Measurement of Plasma Renin Activity by Radioimmunoassay of Angiotensin I

H. TAGAWA, E. MAEHATA and M. KITAMURA
RI Center, Central Clinical Laboratories, Department of Medicine,
M. ISHII, T. IKEDA and Y. KANEKO
Second Department of Medicine, University of Tokyo, Tokyo

Haber’s radioimmunoassay method of plasma renin activity (PRA) was modified, and more sensitive and reliable method was developed. Converting enzyme of angiotensin I (AT I) was blocked by adjusting pH to 5.5 and adding DFP, instead of using 8-hydroxyquinoline and BAL.

**Method:** Blood was taken at 9 am after recumbency for more than 30 minutes, and plasma obtained was frozen. After thawing, plasma was divided into two aliquots of 1 ml, pH was adjusted to 5.5 with HCl and acetate buffer, and DFP was added. One tube was incubated at 37°C for 3 hrs, and another was kept at 0°C. Twenty μl of the treated sample was added to the mixture of tris acetate buffer (pH=7.4), 125I-AT I and AT I antiserum, and was kept overnight at 4°C. Dextran-coated charcoal was used for separation of B & F, and their AT I equivalent was calculated by the reference curve of standard AT I. PRA was expressed by AT I of the incubated plasma minus AT I of the unincubated one.

**Results:** (1) AT I was produced in proportion to the incubation time within 3 hrs. (2) Reproducibility was fair; coefficients of variance of the same samples were 9–15%. PRA was reproducible within 30 days of taking blood. Addition of AT I to samples gave satisfactory recoveries. (3) Correlation coefficient of PRA by the present method and by the bioassay method reported previously was 0.89 (p<0.001). (4) PRA is dependent on sodium intake. However, when urinary sodium excretion was above 40–50 mEq per day, PRA was relatively unrelated to sodium excretion, averaging 1.10 ng/ml/hr (SD=0.64). The value was similar to Haber’s. PRA was doubly increased by IV injection of 20 mg of furosemide or keeping upright posture for an hour.

**Summary:** The modified technique of Haber’s radioimmunoassay of PRA was presented, and was proved to be reliable and useful procedure for the clinical examination (125I-AT I and antiserum were kindly supplied by Dainabot RI Laboratories.)

Studies on Radioimmunoassay of Plasma Renin Activity

M. UEDA, T. YATABE, H. YAMADA and M. IIO
Department of Nuclear Medicine and Radiological Science, Tokyo Metropolitan Geriatrics Hospital, Tokyo

According to the development of radioimmunoassay of plasma renin activity (PRA), physiology of renin-angiotensin-aldosterone system and roles of renin in hypertension have exten-
sively been studied.

During determination of PRA in aged hypertensive patients, we found with PRA immunoassay kit (CEA. IRE. SORIN) which is only one commercially available kit with regular supply, PRA is not satisfactorily measured because of low sensitivity. Several modifications of this assay kit resulted in improvement of sensitivity. Stress was placed on the importance of adjusting pH during incubation for angiotensin production and of addition of angiotensin free plasma for standard determination. Results obtained by our method were compared with those by bioassay method measured by Dr. Ishii (2nd. Dept. Int. Med. Univ. of Tokyo)

As inhibitor during incubation, BAL and 8-hydroxyquinoline were used besides EDTA. 2Na. The pH of EDTA.2Na treated plasma showed very alkaline, frequently over pH 8.6. As reported previously, in this pH renin activity is suppressed and production of angiotensin is limited. Since optimum pH of renin as enzyme is known to be pH 5.5-5.7, adjustment of pH to this optimum range is absolutely necessary. Adjustment of pH was performed with 1 M acetate buffer and 1 N HCl. By this pH adjustment amount of angiotensin produced during incubation was increased. Amounts of angiotensin produced showed linear relation against time by 4 hours in normal PRA plasma and by 3 hours in low PRA plasma.

For standard determination we added “treated plasma” or “angiotensin depleted plasma” which is otherwise the same as sample plasma. This modification made Bo percent higher and the slope steeper. Sensitivity and precision of assay system were increased. “Treated plasma” was produced by 3–9 hours’ incubation of human plasma at 37°C without the presence of inhibitor. By this procedure renin-angiotensin in plasma was damaged. After incubation the same amounts of inhibitors were added to make the standard assay system similar to the unknown sample assay system.

In 15 samples, PRA activity was determined by RIA and bioassay in separate institutes. The comparison of results obtained by RIA and bioassay showed very good correlation. (r = 0.907, p: less than 0.1)

Study on the Regional Pulmonary Function Test using \textsuperscript{133}Xenon

H. KOHMO, M. SASAKI, H. SASAKI, M. KAMBE, S. KATSUTA and M. KODAMA

Department of Internal Medicine and Division of Radioisotope Clinic, Hiroshima University School of Medicine, Hiroshima

This study was carried out in an attempt to elucidate usefulness of new test for regional pulmonary function by using \textsuperscript{133}Xenon. Cases with various pulmonary conditions were subjected for the study. Following intravenous administration or inhalation of \textsuperscript{133}Xenon, the distribution of the isotope in the lung in 40 \times 40 matrixes was measured at maximal inspiration on supine position by divering collimator which was made to cover all lung fields. Radioactivity thus measured was recorded by scintillation camera which was connected with 1600 channel memory system and magnetic tape. Ventilation index (V.I.), perfusion index (P.I.), ventilation-perfusion ratio (V/Q)