Dr. Saul Hertz and the Origin of Nuclear Medicine

Medical Uses of Radioisotopes – RAI

1905–1950

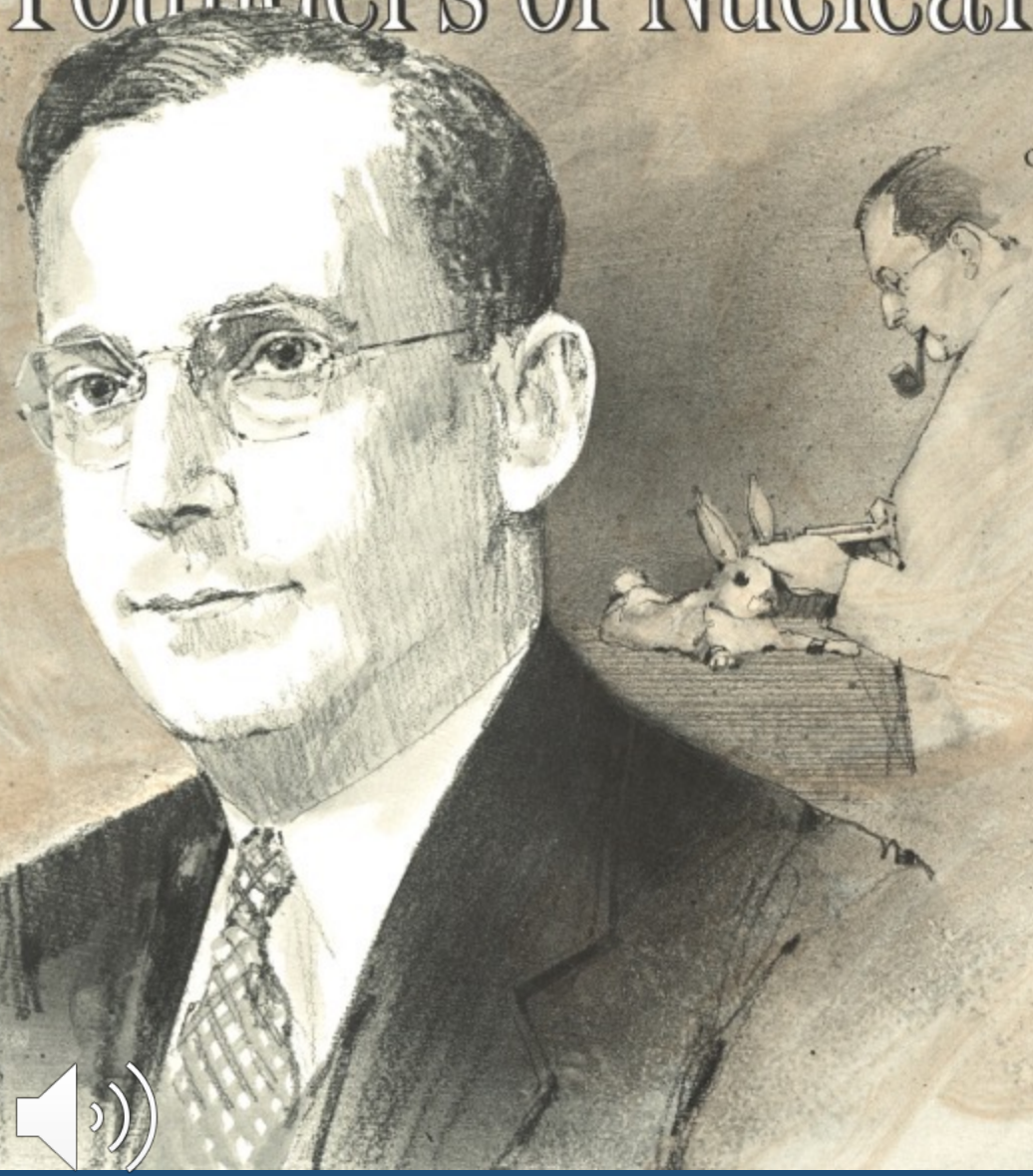
Challenges and Legacy

Presented by Barbara Hertz, M.Ed.

Wedding Picture

June 6, 1941
144 Grove Street
Brookline, MA

The Founders of Nuclear Medicine



Saul Hertz, M.D. First tracer use of radioiodine in studying thyroid physiology (1937); first administration of the "atomic cocktail" (iodine-131) for thyroid therapy (1941).

Mallinckrodt salutes one of the scientists whose pioneering work played an important part in the foundation of Nuclear Medicine.

Mallinckrodt NUCLEAR

November 12, 1936
Harvard Medical School – Vanderbilt Hall

Saul Hertz spontaneously posed the seminal question that launched the RAI research.

OFFICE OF THE PRESIDENT

December 15, 1936

Dr. S. Hertz
Massachusetts General Hospital
Boston, Mass.

Dear Dr. Hertz:

To my chagrin I have just come across the memorandum which I made on your question about the radioactivity of iodine.

Iodine can be made artificially radio-active. It has a half period of decay of twenty-five minutes and emits gamma rays and beta rays (electrons) with a maximum energy of 2.1 million volts. It is probable that there are several other periods of decay, but if so they correspond to types of radioactivity like the one indicated and they are not as yet very definitely established.

Very sincerely yours

Karl T. Compton
President

KTC/L

Massachusetts General Hospital
Boston

NATHANIEL W. FAXON, M. D.
DIRECTOR

December 23, 1936

Professor Karl T. Compton
Office of the President
Massachusetts Institute of Technology
Cambridge, Mass.

