tumors of the kidney and hydronephrosis due to ureteral stone etc. show this pattern.

Hypofunctional type. Renal size itself is not changed. Just an irregular radioactive uptake pattern "salt and pepper" is striking feature. This occurs in a variety of renal parenchymal disorders and in renal insufficiency from any cause. The liver is quite often visualized on the scintigram.

Contracted type. The kidney is less than 9 cm in length and discrepancy in size, unilateral decrease in uptake are noticed. Disease such as renal artery stenosis, aneurysm of renal artery, congenital hypolasia, or chronic nephritis is suspected.

Partially defective type. Cysts, neoplasms, localized inflammations, renal stones will produce filling defects on the renal scintigram if they are larger than 3 cm in diameter. Solitary cyst can hardly be differentiated from neoplasm renoscintigraphically.

Non-functional type. If impairment of bilateral renal function becomes severe like in nephrosclerosis or polycystic kidney, the kidneys will not be visualized. Unilateral failure to visualize may be associated with extensive parenchymal infection or neoplasm or arterial or ureteral occlusion or congenital hypoplasia.

As above-mentioned, although it is impossible to decide the final diagnosis from renoscintigram alone, it can play a definite role in selected cases such as renovascular hypertension or renal neoplasm.

Lastly, from our own experiences, advantages and limitations of this procedure are summarized as follows:

*Advantages of the renal scanning*

1. No special preparation of the patient is necessary.
2. Gas or contrast media in the intestinal tract and obesity do not interfere with recording of the renal scintigram or its interpretation.
3. The renal scanning can delineate discrete areas of varied function within the same kidney.
4. The renal scanning is a safe, painless and easy procedure.

*Limitations of the renal scanning*

1. Lesions less than about 3 cm in diameter will be missed.
2. Patient has to remain immobile for about one hour.

# Symposium II. Diagnostic Use of Radioisotopes for Gastrointestinal Diseases

## Analysis of the Blood Curve of Radioactive Iodine Labeled Fat

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$^{131}$I-labeled triolein and oleic acid have been widely used for the study of digestion and absorption of fat in the intestinal tract. Up to the date, however, theoretical observation of the blood radioactivity curve is scanty. For example, only the peak value and sum or mean of total radioactivity at 4, 5, and 6 hours following test meal administration have been discussed in many reports.

The blood radioactivity is seriously affected by many factors, such as gastric emptying time, mixture and digestion with duodenal juice, quality and quantity of the carrier, and stability or impurity of labeled fat. Therefore, we attempted to analyse the blood radioactivity curve and studied of the factors which influence on it by means of double isotope technique and thin layer chromatography.

### I. Our analytic method

The radioactivity in plasma is plotted on a logarithmic section against time—BLOOD CURVE, and this curve is extrapolated to the initial decline phase—METABOLIC CURVE. Then an ABSORPTION CURVE is mathematically obtained by reducing the former from the latter. The absorption

curves thus obtained in clinical cases tended to show a non-linear portion during the initial 2-3 hours and followed by a linear portion thereafter. The latter portion shows the absorption rate of the labeled fat, and is quantitatively expressed by half life $T\frac{1}{2}$ or rate constant K. The former portion is disfcussed below.

II. Factors which influence on the blood curve

1) Gastric emptying time, and mixture and digestion with duodenal juice

By studying the absorption curves in clinical cases of total gastrectomy, and obstructive jaundice, with simultaneous administration of $^{125}$I-triolein to the stomach and $^{131}$I-triolein to the duodenum, it was found that the non-linear portion of the absorption curve was affected by these factors.

2) Carrier

Comparing the absorption curve following the injestion of a small amount of milk as a carrier with the curve following 180 ml. of milk, 0.5 Gm. of butter per kg. of bodyweight, and two pieces of bread in the same patient, the former's half life was distinctly shorter than the latter's. This fact shows the importance of quality and quantity of the carrier.

3) Stability of the labeled fat

$^{131}$I-triolein and Na $^{125}$I was simultaneously administered to the dog whose thoracic duct had been canulated. $^{131}$I in the lymph was abruptly increased after 3 hours, and above 90% of it was TCA-precipitable. $^{125}$I in the blood was abruptly increased by 1 hour, but $^{131}$I in the blood was increased slowly and was kept in this state after 3 hours. These results shows that the labeled fat is relatively stable during digestion and absorption of it.

4) Commercial triolein and oleic acid

Commercial $^{131}$I-triolein and oleic acid were analysed by thin layer chromatography autoradiography. It was found that these commercial preparations were radioactively impure. Accordingly we have prepared pure $^{125}$I-triolein by thin layer chromatography, and administered it with commercial $^{131}$I-triolein simultaneously to a patient to compare the absorption curves. The result revealed slight difference in absorption of both preparations.

5) Radioactive triolein curve in the blood

For the study of absorption and digestion with the labeled fat, it is not correct in strict sense to count the radioactivity in untreated plasma. Therefore, we have extracted and separated triolein in the plasma by thin layer chromatography following the injestion of labeled fat, and counted it. This absorption curve was different from the one of untreated plasma, but the difference was not remarkable.

## Digestion and Absorption Test Using Triolein or Oleic Acid

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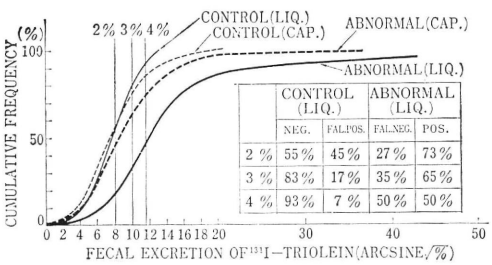
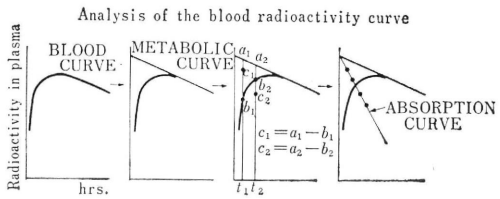



| | CONTROL (LIQ.) | | ABNORMAL (LIQ.) | |
|---|---|---|---|---|
| | NEG. | FAL.POS. | FAL.NEG. | POS. |
| 2 % | 55% | 45% | 27% | 73% |
| 3 % | 83% | 17% | 35% | 65% |
| 4 % | 93% | 7 % | 50% | 50% |




Sixteen years have passed since $^{131}$I labeled fat was first used as a new aid for digestion-absorption test on experimental animals by