

## Clinical Significance of Calculation of High/Low Ratio of Adrenal Glands after Administration of $^{131}\text{I}$ -19-Cholesterol

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It is possible to delineate adrenal gland with a rectilinear scanner after administration of  $^{131}\text{I}$ -19-Cholesterol. Optimal time for scanning was about 8 days after administration. In order to calculate high/low ratio of adrenal glands, the following system was used. During scanning, information was fed into 4096 channel memory unit and stored in a  $64 \times 64$  matrix. After examination, memory content was punched out on a computer compatible paper tape. This paper tape was processed with a digital computer (Hitac-10: 8KW). The content of paper tape was displayed on an oscilloscope. The viewer chooses four "area of interest". Region 1 and 2 were selected to contain adrenal glands.

Background level around the right adrenal gland is usually higher than that around the left adrenal gland because slight radioactivity of the liver sometimes remains. Therefore two "area of interest" are selected as a background area. Region 3 is the area around the right adrenal gland

and region 4 is the area around the left adrenal gland.

The computer decides maximum, minimum counts, total counts of the selected area and mean counts per unit area. After subtraction of background counts, high/low ratio of adrenal glands is calculated. In four patients with Cushing's syndrome due to bilateral adrenocortical hyperplasia, high/low ratio was 1.0–2.0. This means that each adrenal gland has the almost same radioactivity or twofold radioactivity. The scintigram shows the almost equal size of adrenal glands.

In two patients with primary aldosteronism due to unilateral adrenal adenoma, high/low was 4.0. The side of adrenal adenoma has higher radioactivity. In conclusion, it appears to be possible to differentiate bilateral adrenocortical hyperplasia from unilateral adrenocortical adenoma more quantitatively with this method than with the conventional photoscintigram.

## Analysis of Calcium Metabolism in Humans

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A computer program was developed for the fitting of experimental data to the equation which is expressed as the sum of the exponential func-

tions.

The program consists of two parts; the first part is concerned with the approximate estima-

tion of the parameters of the equation and the second is for the improvement of the estimates.

As to the initial estimation of the parameters, the experimental equation is transformed into the integral form and the coefficients of the equation are solved by numerical integration and linear programming. The characteristic equation is then formed from the coefficients and is solved for the parameters of the experimental equation. The estimates thus found are usually close to their true values and can be used as the initial guess of the parameters in the subsequent computation.

The improvement of the estimates is done by the non linear least squares, using the algorithm of Davidon, Fletcher and Powell, which is superior to Newton's method in the ability of tolerance with roughness of the initial estimates.

This program can handle both equally and unequally spaced data, requires no other inputs as data and convergence criterion which is related to the accuracy of data, and compute automatically the number of the exponential terms and the parameters of the equation. The application of the program to clinical studies of Ca-47 kinetic analysis gave satisfactory results.

### **Hormonal Effect on Lipid Absorption and Protein Synthesis**

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Lipid absorption is generally accepted to be most severely disturbed in intestinal absorption of diets in any malabsorption syndrome which may frequently associate with hypoalbuminemia. On the other hand, the inhibitor of protein synthesis could depress intestinal fat absorption blocking intestinal chylomicron production, as postulated by Isselbacher. Thus, it is strongly suggested that there is close relation between lipid absorption and intestinal protein synthesis.

In order to re-investigate this problem, using lymph duct-cannulated rats, it was demonstrated that puromycin (15 mg) administration to female rats results in a marked inhibition of intestinal absorption of oleic acid and cholesterol after the administration of an aqueous emulsion containing oleic acid-1-C<sup>14</sup> and cholesterol-7 $\alpha$ -H<sub>3</sub>. These lipids do also accumulated in the mucosal wall in female rats. However, in male rats, only the

cholesterol absorption is inhibited, while oleic acid absorption and its distribution in the intestinal wall and lymph is not affected even by the same treatment of puromycin. Thus, it was found a difference between sexes with respect to the effect of puromycin on fatty acid absorption and a separate mechanism of transport of fatty acid and cholesterol in male rats.

To examine if differences in the sex responses might indeed due to the sex hormones and their effects on intestinal protein synthesis, everted intestinal sacs were prepared and incubated with leucine-1-C<sup>14</sup> for one hour. The results of incorporation of labeled leucine into protein showed that puromycin inhibition was greater in the male rats. It was also found that about 50% drop in protein synthesis due to ovariectomy and significant stimulation of synthesis by the addition of estradiol in vivo and in vitro.