Dear Sir:

I received your letter in relation to the radio activity that can be artificially induced with iodine and believe the data will be of considerable interest to us as we intimated to you. The fact that iodine is selectively taken up by the thyroid gland when injected into the body makes it possible to hope that iodine which is made radio active and which loses its radio-activity as rapidly as you indicated will be a useful method of therapy in cases of overactivity of the thyroid gland.

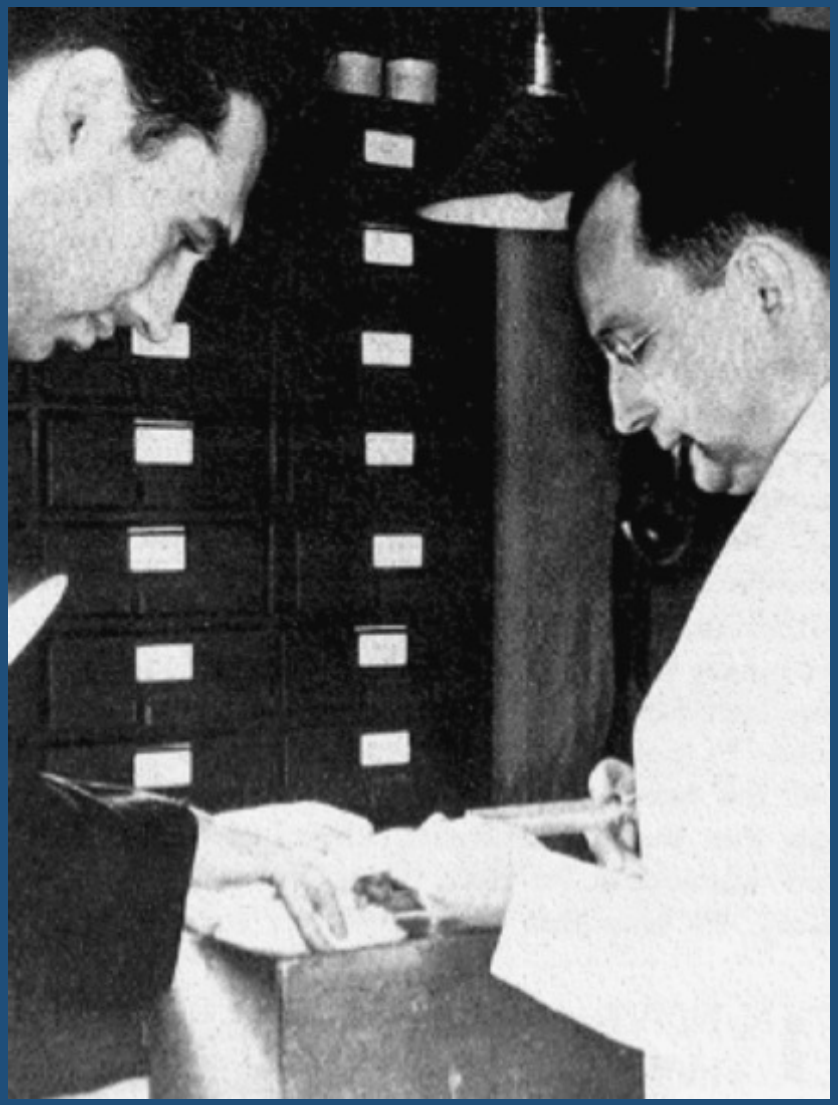
Thank you for this information and if animal experiments are undertaken we will communicate the results to you.

Very sincerely yours,

Saul Hertz M.D.
Thyroid Clinic

SH:IM

1937



MIT’s Dr. Arthur Roberts / MGH’s Dr. Saul Hertz

$30,000.00

from Mary and John Markel Foundation

to build MIT's cyclotron

TABLE I AN ANALYSIS OF CASES "NOT CURED" BY Ra-I+KI (TO MARCH-'46)

SERIES NO.	CASE-HOSP. NO.	B.M.R. PRIOR TO I^{130}	DOSAGE OF I^{130} and DATES of ADMINISTRATION	B.M.R. PRIOR TO SUB-TOTAL THYROIDECTOMY	POST-OP B.M.R.	THYROID WEIGHT	HISTOLOGY	TOTAL THYROID IRRADIATION (R) 12 HR	TOTAL THYROID IRRADIATION (R) 9 DAY	ESTIMATED THYROID WT. BEFORE I^{130}	% OF Ra-I (URINE) EXCRETED-72 HRS. FOLLOWING THE ADMINISTRATION OF I^{130}
1	ELIZABETH D. MGH-173954	+30	2.1 mC 3-31-'41 1.3 mC 4-16-'41 } 3.4 mC	(-5)(-7)	(-29)	34	INVOLUTION	470 220	660 240	35	20 28
5	LILLIAN R. [illegible]	+35	5.7 mC 7-16-'41	PLANNED EXPERIMENT	(-20)	31	HYPERPLASIA NO INVOL.	1000	1150	40	27
10	GLADYS B. MGH-121922	+55	0.7 mC 2-2-'42	(+3)	(-26)	26 30 } 56	HYPERPLASIA + MOD. INVOL.	120	80	60	38
14	WILFRED B. MGH-363179	+50	15 mC 7-15-'42	(-15)	(-24)	55	HYPERPLASIA + INVOLUTION	650	—	60	71
16	CARMELLA D. MGH-255820	+25	10 mC 8-11-'42	(-8)	(-24)	28	INVOLUTION	1800	—	45	6
19	PETER C. MGH-369233	+65	15 mC 8-25-'42 8 mC 3-8-'43 5 mC 3-9-'43 } 28 mC	(+8) TO (+13)	(+36) TO (-18)	35	SL. HYPERPLASIA + INVOLUTION	2000 1500	—	60	9 15 7
2	MARGARET B. MGH-300230	+35	1.4 mC 5-10-'41 0.9 mC '41 2.4 mC '42 0.8 mC '42 } 5.6 mC	NOT OPERATED ← PERSISTENT THYROTOXICOSIS ANOTHER 20 mC PROPOSED				160 110 120 100	140 100 120 100	40	54* 48 78 — —
4	CAMILLE SCH* MGH 309302	+30	3.6 mC 7-14-'41 2.2 mC 7-31-'41 } 5.8 mC	← EYES BETTER. NO GOITER. BMR (+2) OFF MED. - 4 YRS				270 170	300 180	60	55 56
3	RUTH M. MGH-304538	+50	3.4 mC 6-6-'41	REMISSION FOR 1 YR - THEN				430	410	45	45
			20 mC 1-9-46	(RECENTLY FOR TRUE RECURRENCE)				4300	—	30 (RECURRENCE)	35

