the time passed after the injection.

The ratio of ^{14}C/^{3}H in the DHA-S increased until the ratio became constant 40 minutes after the injection.

The results seem to indicate that there is actually between DHA and DHA-S and that an equilibrium between these two compounds is obtained in a short time in human body.

^{131}I Thyroid Uptake Rate in Euthyroids and Various Thyroid Disorders

F. KINOSHITA, M. YASUDA, Y. KIRIU and J. ARAI

Tokyo Metropolitan Hospital at Okubo

We reported on the ^{131}I thyroid uptake rate in various thyroid disorders more than ten years ago, but method and instrument of thyroid uptake was greatly improved ever since. This report is the results of ^{131}I thyroid uptake rate in many euthyroid and various thyroid disorders, studied at our hospital in past 3 years.

1) Medical spectrometer (channel width 364 ± 30 Kev) and B-Filter were used and counting was made after 3, 6, and 24 hours with 30 cm of distance from the neck.

2) Tyroid uptake in 300 euthyroid cases was 1.0~59.0 (average 21.1%), in 200 hyperthyroid cases 30.4~97.0 (64.6%), in 16 hypothyroid cases 1.0~13.1 (5.2%), in 152 nontoxic diffuse goiter 4.6~91.0 (30.9%), in 90 cases of nontoxic nodular goiter 2.0~60.0 (22%), in 20 cases of malignant goiter 4.5~44.5 (16.9%), in 33 cases of chronic thyroiditis 3.4~61.8 (23.9%), in 13 cases of subacute thyroidits 0.0~4.0 (1.6%) and in 5 cases of strumitis 9.0~43.5 (25.8%).

3) In 300 euthyroid and 200 hyperthyroid cases, no signifificant difference of ^{131}I thyroid uptake rate was seen depending on the age or sex of the subjects.

4) Lower 24 hour uptake than 3 or 6 hour uptake was seen in 7.3% of euthyroid cases, 30.0% of hyperthyroid cases, 7.9% of cases of nontoxic diffuse goiter and 5.5% of cases of nontoxic nodular goiter.

5) When 20% was used as the upper limit of normal for 3hr. uptake value, the diagnostic error was 2.8%. When 35 or 40% and 45% were used as the upper limits for 6 and 24 hrs. uptake respectively, the respective diagnostic errors were 1.8 and 2.4%.

6) The effective half life in 155 hyperthyroid cases was 5.7 days in average.

7) In 150 cases of hyperthyroidism successfully treated with ^{131}I, 24 hrs. ^{131}I thyroid uptake after treatment was 1.4~70.9 (average 29.2%) and 39% and 15.3% of the cases showed ^{131}I thyroid uptake rate higher than 40% respectively.

Studies on the Initial Metabolic Phase of the Inorganic Iodide

E. MATSUMURA, S. NAKANO, T. FUKA, H. INUI, S. ISHIGAMI and N. SENDA

The Center for Adult Diseases, Osaka

The metabolism of inorganic iodine in relation to thyroidal function is not completely clear. Time course of the distribution of radioactivity in forearm of various thyroidal functions was measured by use of arm counter (Packakrd) after intravenous injection of 10-40μC of ^{131}I Na solution. The curve obtained was composed of three phases; namely the first phase of rapid increase followed by second slow uphill movement and the third gradual downstroke.

The time after injection required for maximum radioactivity and the half-life of the downstroke were found to well indicate the thyroidal function.

The average value of the former was 12.3 minutes in normal thyroidal function, 3.4 minutes in hyperthyroidism and 37.6 minutes in hypofuction.

The mean value of the latter was 5 hours in normal, one hour in hyperthyroidism and 13,5 hours in hypofunction.

Although the above difference may well be resulted from the different rate of iodine uptake by thyroid, the other possibility still remains that the diffusion volume and the rate constant could affect the type of the arm counter curve.

To clarify the latter possibility, inorganic iodide metabolism was mathematically analysed by compartment model.

Radioactivity of forearm was thus expressed as the following equation.

$$f(t)=(1+\lambda u)\exp[\alpha t]-(1-\lambda v)\exp[\beta t]$$

In the equation, λ means the ratio, (first diffusion volue: V_0)/(second diffusion volume: V_1) in forearm which was found smaller than that in whole body.

The terms (u, v, α, β, λ) or (k_T, k_D, V_0, V_1, λ) are parameters of compartment model.

Here k_T and k_D means the rate constants between V_0 and thyroid and between V_0 and V_1, respectively.

Experimentally, we figured out k_T, k_D, V_0 and V_1 from plasma disappearance curve and checked the change of $f(t)$ with ten cases of normal subjects, six patients of hyperthyroidism and four patients of hypothyroidism.

When k_D of the normal curve was substituted by that of hyperthyroidism, the time required for the maximum radioactivity was shortened with the same reasonable decrease by substitution of k_T. In contrast, the prolongation was obtained by the substitution of k_T and k_D respectively in case of hypothyroidism.

Our results indicate that the thyroidal function controls the parameters k_D, V_0, V_1, λ as well as k_T, which had been considered the only parameter controlled by thyroidal function.