

IV. Kidney

Quality Control and Stability Studies of ^{169}Yb -DTPA, and Its Application Determination of Glomerular Filtration Rate in Rabbits

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^{169}Yb -DTPA, which was developed by Dr. H. N. Wagner, et al., was used for many purposes such as brain scann, cisternography and determination of glomerular filtration rate. In the study presented here, ^{169}Yb -DTPA, which was prepared by Dr. Wagner's method, was confirmed to be a very stable compounds by paperchromatography and thin layer chromatography, in which acetone- H_2O (1:1) was used as developer. Rf value of ^{169}Yb -DTPA with this developer was between 0.7-0.8, while $^{169}\text{YbCl}_3$ remained at origin. Any radiochemical impurities were not detected by these methods after repeated autoclaving of the substance and storage for about two months.

To confirm its applicability to determina-

tion of glomerular filtration rate, ^{169}Yb -DTPA and ^{131}I -iothalamate were injected simultaneously into a rabbit and concentrations of each compound in plasma and urine were determined by utilizing the differences of gamma energies of both nuclides by a pulse height analyzer. GFR values obtained from UV/P with both compounds showed good correlation and its correlation factor calculated from 17 determinations was 0.991. Furthermore GFR values calculated from the blood clearance curve method showed good agreement. These findings indicate that ^{169}Yb -DTPA is a satisfactory substitute for ^{131}I -iothalamate clearance.

The Measurement of Glomerular Filtration Rate with Yb-169 DTPA

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We performed the simultaneous GFR clearance method, using ^{169}Yb -DTPA and sodium thiosulfate.

RI clearance, one of various technique of renal function test using radioisotopes, was

reported.

Now, the purity of agent and its urinary metabolites of rats were examined by radiothin layer chromatography using a mixture of acetone and water (1:1). The solvent system

appeared to be the most suitable from the point of short developing time, proper RF value and good separating power. In rats urine one artificial radio peak other than ^{169}Yb -DTPA was detected on thin layer chromatogram with this solvent.

Whole body retention of ^{169}Yb -DTPA in female albino rats was studied for 41 days. The excretion showed biphasic pattern and about 95% of the dose was excreted in the first 42 hours. While the residue (5%) was excreted very slowly and about 2% of dose still remained even on 30th day.

The distribution of ^{169}Yb -DTPA was recognized mainly in the bone, liver and lung by autoradiogram of mice.

In man, 80-90% of the intravenously administered ^{169}Yb -DTPA was excreted in the urine for the first 2 hours. In the following 48 hours,

hardly any RI activity was detected in the urine.

The renal scintigrams were obtained by administering ^{169}Yb -DTPA, but the visualization was different from that of ^{198}Hg or ^{203}Hg -chlormerodrin.

In 23 patients, the GFR of ^{169}Yb -DTPA (0.4-0.5 $\mu\text{Ci}/\text{kg}$) was compared simultaneously with GFR of sodium thiosulfate (80 ml). Prior to the examination, all patients were given 200-300 ml water.

The activity of ^{169}Yb -DTPA in 1 ml of serum and 1 ml of urine was measured by means of a well-type scintillation counter (77-177-photon energy range).

The clearance was calculated on the base of formular $c=uv/p$. The relative coefficient of ^{169}Yb -DTPA sodium thiosulfate (in the terms of clearance) was calculated at 0.98.

Simplified Single Injection Clearance in Children

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ABSTRACT. The renal clearance of sodium ^{131}I -iothalamate after a single intravenous dose of 10 to 25 μCi was calculated from the plasma disappearance curve. The endogenous creatinine clearance was compared with these results.

Twenty nine cases of all levels of renal function were studied. The correlation between both methods was good. In five patients, the clearance was obtained by external counting and agreed well with the clearance calculated from the plasma samples. The simplified single injection clearance was calculated on the basis of the one-compartment model

proposed by H. Smith, in 20 pediatric patients with all levels of renal function. The correlation between two-compartment system and one-compartment system methods was fairly good. (correlation coefficient, $r=0.6$) The single injection clearance of sodium ^{131}I -iothalamate, calculated on the basis of the two-compartment model is accurate in younger children, where a complete urine collection is difficult to obtain. It is also helpful in out-patients because of its short duration. The number of plasma samples required can be reduced to one by the use of an external counter.