* OPHTHALMOPATHIC TYPE

TABLE II - ANALYSIS OF 20 CASES "CURED" BY RaI + KI ON BASIS OF EXAMINATION MARCH 31, 1946

SERIES NO.	CASE-HOSP. NO.	DOSE OF I^{130} and DATE OF ADMINISTRATION	BMR BEFORE I^{130}	BMR LEVEL OFF IODIDES	TIME OFF IODIDES	THYROID SIZE '46	ESTIMATED THYROID WT. (8m.)	% OF RaI EXCRETED 72 HOURS	ESTIMATED IRRADIATION (r) 12 HOUR	THYROID (r) 8 DAYS*
6	MICHAEL K. MGH-227382	2.3mC 7-24-41 } 4.0 mC 1.7mC 7-30-'41 } mC	+45	DEC. '42 (-9) MAY '43 (-16) JAN. '46 (-7)	4 YRS.+	N	45	35 22	320 280	390 300
7	ALLISON D. (AET 9.) MGH-319927	1.4mC 8-19-41 } 2.9 mC 1.5mC 5-21-41 } mC	+65	1-8-'46 (-4)	4 YRS.	N	45	3 20 (?)	260 260 (?)	280 220 (?)
8	NAOMI K. (AET 9) MGH-321155	1.5mC 9-24-'41	+30	7-17-'45 (-3) 5-27-'46 (+4)	7 MOS	FIRM 2 X N	40	15	300	250
9	MILDRED G. MGH 322935	4.9mC 11-26-'41	+30	5-8-'45 (-10)	4 YRS.	N	60	17	650	420
11	FRANCES H. MGH-198910	5.8mC 4-9-'42	+37	7-9-'42 (-12) 2-24-'44 (+9) 2-3-'46 (+3)	3.5 YRS.	N	60	17	750	380
12	FERDINAND L. MGH-334330	7.5mC 5-15-'42	+55	'45 (+11) 2-3-'46 (-13)	3 YRS.	HARD 1.5 X N	60-75	26	950	500
13	DOROTHY P. MGH-585541	12mC 6-9-'42	+30	3-'43 (+6) 2-3-'46 (-10)	3 YRS.	N	40	71	750	
15	MARY M. MGH-362811	6mC 8-11-'42 } 10 mC 4mC 8-11-'42 } mC	+35	4-'45 (-6) 2-3-'46 (+2)	10 MOS.	N	40	10	2000	
17	GEORGE T. BCH-1076956	13mC 8-13-'42	+50	6-10-'44 (-15) 1-6-'46 (-9)	3 YRS.+	N	60	14	1300	
18	JEANETTE G. MGH-367094	10.5mC 8-15-42	+35	8-22-'44 (+10) 2-16-'46 (+1)	3 YRS.+	N	40	15	2000	
20	ANNE D. MGH-233271	10mC 11-14-'42	+50	4-3-'45 (-1) 2-16-'46 (-5)	2 YRS.+	N	45	20	1600	
21	RICHARD T. BIH-67686	14mC 11-20-'42	+45	1-8-46 (-13)	3 YRS.+	N	50	15 (?)	2000	
22	ESTHER R. MGH 30[illegible]04	13mC 3-9-'43	+20	6-30-'43 (-8)	2 YRS.+	"?N" (LMB)	55	33	2200	
23	MARGARET D. MGH-385741	8mC 3-15-'43 } 18 mC 10mC 3-16-'43 } mC	+55	6-9-'43 (-11) 2-16-'46 (-3)	2 YRS.+	FIRM 1.5 X N	75	76 67	500	
24	JANE ANNE F. MGH-397402	10.5mC 3-26-'43 } 15 mC 4.5mC 3-27-'43 } mC	+40	12-'45 (-5)	2 YRS.+	N (DR. J.C.) (ZILHARDT)	50	57? 31	1000	
25	SOPHIE R. MGH-397951	16mC 4-2-'43	+44	9-28-'44 (-7) 4-27-'45 (+9) 3-20-'46 (+14)	2 YRS.+	N (DR. J.C.) (AUG)	50	20.6 63.0	750	
26	BESSIE W. METAB. #23843	12mC 4-6-'43	+39	'45 (-8) 1-16-'46 (+2)	2 YRS.+	N	45	85	350	
27	WINIFRED K. MGH-398698	13mC 4-12-'43	+40	7-17-'45 (-16) 2-15-'46 (-10)	2 YRS.+	N	50	33	1600	
28	MARGARET H. p.p. Dr Hertz	10.5mC 4-13-'43 } 21 mC 11.0mC 4-13-'43 } mC	+55	12-'45 (-5) 2-3-'46 (+6)	2 YRS.+	N	75	---?	2000	
29	JULIA RAF. RY MGH-395852	8mC 3-29-'43 } 12 mC 4mC 3-30-'43 } mC	+30	2-'46 (+4)	2 YRS.+	N	55	10 53 (?)	1200 250	

* BD. ISOTOPE FIGURES ASSUME NO LOSS OF IODINE FROM THYROID DURING DECAY; THEY ARE THEREFORE EXCESSIVE. THEY WERE NOT MEASURED FOR CASES 13-29 -.-

DR. SAUL HERTZ
Commander (MC) USNR

RADIOACTIVE IODINE IN THE STUDY OF THYROID PHYSIOLOGY

VII. The Use of Radioactive Iodine Therapy in Hyperthyroidism

SAUL HERTZ, M.D.
Boston
and
ARTHUR ROBERTS, Ph.D.
Cambridge, Mass.

