D) Measuement C (in vitro, Radioimmunoassay)

The studies on automation of the radioimmunoassay using a minicomputer system

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We have reported some results in making the radiommunoassay of insulin into automatic procedure using a minicomputer system.

In need of accuracy and simplification of the tests, caused by the increasing number of station and samples, whether disposable plastic tubes could be used in the tests instead of glass ones, was tested.

The method used was Morgan and Lazalow's, i.e. two antibody style, using I-125 labelled insulin.

The results were: when no carrier insulin was added, the precipitation rate for glass tubes was 55.0% on the average, while for plastic ones was 61.2%.

The deviation of the rate for glass tubes was not so much influenced by the added amount of carrier insulin, and comparision of the deviation of the precipitation rate for glass tubes with that for plastic ones, the latter was a little higher and had a disadvantage of easier flowing out of the precipitation from the bottom of tubes.

But the careful handling of the tubes removed the disadvantage and obtained better results. And plastic tubes had also a merit of disposable.

In conclusion, plastic tubes were usable, when secured by handling them carefully.

The automatic diagnosis of renogram by minicomputer system

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As a method of dynamics studies on RI, the integral transformation of renogram curves were carried out in our laboratory by a minicomputer system and the same procedure was on the selected parts of the kidneys obtained by scinti camera (i.e. renogram curves of R.O.I.).

The primary report was presented at the meeting of Nippon Societas Radiologica in August, 1972.

The results were:

1. The integral transformation of renogram.

a) In the case of normal functional kidneys, transformed curves consisted of a peaked section "A", followed by a flat section "B", and a down slop which reached to a next flat part "C". "A" is equivallent for segment "a" on the ordinary renogram curves, "B" for segment "b" and "C" for segment "c".

b) Obstructive cases.
"B" and "C" could not be distinguished.

2. R.O.I. renogram after the transofrmations.
   a) In a case of normal kidneys.
      i) Cortex area curves.

"A" disappeared and "B" reached to "C" faster than normal transformed renogram. The form of "B" and "C" were the same as normal transformed renogram.

ii) Pelvis area curves were convexed form and "A" disappeared.

b) In a case of obstructive cases.

i) Cortex area curves were same with normal R.O.I. renogram curves.

ii) Pelvis area curves were same with obstructive renogram.

These transformed curves were considered to be same with the curves which obtained after the injection of radioisotopes into renal area, and this method, we think, are valuable for the automatic analysis of radiorenogram curves.

Data processing for radioimmunoassay

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It is very important to simplify the data processing in radioimmunoassay. For this purpose, we manufactured a new automatic well counting system with a desk top type computer. In this system, we applied a new method for automatic calculation of absolute amount of hormone in radioimmunoassay using a standard curve which is memorized by the computer. Sample number of count and counting time are sent from automatic well counting system to computer and then analyzed taking steps as follows.

(1) The measurement of radioactivity in samples which contain known amount of hormone to make a standard curve. The 1st count and back ground are measured, and memorized by computer, and the back ground counts are subtracted from each counts to obtain net counts in c.p.m. and B (%) values for each sample.

(2) Plot the B (%) values to the amount of hormone by hand.

(3) Determine a most approximate curve for each data point. In this case, we simulated the standard curve between B (%) values and absolute amount of hormone by a hyperbola.

$$y=\frac{c}{x+a}-b$$

Where: y is the amounts of hormone.
x is the B (%) value.
a, b, and c are the constants for the hormone to be measured.

(4) Find a difference between standard curve and approximate curve. If there are difference in in cliniczl view, we can define two separated approximate curves as a standard curve, so we can get more accurate approximate curves.

(5) Finally, the measurement of radioactivity in samples which contain unknown amount of hormone. In this case, sample number, number of count, counting time, c.p.m., B (%) and absolute amount of hormone for each sample are printed out in roll chart. We applied this approximation method to the measurement of Insulin, H.G.H., T.S.H., Au-Ag, and α-fetoprotein and find that the result is very satisfactory.