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Radioactive Iodine I 131 in the Henry Ford Hospital

John H. L. Watson, Ph.D.*

Radioactive Iodine is an isotope of ordinary iodine with identical properties, including those of metabolic nature, except that it is an unstable atom which breaks down with release of gamma and beta radiations. Its half-life is 8 days. It is made by deuteron bombardment of tellurium in a cyclotron; or in a chain-reacting uranium pile, both by neutron bombardment of tellurium and as a fission product of U 235.

As might be expected, it is widely used in thyroid studies, both as a therapeutic and as a tracer or diagnostic tool. As a therapeutic agent it is used to treat hyperthyroidism and carcinoma of the thyroid, and to relieve symptoms of Angina Pectoris in selected cases. As a tracer material it is used to estimate the thyroid’s ability to pick up the element, and to determine the location of the gland or of “hot” nodules within it.

Shipments of I 131 are received twice a month by the Physics Laboratories of the Edsel B. Ford Institute for Medical Research from the Atomic Energy Commission works at Oak Ridge, Tennessee, and are available to all departments of the Hospital for human and/or animal application. Requests for material are made on the forms provided by the local Isotope Committee, through its Secretary, Doctor C. M. McColl.

Two services are offered for tracer studies in Hospital patients. The first of these is an I.P.D. procedure in which the patient is admitted to a room on B-4 and remains in the Hospital for two or three days. A tracer dose of 50 microcuries is given orally and both uptake and excretion data are collected. The patient is scanned thoroughly for uptake on four occasions during the period, at approximately 4, 24, 28, and 48 hours. At 24 hours a percentage uptake by the whole glandular area is determined by a phantom technique developed in this laboratory.** At the same time, and often for longer periods, urines are collected and the volumes and times of voidings are noted. Aliquots from each urination are sent to the radioactive laboratories for determinations of activity. From these data the relationship between cumulative percent of I 131 excreted is plotted against time. The slope and quantitative data of these graphs are significant as regards the ability of the thyroid to pick up iodine. From them it is possible to decide whether the patient retains iodine in a manner characteristic of hyper- or hypothyroidism. In addition, the slope of such a curve yields information on

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renal efficiency. A report on these studies, with suggestions for dosage if the patient requires therapeutic treatment, are prepared and sent to the doctor who requested the dose. The tracer is a diagnostic tool in real or supposed thyroid disorders and an indicator of foci of thyroid activity.

The second tracer service is executed more briefly in the O. P. D. It is a less expensive, less time consuming procedure which involves only uptake scanning. The scanning is done over only a few selected areas and the service is applicable only to patients for whom a simple decision is required as to whether the patient retains iodine in an abnormal or normal manner. The service is handled from the Emergency desk in the M-Unit Arcade. Again, a report is sent to the referring doctor.

The use of radioiodine therapeutically presupposes that an I.P.D. tracer study has been carried out from which some accurate estimation of dosage has been possible. The dose is prepared in the radioactive laboratory and sent to the referring doctor's office for oral administration. In therapy, the patient must be followed carefully clinically and the dosage repeated until the desired results are achieved. Symptoms of thyroiditis must be looked for, and remembering that the therapy is the equivalent of a total or partial thyroidectomy, symptoms of thyroid storm must also be expected when hyperthyroid patients are treated.

Radioiodine therapy of hyperthyroidism is indicated whenever the patient is a poor risk for operation or when surgery is refused. Radioiodine therapy of thyroid carcinoma is always indicated, with surgery or without it. With carcinoma the dosage is large (about 25 MC) and is repeated every two weeks for periods of months. The iodine radiation should be applied ideally before any x-ray is given. In selected cases, radioiodine therapy is the treatment of choice to relieve symptoms of Angina Pectoris.

I 131 is given only to patients who have satisfied certain preliminary dietary requirements. Particular among these is that they receive no iodine or thyroid medication for a period of four weeks prior to the dose. If this is not done, the possibility exists of chemical blockage of the relatively small amounts of I 131.

A summary of present clinical uses to which I 131 is being put in the Hospital follows:

1. Diagnostic in thyroid disorders (adult).
2. Therapy in hyperthyroidism.
3. Therapy for carcinoma of the thyroid and its metastases.
4. Therapy for angina pectoris in selected cases, with concurrent tracer studies.

Clinical Research Projects being conducted in collaboration with the Physics Department personnel include:

1. “A Study of I 131 as a Diagnostic Tool in Children Suspected of Thyroid Disorders,” with Dr. J. A. Johnston of the Pediatrics Department.
2. "A Study of Total Thyroidectomy Patients Using I 131, in Order to Follow Thyroid Metabolism in Such Patients," with Dr. D. E. Szilagyi of General Surgery. This is a continuing research. The I 131 tracer methods were used by Dr. Szilagyi to assist in problems on the effects of adrenocortical stimulation on thyroid function. The same procedures are being used in studies on the survival of thyroid autotransplants.

3. The researches begun on the use of I 131 labelled diiodofluorescein in the localization of brain tumors have been discontinued but the project is still open for reinstatement with the Department of Neurosurgery.

4. Analysis of I 131 tracer data (1) with relation to its use in diagnosing kidney failure and particularly in investigating certain diuretic effects, and (2) with relation to devising a means of determining quantitatively from the data (a) rate of excretion of I 131; (b) rate of thyroid uptake of I 131; and (c) the disappearance rate of the I 131.

Two papers only have been published from the Hospital on experimental results with I 131 although many papers have been published with reference to Radioisotopes in general. The two papers published are:


Several papers have been read before national meetings by Doctor Szilagyi and his staff on results of these studies.

During 1952 a total of 135 separate doses of radioiodine were prepared and delivered by Physics for clinical studies. Among the departments of the Hospital, these were distributed as: General Medicine, 15; General Surgery, 62; Cardio-Respiratory, 24; Pediatrics, 15; Metabolism, 9; Infectious Diseases, 6; Endocrinology, 2; and Cancer Clinic, 2. No other departments asked for service. At the same time 47 doses of P 32 were delivered (45 to General Medicine and 2 to Ophthalmology) and 3 shipments of radioactive gold colloid were received, one for General Medicine and two for Gynecology and Obstetrics. The application of radioisotopes, and especially of Iodine (I 131), is growing wider in the Hospital and with the O.P.D. service operating should increase even more during 1953.