In previously published experiments of this series[1] radioactive iodine was used as an indicator in the study of animal and human thyroid physiology and iodine metabolism. Much of this preliminary work was done with a view to the discovery of the conditions under which radioactive iodine might be administered with maximum radiational effect in the pathologic thyroid of patients ill with hyperthyroidism. The present paper is a progress report on our early experiences (1941-1946) with such "internal irradiation" in the treatment of 29 cases of hyperthyroidism. It is, indeed, a three to five year follow-up report on these cases.

PROCEDURE

Patients were selected who had had no previous iodine treatment and who were judged clinically to have hyperthyroidism. The usual clinical tests were made and the patients were presented to the Thyroid Clinic of the Massachusetts General Hospital for discussion and determination of their suitability for this type of treatment. In each instance a dose of radioactive iodine, which had been made by the cyclotron at the Massachusetts Institute of Technology or by the Harvard University cyclotron, and separated chemically as sodium iodide, was then orally administered.

The samples of radioactive iodine used were obtained by deuteron bombardment of tellurium and at the time of administration consisted of a mixture of different radioactive isotopes of iodine. Over 90 per cent of the activity at this time consisted of the 12.6 hour isotope I^{130} and most of the remainder of the 8 day isotope I^{131}. The total activity administered varied between 0.7 and 28 millicuries. In 19 cases the total dose was administered to the individual patients as one dose; in 10 cases divided dosages were employed.

From the data already obtained from tracer studies it was considered desirable to keep the total amount of iodide administered below 2 mg. of iodine in order to insure maximum collection by the thyroid.

Urinary iodine excretion was determined during the first seventy-two hours after the administration of radio-iodine. An indirect estimate of the thyroid retention of radioactive iodine was thereby obtained, since an approximate balance exists between administered iodine on the one hand and the sum of thyroid iodine retention and urinary excretion on the other.

Urinary studies were carried out on aliquot portions of carefully collected twenty-four hour specimens, which were kept iced and corked during the collection periods.

It was early found[2] that significant amounts of the original dose were to be found only in the first three days' specimens. Fecal excretion was tested and was found to be so low as to be negligible for the purpose of these experiments.

In a few cases external gamma ray counter measurements were made of the activity of the thyroid of patients following the administration of radioactive iodine. Such measurements are difficult, for obvious reasons, to evaluate quantitatively. However, day to day measurements of this type can give good data on the variation of thyroid iodine content. They were performed in order to follow the loss of iodine from the thyroid following the initial uptake and to evaluate the effect of routine iodinization following the administration of radioactive iodine.

External counter measurements were roughly calibrated against actual direct measurements on the thyroid glands at operation and after chemical separation[3] in 2 patients, previously scheduled for surgery, who received therapeutic amounts of radioactive iodine.

Following the administration of radioactive iodine, routine iodine (nonradioactive) in the usual dosage of saturated solution of potassium iodide 5 minims (0.3 cc.) twice a day was begun at periods varying from one day to several weeks after the radioactive iodine dose.

The basal metabolic rate of the patients treated was tested frequently both before and after the radioactive iodine administration. Basal metabolic levels were taken prior to treatment to establish a measure of the degree of thyrotoxicosis present. In addition to the basal metabolic rate, weights, pulse rates and physical findings were recorded and the total clinical picture was used to evaluate the effects of treatment. No adverse effects, such as fever, nausea or irradiation sickness, were noted in this series of patients. No complaints were recorded regarding the taste of the medicament (since it is tasteless), nor were any local effects, either in the oral cavity or over the thyroid, encountered at the dosage levels used. No increase in the degree of thyrotoxicosis following the radioactive iodine treatment, per se, was recorded, although several test patients were kept uniodinized for three to four weeks prior to routine iodinization.

In most cases, after a period of two to four months following the radio-iodine administration, routine iodine therapy was stopped when an essentially normal basal metabolic rate had been maintained on iodine for a few weeks or months. Such basal metabolic rate response was taken to be indicative of good control of

A report to March 15, 1946.
From the Thyroid Clinic and Metabolism Laboratory of the Massachusetts General Hospital and the Radioactivity Center, Massachusetts Institute of Technology. This material was presented in part to the American Society for Clinical Investigation in May 1942 (see abstract of proceedings, Physiol. Rev. 22:4, 1942). The work was aided by a grant from the John and Mary R. Markle Fund in the names of Professors J. H. Means and Robley D. Evans and was accomplished by close cooperation of the Radioactivity Center of the Massachusetts Institute of Technology, Cambridge, Mass., and the members of the medical staff of the Massachusetts General Hospital, Boston.
The work was performed at the Massachusetts General Hospital and the Massachusetts Institute of Technology under a grant from the John and Mary R. Markle Fund. Cooperation and assistance in this work were given by Professor J. H. Means, Professor J. W. Irvine, Dr. Wendell C. Peacock, Professor M. Stanley Livingston, Professor Robley D. Evans, Dr. R. W. Rawson and Jacob Kistner, the technical assistants Dr. Phyllis Brown Shattuck, Miss Ann Gaurdo and Miss Mary Leanon as well as the nursing, surgical and medical staffs of the Massachusetts General Hospital. The speech of President Karl T. Compton of the Massachusetts Institute of Technology before a Harvard Medical School colloquium in the fall of 1936 served to inspire the senior author in the initiation of this investigative program.

