

## Correction of Radioisotope Uptake for Organ Depth using Double Tracer System

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One of the problems encountered in measuring thyroid  $^{131}\text{I}$  uptake and kidney  $^{197}\text{Hg}$  and  $^{203}\text{Hg}$  uptake is the uncertainty of the organ depth in tissue. This can lead to error of uptake ratio due to the unknown attenuation by overlying tissue.

The present investigation is a method employing a mixture of  $^{125}\text{I}$  and  $^{131}\text{I}$  for measuring the thickness of overlying tissue and obtaining correction factor of the uptake.

Because of the wide energy separation between  $^{125}\text{I}$  and  $^{131}\text{I}$ , the relative attenuation of their radiation may give a measure of organ depth. To establish this relationship, lucite neck and body phantoms with mock-thyroid and mock-kidney containing equal counts of  $^{125}\text{I}$  and  $^{131}\text{I}$  were used. Layers of Lucite plate simulated overlying tissue were added.

The detector housed in a lead collimator was  $2 \times 2$  in. NaI (Tl) crystal and the pulses were analysed by a 100 channel pulse height analyzer. The tissue surface—crystal surface distance chosen was 10 in. for thyroid and 10 cm. for kidney.

The results obtained showed the ratio of the 27 keV  $\times$  radiation to the 364 keV gamma radiation could be used as a function of the organ depth. Also from the ratio could be determined the factor needed to correct the observed  $^{125}\text{I}$  and  $^{131}\text{I}$  count rate to 1 cm. tissue overlying the thyroid and the observed  $^{125}\text{I}$ ,  $^{131}\text{I}$ ,  $^{197}\text{Hg}$  and  $^{203}\text{Hg}$  count rate to 7 cm. overlying the kidney.

Preliminary results on two adults subjects who ingested a mixture of  $^{125}\text{I}$  and  $^{131}\text{I}$  showed the depth of "apparent" center of the thyroid was 3.7 and 3.8 cm. The thyroid uptake corrected for these two subjects was 47.2% and 17.3%.

The 5.4 cm. depth of "apparent" center of the kidney was found in one subject who was injected intravenously a mixture of  $^{125}\text{I}$  and  $^{131}\text{I}$  labeled ortho-iodohippurate.

To measure kidney depth, similar studies have been done using  $^{197}\text{Hg}$  and  $^{203}\text{Hg}$  double tracer system. Less well data, however, could be derived because of the poor energy separation and the influence of compton scattering.

## II. Scanning

### A Method for the Test of Honey Cone Collimators

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Radioisotope  $\gamma$ -ray source was placed at the site of crystal on the collimator to be tested. The source was shielded with Pb and set on a dark box containing shets of

X-ray films between metacrylate plates. After an appropriate exposure time, films were developed. The results, with 5.5 mc  $^{131}\text{I}$  for 3 days, showed the depth and width