Metabolic Studies on Radioiodinated Immunoglobulin G (IgG) and Albumin

A. Iio, J. Konishi, K. Fujii, T. Sakurami, K. Iwai and M. Fukase
Second Division of Internal Medicine
T. Mori and K. Torizuka
Central Clinical Radioisotope Division
C. Uyama and T. Soma
Department of Technology, Kyoto University, Kyoto

Metabolisms of radioiodinated Immunoglobulin G(IgG) were studied on 55 cases with various conditions by using whole body counter. In 26 cases of them, radioiodinated human serum Albumin (RISA) metabolisms were studied simultaneously by double isotope method.

Three to 100 μCi of ^{131} or ^{125}I-IgG or RISA were injected intravenously, and radioactivities in serum and in total body were measured for 2 to 2~4 weeks.

We tried to analyse the IgG and RISA metabolism by two compartment (vascular and extravarcular system) analysis.

Sizes of the metabolic pool and various rate constants from pool to pool, such as, vascular $\rightarrow$ extravarcular (α), extravarcular $\rightarrow$ (β), vascular $\rightarrow$ excretion (γ) and etxravarcular $\rightarrow$ excretion (ε) were calculated mathematically. ε is approximately equal to the γ.

Simulation curves obtained by analogue computor setting the calculated data were well coincided to the curves from the measured data.

Rate constants in normal subjects were $\alpha = 0.185 \pm 0.048$, $\beta = 0.186 \pm 0.028$ and $\gamma = 0.0591 \pm 0.0096$ in IgG metabolism, and $\alpha = 0.318 \pm 0.038$, $\beta = 0.212 \pm 0.035$ and $\gamma = 0.0546 \pm 0.0066$ in RISA metabolism, respectively.

In the cases with collagen diseases, α, β and γ in IgG and γ in RISA were higher and β in RISA war lower.

In the cases with hypoproteinemia, α was higher and γ was distinctly lower in both IgG and RISA.

In the cases with liver disease or splenomegaly, β was higher.

In the cases with protein losing disease, such as nephrotic syndrome, γ was higher.

Serum IgG concentrations were determined by the immunoprecipitation in agar (Hyland hab.) and serum Albumin concentrations were determined by Tiselius' electrophoresis

The degradation rates, which were calculated from the above data, in normal subjects were 2.70 ± 0.69 g/day in IgG and 11.58 ± 1.90 g/day in Albumin.

The degradation rate in IgG metabolism was higher in the cases with collagen disease and autoimmune hemolytic anemia, and was lower in the cases with hypoproteinemia.

In RISA metabolism, that was higher in the cases with collagen disease and nephrotic syndrome, and was lower in the cases with hypoproteinemia.

The degradation rates of both proteins (Y mg/day) were found to be roughly proportional to the serum protein concentration (X mg/100 ml), as shown by the following formulae:

$Y = 206 \times +445$ in IgG and $Y = 231 \times +730$ in RISA metabolism.

In the cases with protein losing disease and cases during or after various treatments, dislocations from the regression line were often observed between the serum protein concentrations and the degradation rates.

In a few cases, duplicate studies of IgG metabolism were performed at before and during treatments with Glucocorticoid or 6-Mercaptopurine. Glucocorticoids were found to reduce the size of extravascular pool but not to reduce the degradation rate of first, while, by 6-MP treatments, both production and degradation rates were found to be smaller from the earlier time of treatment.