1. Hertz, S.; Roberts, A., and Evans, R. D.: Radioactive Iodine as an Indicator in the Study of Thyroid Physiology, Proc. Soc. Exper. Biol. & Med. 38:510 (May) 1938. Hertz, S.; Roberts, A.; Means, J. H.; and Evans, R. D.: Radioactive Iodine as an Indicator in Thyroid Physiology: II. Iodine Collection by Normal and Hyperplastic Thyroids in Rabbits, Am. J. Physiol. 128:565 (Feb.) 1940; Tr. Am. A. Study Goiter, 1939, p. 260. Hertz, S.: Radioactive Iodine as an Indicator in Thyroid Physiology: III. Observations on Rabbits and on Goiter Patients, Am. J. Roentgenol. 46:467 (Oct.) 1941. Hertz, S., and Roberts, A.: Radioactive Iodine as an Indicator in Thyroid Physiology: VI. Application of Radioactive Iodine in Therapy of Graves' Disease, J. Clin. Investigation 21:624 (Sept.) 1942. Hertz, Roberts and Salter.[2] Hertz and Roberts.[3]

profession, this form of treatment may well prove itself not only highly effective, safe and noninjurious but also cheap and of least inconvenience to the patient who may receive it while continuing at his normal pursuits. After a short period of hospitalization for the usual preliminary clinical studies and the administration of radio-iodine, the patient may be fully iodinized and released, to be followed as an ambulatory case.

SUMMARY

On the basis of a series of animal and clinical experiments using radioactive isotopes of iodine as a tracer in the study of thyroid physiology and iodine metabolism, the treatment of 29 cases of hyperthyroidism with internal irradiation by radioactive iodine was instituted. By careful excretion studies, external counter measurements over the thyroid gland and by planned operations in 2 cases, data were obtained which allow us to construct a formula for a procedure in treatment.

The addition of ordinary iodine therapy after the administration of radio-iodine offers many advantages in the clinical care of these patients and in the economy and safety of the procedure.

By an analysis, over a long period, of both the failures and successes in this series of 29 cases, it is shown that radioactive iodine when given in the dosage range of 5 to 25 millicuries to uniodinized patients with hyperthyroidism possessing goiters of 60 to 75 Gm. is highly effective as a cure of the disease in about 80 per cent of cases. When appreciable activity has been administered and subtotal thyroidectomy is resorted to, myxedema or hypometabolism may be expected to develop in a large fraction of the cases (100 per cent in 5 cases in this series).

THE TREATMENT OF HYPERTHYROIDISM WITH RADIOACTIVE IODINE

EARLE M. CHAPMAN, M.D.
and
ROBLEY D. EVANS, Ph.D.
Cambridge, Mass.

Roentgen treatment has been used for hyperthyroidism for many years. In 1923 Means and Holmes[1] pointed out that in this form of treatment about one third of the patients are cured, another third improved and another third not affected. Since 1923 ordinary iodine by mouth has been used as a preoperative method of quieting the hyperactive thyroid in preparation for surgery. Under iodine alone occasionally the patient and the doctor have been agreeably surprised to find that the symptoms and signs of hyperthyroidism disappeared, and a permanent remission apparently was effected. That x-ray treatment and iodine treatment sometimes cure hyperthyroidism led to the hope that some day a more effective, nonsurgical agent would be found. Then the MacKenzies[2] and Astwood[3] discovered that several chemical compounds inhibit the function of the thyroid in hyperthyroidism as well as under other circumstances. Several of these agents have been investigated, and until now thiouracil has been found to be most useful in the treatment of thyrotoxicosis.

Induced radioactivity was discovered in 1934, and that same year Fermi and his co-workers[4] in Italy prepared radioactive isotopes of iodine. Because the thyroid absorbs iodine selectively, it seemed likely that beta rays from iodine rendered radioactive would have a greater radiation effect than that derived from roentgen rays delivered through the skin and overlying tissues.

The use of radioactive iodine in the study of thyroid physiology was soon undertaken and reported first in 1938 by Hertz, Roberts and Evans.[5] Subsequently these and other investigators used various isotopes of radioactive iodine as tracers for the study of thyroid function[6] and it was found that in untreated hyperthyroidism the thyroid may take up as much as 80 per cent of a small dose (less than 2 mg.) of iodide within a few hours after oral administration.[7] This established the basis for therapeutic trials of radioactive iodine, and in 1942 Hertz and Roberts[8] published a preliminary report of the treatment in this manner of 10 patients. In this series the procedure was to give the radioactive iodine and follow this with ordinary iodine by mouth for a period of several months. However, our review in the clinic of these 10 cases of Hertz and Roberts, and an additional 18 so treated under the direction of Hertz, has led to the conclusion that it is difficult to decide whether those patients who improved were responding to the ordinary iodine, to the radioactive iodine or to their combination. The dosage of radioactive iodine given to these 28 patients averaged 5 millicuries in 1941, 10 millicuries in 1942 and 14.5 millicuries in 1943, the largest single dose being 21 millicuries. In April 1943 Dr. Hertz went on active duty in the Navy and asked us to continue with this study. The present report is on a series of 22 patients with hyperthyroidism (treated only with radioactive iodine and with considerably higher doses. Although both Hertz and Roberts[8] and Hamilton and Lawrence[9] were encouraged by their therapeutic trials, the details of their findings have not yet been published.

