

VI. Endocrine Organs and Metabolism

Kinetic Analysis of Metabolism of Thyroid Hormones with ^{131}I -Triiodothyronine and ^{131}I -Thyroxine by Aid by Aid of Computer in Various Liver Diseases

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As reported previously, the liver plays an important role in the peripheral metabolism of thyroid hormones in man. Concentration of serum thyroxine (T_4) using tetrasorb kit was $9.93 \pm 1.87 \mu\text{g}/\text{dl}$ serum, and concentration of serum T_3 by means of Sterling's method was $210 \pm 31 \mu\text{g}/\text{dl}$ in normal controls. The values obtained in liver diseases were within normal range.

A three compartments model was set up, using plasma disappearance curves, time dependent counting over the liver and the tracer excretion into the urine, to analyze the metabolism of T_3 and T_4 .

Plasma disappearance curve $Q_1(t)$ which was given as three exponential function was correspond to compartment the one. Supposing $Q_2(t)$ was to be the concentration of tracer in the extravascular space of the liver at time t . So $Q_1(t)$ and $Q_2(t)$ were approximated to three exponential function respectively with the same coefficient of exponent by aid of digital computer FACOM 270-20.

The individual values for the fractional rate constant and pool size for distribution of tracer and metabolism and excretion values of tracer into bile and urine were calculated.

The calculated rate constant of k_{21} , expressing the uptake from the plasma to liver was 0.0135 min^{-1} , k_{12} , for reverse flow rate from liver to plasma, 0.00675 min^{-1} and k_{02} , expressing the excretion from liver to bile duct, $0.000315 \text{ min}^{-1}$ in average. The cases of chronic hepatitis and liver cirrhosis showed a more remarkable decrease in the values of k_{02} and k_{21} than normal controls, which showed a slight increase in the value of k_{01} . The cumulative biliary excretion during the initial 24 hours averaged $65.2 \mu\text{g}(T_4)$ and $0.8 \mu\text{g}(T_3)$, but the cases of liver diseases with diminished hepatic pool size and biliary excretion showed remarkably decreased values of T_3 and T_4 , while they gave increased values of T_3 and T_4 excreted into the urine. As half life of plasma disappearance curve of T_3 was 1.2 days, metabolic rate of T_3 was about three times faster than that of T_4 and rate constant of k_{21} of T_3 were about 20 times faster than that of T_4 . It was recognized that reduction in the values of the liver pool size and excretion into the bile of thyroid hormones were remarkable in the cases of liver diseases.