

Estimation of Digestion in vivo in Man Using Labeled Food Materials

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The nutritive value of food has in the past been estimated from its chemical composition, but it is also related to digestibility which has not been determined in vivo. It is impossible to reproduce in test tubes, the same digestion process as occurs in the G.I. tract. Certain food-stuffs are poorly digested and therefore low in nutritive value in spite of the high contents of good nutrients.

Theoretically two methods may be feasible. In Method I, a tracer is incorporated into a food-stuff, preferably in its native state, if not, in such a way that it is not readily extracted. From the chemically determined total content of the marker and the absorbed radioactivity, digestion is calculated. Method II can be used when % absorption of the tracer dose is precipitously decreased when isotopically diluted by the same but cold material liberated from food. This so-called diluting dose can be the native content of food, or can be artificially added. Gamma emitters which are bound to protein in food or to the supportive structure of the food, and are absorbed completely or to a consistent extent suit the purpose.

First, attempts were made with ^{59}Fe by incorporating it into various food items and feeding them to humans. It was found to be unsuitable. ^{57}Co -cyanocobalamin was tried and found to be usable because its absorption is

well documented with regard to dosage, easily measured from urinary analysis, and the percentile absorption drops sharply with increasing doses between 0.2 and 8 ug.

^{57}Co -cyanocobalamin was incorporated into hen eggs by injection to laying hens, and into rat and chick livers repeated injections. When fed to human volunteers and absorption was measured by Method I, liver was found to be digested almost completely, while egg yolk was hard to digest, being digested to the extent in the neighborhood of 20%. Free ^{57}Co -cyanocobalamin was added to rice, gello, egg white and yolk, agar, ice cream mix, etc. before cooking or preparation, they were fed and digestion (liberation of ^{57}Co) was estimated. The result indicated that rice, pudding, agar, and ice cream were well digested while cooked eggs were poorly digested. If mixed with beef steak and fed to human volunteers, digestion or liberation of cold B_{12} from steak became poorer with increasing amounts fed. ^{35}S -labeled thiamine was also used in a similar manner and found to be of some value in the estimation of food digestion because of the consistent absorption in the dose range 0.2 mg.

We are presently in the pursuit of other gamma emitters or radionutrients including metals which short biological half lives that are well absorbed.

Evaluation of the Pancreas Dynamic Images Using Scintillation Camera

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Because of rapid imaging capability, scintillation camera enables us to make serial exposures of the pancreas. And scintiphotos can be obtained before and after changing the

posture either supine or upright trunks to flexibility of camera detector.

The following points of scintiphotos considered to be superior to a conventional scan-

ning of the pancreas.

(1) The pancreas image in the first few minutes after intravenously injection of ^{75}Se -Selenomethionine ($2\ \mu\text{Ci}/\text{Kg}$ body weight) shows higher degree of RI accumulation of the pancreas than the liver in some cases.

(2) It is possible to observe the peristaltic pattern of the pancreas that changes in shape, for example, from horse shoe form to inversed sigmoid form in the pancreas serial dynamic

images.

(3) From both informations of the pancreas images in upright position and supine position, it is able to find out deformity and mobility of the pancreas relating to abnormality of the retroperitoneum or the liver.

(4) The best angle to separate the pancreas image from the liver image was 5° upward of inclination along body surface according to our experiences.

Clinical Application of Scinticamera

(2) Pancreatic Disease

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Clinical application of scinticamera was studied on 100 cases of pancreatic and extra-pancreatic diseases.

They (100 cases) were: 9 cases of pancreatic carcinoma, 2 cases of pancreatitis, 4 cases of combined operation cases of gastrectomy with panreatico-duodenotomy and other 85 cases which were considered to be normal. Results obtained were as follows:

1) Scinticamera image of all pancreatic carcinoma cases was shown and its classifica-

tion was proposed.

2) Sinticamera image of extra-pancreatic diseases was shown with examples, which were decisively helpful for excluding intra-pancreatic diseases.

3) The causes of non-visualization of pancreas were studied.

4) The evaluation of clinical course and therapeutic effect could be made effectively on the case of pancreatitis by using scinticamera.

^{131}I -Erythrosine B for Pancreas Scanning

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Erythrosine B, tetraiodo compound, is known as a contrast medium for the intravenous angiography.

Erythrosine B labeled with ^{131}I iodine was tested as an agent for the pancreas scanning. ^{131}I -Erythrosine B was administered 300~700 μCi to 8 patients introvenously and several scintiphotos were recorded for 24 hours by a scintillation camera.

The patients also scanned with ^{75}Se -Seleno-

methionine and ^{131}I Rose Bengal for visualisation of the pancreas and the gall bladder.

The pancreas was not successfully visualized by ^{131}I -Erythrosine B.

The vague shadows in the pancreas lenion were obtained in only 3 cases, and completely negative in 5 cases.

Liver, kidneys, Urinary bladder and intestine were visualized.