METHODS AND DOSAGE

Selection and Care of Patients

The patients selected in the Thyroid Clinic of the Massachusetts General Hospital for radioactive iodine therapy were judged by several physicians to be thyrotoxic on the basis of classic disease pattern accompanied with constantly elevated basal metabolic rates. All patients had thyroids estimated to be at least two to three times normal in size. All but 3 were kept free from all forms of treatment, especially iodine, for at least four weeks prior to giving radioactive iodine. For the administration of the drug they were usually hospitalized for a time adequate to obtain levels of their basal metabolic rate, then given radioactive iodine by mouth—simply a drink of what tastes like rather stale water.

Aided in part by a grant from the John and Mary R. Markle Foundation.
From the Thyroid Clinic of the Massachusetts General Hospital (Dr. Chapman) and the Radioactivity Center of the Department of Physics of the Massachusetts Institute of Technology (Dr. Evans).

1. Means, J. H., and Holmes, G. W.: Further Observations on the Roentgen Ray Treatment of Toxic Goiter, Arch. Int. Med. 31:203 (March) 1923.
2. MacKenzie, C. G., and MacKenzie, J. B.: Effect of Sulfonamides and Thiourea on the Thyroid Gland and Basal Metabolism, Endocrinology 32:125 (Feb.) 1943.
3. Astwood, E. B.: Treatment of Hyperthyroidism with Thiourea and Thiouracil, J. A. M. A. 122:78 (May 8) 1943.
4. Fermi, E.: Radioactivity Induced by Neutron Bombardment, Nature, London 133:757 (May 19) 1934.
5. Hertz, S.; Roberts, A., and Evans, R. D.: Radioactive Iodine as an Indicator in the Study of Thyroid Physiology, Proc. Soc. Exper. Biol. & Med. 38:510 (May) 1938.
6. Rawson, R. W.: Radio Iodine: Its Use as a Tool in the Study of Thyroid Physiology, to be published. Hamilton, J. G., and Soley, M. H.: Studies in Iodine Metabolism by the Use of a New Radioactive Isotope of Iodine, Am. J. Physiol. 127:557 (Oct.) 1939. Le Blond, C. F.; Sue P., and Chaworre, A.: Passage de l'iode radio-actif dans la thyroïde d'animaux sans hyperthyroïdie, Compt. rend. Soc. de biol. 133:340, 1940.
7. Hertz, S.; Roberts, A., and Salter, W. T.: Radioactive Iodine as an Indicator in Thyroid Physiology: IV. The Metabolism of Iodine in Graves' Disease, J. Clin. Investigation 21:25 (Jan.) 1942.
8. Hertz, S., and Roberts, A.: Application of Radioactive Iodine in Therapy of Graves' Disease, J. Clin. Investigation 21:624 (Sept.) 1942.
9. Hamilton, J. G., and Lawrence, J. H.: Recent Clinical Developments in the Therapeutic Application of Radio-Phosphorus and Radio-Iodine, J. Clin. Investigation 21:634 (Sept.) 1942.

THE JEWISH ADVOCATE

Dedicated to Americanism, Judaism, Social Service

Vol. 97, No. 17 THURSDAY, MAY 23, 1946 Twenty-Four Pages Seven Cents the Copy

U.S. Government Officially Endorses Inquiry Committee Recommendation To Admit 100,000 Jews Into Palestine

State Dept.'s Request for More Views Doesn't Halt Urging Speedy Transfer

WASHINGTON, May 23 (Special Dispatch)—The State Department announced last night that the United States Government has officially endorsed the Palestine Inquiry Committee's recommendation for the immediate admission of 100,000 Jewish refugees into Palestine and that it was determined to press for speedy transfer of the immigrants.

The statement was issued to clear up misunderstandings created by a State Department memorandum issued this week requesting further views from Jews and Arabs on the Anglo-U. S. Report.

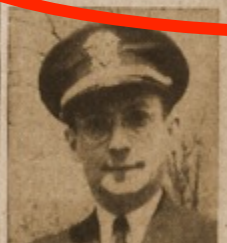
President Truman had endorsed the provision calling for the admission of the 100,000 when the Report was made public on April 30, and urged then that the immigration be carried out "with the greatest dispatch."

"It must be clear that the President's statements are controlling upon all the departments of government."

(Continued on Page 7)

Local Researchist Discovers Cure for Goitre Through A-Bomb By-Product

By SHIRLEY I. CIBLEY



DR. SAUL HERTZ
Commander (MC) USNR

In 1936, the field of radioactive isotopes and their possible uses to extend and test medical theories and biochemical processes was just coming to the forefront of medical research. In that same year, Dr. Saul Hertz, of Brookline, attended a Harvard Medical School conference and was particularly inspired by a speech delivered by Dr. Karl T. Compton, in which the President of Massachusetts Institute of Technology made a plea for medical men to become interested in the application of the newer physical methods which were then becoming available through technological studies.

Thus was born the germ of an idea with which Dr. Hertz has worked, studied and experimented, and which today has resulted in his revolutionary discovery of a new treatment for Graves' disease (popularly referred to as pop-eyed goitre) through the application of radioactive iodine.

(Continued on Page 11)

Spotting the News

(World News Services Feature)

By ABRAHAM J. ARNOLD

HAGANA WARNING—The transfer of British military bases from Syria, Lebanon and Egypt to Palestine wil' not be tolerated, warned the Voice of Israel, underground radio of the Hagana resistance movement. Having agreed to remove their troops from Egypt and other countries in the Middle East, Britain is interested in maintaining the mandate at all costs and later taking over the trusteeship of Palestine. She wants this not in the interests of the Jewish people but to maintain her own power in the Middle East, the undrground radio pointed out.

THE "HOLY WAR" IS OFF—Latest statements by Arab League leaders and spokesmen for the Arab Higher Committee in Palestine finally reveal that th. call for a "Holy War" in Palestine was nothing but a first-class hoax. Dr. Izzat Tarnous, spokesman for the Arab Higher Committee, said this week that the use of force was not being considered and they were not prepared for a clash. It is also reported that the Arab attitude towards Russia has cooled off considerably. This shows quite clearly that the Arabs were bluffing in their war threats and leads us to believe that the Arab League has not got the full support among the Arab masses in Palestine to which they lay claim, . . . nor, as events show have they the alleged support of the Russians. This bears out the opinio of a highly placed Zionist leader, voiced to this writer, that the Russians would not support Arab demands at this time despite efforts to extend their influence and power in the Middle East.

Marine Flasher Brings First Immigrants—4 Have Kin Here

Local Community Plans to Welcome Its Quota; Rabbi Shubow Accompanies Group from Germany

Dreams of freedom, sustained through the horror and degradation of the war years, became reality for 887 European immigrants aboard the "S. S. Marine Flasher" when the reconverted troopship docked this past Monday in New York harbor.

Passage for 444 of the displaced persons, who are the first to arrive here under President Truman's immigration directive, was arranged by the Joint Distribution Committee

UN Commission In Report on Human Rights

NEW YORK (JTA)—The early writing of an International Bill of Rights under the provisions of the United Nations Charter, pledging world-wide promotion of human rights by all states which are members of the United Nations, is urged in a report which the U.N. Commission on Human Rights completed this week under the chairmanship of Mrs. Eleanor Roosevelt.

The report will be submitted

Zionists Hold Special Meet In Washington

N. E. Emergency Council Plans Fund Dinner to Implement Decisions

A large delegation, representing leaders of the New England Zionist Region, Hadassah, Poale Zion and Mizrachi, as well as local Zionist Emergency Councils, is attending the all-day Conference called by Dr. Abba Hillel Silver and Rabbi Stephen S. Wise in Washington, D. C., today. The delegation, led by Ralph F. Bess, chairman of the New England Zionist Emergency Council, Mrs. Lewis Goldberg, representing the New England Hadassah Region, and Rabbi Isadore D. Passow, executive director of New England Zionist Emergency Council, will meet with leaders from all parts of the country to decide on a course of action "to fight the present policy of evasion and equivocation" on the Anglo-American Inquiry Committee's recommendation to admit 100,000 Jews into Palestine immediately.

The course of action on the Zionist political front to be decided at today's national conference will be implemented in

(Continued on Page 11)

Governor Tobin To Sign Mass. FEPC Bill Today

B'nai Brith To Convene Here This Week-End

B'nai Brith leaders from every part of New England, New York State and Eastern Canada, will gather in Boston this week-end, at the 94th annual convention of District No. 1, which will open Friday evening with special services at Temple Sinai, Brookline.

On Saturday afternoon, a tea and entertainment will be tendered visiting ladies at the Salle Moderne, Hotel Statler, and a special reception to visiting delegates and guests

Sen. Barkley to Address Dinner For Birobidian

Judge Pinanski Public Library Board Chairman

New Palestine Colony Honors Massachusetts

JERUSALEM (JTA)—The colony of Nachlath Massachusetts, named in honor of the State of Massachusetts, was

Beth Israel Hospital, Boston

“My new research project is in Cancer of The Thyroid which I believe holds the key to the larger problem of Cancer in general.”

Dr. Saul Hertz
Letter to MGH’s Director
March 12, 1946

SAUL HERTZ, M. D.
(Director of the Radioactive Isotope Research Fund*
270 Commonwealth Avenue, Boston, Massachusetts)

Announces

The Establishment of a Memorial to the

AARON DANIEL and BERTHA HERTZ Family

of Cleveland, Ohio
to be known as

The Radioactive Isotope Research Institute

with Clinical and Laboratory Facilities at
Commonwealth Avenue, Boston, Massachusetts
and
New York City Headquarters at 932 5th Avenue**

To Be Devoted to the Application of
Nuclear Physics to Medical Investigation,
Diagnosis and Treatment.

*Registered at Boston, Mass. on the 9th Day of September, 1946.
**Dr. S. M. Seidlin, Associate Director; Dr. Roy Hertz, Oncologist; Dr. Eugene Nelson, Physicist.

Dr. Samuel Seidlin of New York's Montefiore Hospital treats metastasis with RAI

RADIO-IODINE HALTS ONE TYPE OF CANCER

Radioactive chemical brings about history-making recovery of patient dying from thyroid tumors

The man shown in the contrasting portraits at right is a Brooklyn shoe salesman named Bernard Brunstein who is destined to become one of the most famous patients in medical history. Brunstein is the first person known to be cured (insofar as a cure can be established by medical tests on a living patient) of metastatic cancer, a form of the disease in which the malignancy spreads through the body from an original tumor. Metastatic cancer has always been 100% fatal. But Brunstein's tumors were destroyed in a simple, almost miraculous way: by the drinking of four doses of radioactive iodine.

When Brunstein was admitted to New

BERNARD BRUNSTEIN IN 1942 (LEFT); AS HE LOOKS TODAY

iodine is chemically identical with ordinary iodine, it gives off a powerful radiation that can kill any tissue that absorbs it in sufficient concentration. The chemical had never been effectively used as a treatment for cancer, but Brunstein agreed to try it in the hope that it might help. It did. Three months after he drank his first glassful of the tasteless, colorless liquid, his heart began to slow down and he started to put on weight. Geiger counters placed over the tumor sites revealed that there was a heavy concentration of radio-iodine in these areas. After three additional doses the tumors slowly began to diminish in size

“I have certain ideas in the field of Cancer…the cancer field is relatively virgin territory both from the standpoint of actual knowledge or prognostic attack.”

“Only recently a group of of workers in England have reported the regular production of cancer of the Thyroid in animals by a series of steps which are subject to analysis and close study by means of Radioactive Iodine as a tracer.”

Dr. Saul Hertz
Letter to MGH’s Director
March 13, 1946

A Plan for Analysis of the Biologic Factors Involved in Experimental Carcinogenesis of the Thyroid by means of Radioactive Isotopes*

SAUL HERTZ, M.D.

Commander (MC) USNR; Research Associate, Harvard Medical School and Massachusetts Institute of Technology; formerly in charge of the Thyroid Clinic of the Massachusetts General Hospital, Boston.

In studies by Hertz, Roberts *et al.*[1-3] the radioactive isotopes of iodine were utilized in studies of thyroid physiology, biochemistry, and pathologic physiology of both animals and man. In that series of experiments the isotopes I 128, I 130, and I 131 were found to give data in tracer experiments which led to a successful therapeutic application in Graves' disease.[4]

At the outset of the above experiments in 1937, it was thought that there might be equally promising therapeutic possibilities in the treatment of carcinoma of the thyroid. 1942, documents clinical trials of RAI to treat Thyroid Carcinoma.

tive to the Ra-I. We pointed out, therefore, that the cancer cells were biologically quite different from the normal and hyperplastic thyroid cells with respect to their iodide metabolism. We postulated that there might be an enzyme system in the normal and hyperplastic thyroid which had the function of conversion of inorganic iodides to organic iodides in the preliminary steps of bio-synthesis of thyro-globulin, and that enzyme system ("iodase") might be either absent or deficient in the cancer tissue.

*This paper is prepared in order to place on record an experimental approach to cancer of the thyroid. This approach impresses the author as of sufficient interest and importance to workers in the field of cancer to warrant publication of this article at the inception of a program of research being undertaken at the Massachusetts Institute of Technology and Beth Israel Hospital, Boston, Massachusetts. It is published in the hope that others will find in it a stimulus to adopt portions of the problem for analysis according to the available techniques in their particular laboratories so that the program may go ahead as rapidly as possible through a community of interest and division of labor.

(*Bulletin of the New England Medical Center VIII: 220-224, October, 1946*)

thiourea therapy should be especially careful in the use of such insecticide powders," particularly when thiourea is being used in a prolonged fashion as a non-operative treatment of Graves' disease.

SUMMARY

active iodine, sulphur, antimony, cyanate, and fluorine to such an analytic study is emphasized. From this projected program it is hoped that a logical theory of carcinogenesis and an understanding of important preventive and therapeutic factors may be developed.

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Hertz to Use Nuclear Fission in Cure for Cancer

By DONALD G. VINCENT

Dr. Saul Hertz, instructor in Medicine in the Medical School, has announced that he has founded an institution, The Radioactive Isotope Research Institute, whose purpose is to apply radioactive fission products to the treatment of the thyroid cancer, goiter, and other malignant growths.

Dr. Hertz is connected with both the Medical School and Beth Israel Hospital as medical associate and research associate. In the past, he has been in charge of the Thyroid Clinic of the Massachusetts General Hospital and Research Associate at the Massachusetts Institute of Technology.

The research conducted by Dr. Hertz and others which led to the Radioactive Isotope Research Institute, was financed by a grant from the John and Mary Markle Fund in New York City and the Milton M. Proctor Fund here. Most of the work was done at the Massachusetts General Hospital and at M.I.T.

Wants Central Agency

Dr. Hertz has long hoped that the government will set up a centralized agency to handle the distribution of radioactive isotopes for use by private enterprises working on approved projects. Now that isotopes are about to be released in greater quantity than ever before, the matter is assuming immediate importance. For although more isotopes are available than previously, the quantity at hand is limited and an efficient organization in the field is necessary.

The new Institute, financed by the establishment of a memorial to the Aaron Daniel and Bertha Hartz family of Cleveland, Ohio, will be the first privately endowed organization to receive regularly a clinical supply of radioactive iodine and radioactive phosphorous, by-products of the uranium piles which produce plutonium for use in atomic bombs. This method of production is relatively cheap, since the only alternative means is cyclotron bombardment which produces such small quantities as to be impractical for the desired scale of operation.

Elements Absorbed by Gland

Chiefly concerned are isotopes of elements which the thyroid, especially in cases of toxic goiter, has the property of absorbing and concentrating at the affected portion of the gland. This process enables the radiation emitted by the radioactive isotopes to destroy harmful growths. Other elements which do not become concentrated in the body as iodine does, may be used in research on body chemistry, since by their effect on a Geiger counter, their progress through the body may be traced—this they are termed "tracer elements."

The beauty of radio-therapy lies not only in its more favorable rate of cure over the ordinary surgery, but in its simplicity.

Simple, No Ill Effects

Few ill effects from this treatment have been noted. When radio-therapy was first used an the correct dosage was not accurately known, a few cases of "radiation sickness" were noted, but this had been encountered before the use of radium treatments and hence was not overly alarming.

Radioactive iodine, which has now been shown to be effective in curing disease, is a by-product of nuclear chain-reacting "piles" used to manufacture the materials for atomic bombs. There are many such piles now in operation, all under Army direction. Up to the present, the Army has been unable to release the radioactive by-products of the piles for medical or research purposes. Any one of the existing piles produces more than enough radioactive iodine in one day's operation to treat every sufferer from Graves' disease in the country. At present, all such radioactive materials are stored in vain.

The patient drinks a glass of water containing the tasteless radioactive iodine. The treatment is not only simple, but should be inexpensive. Even as now produced by cyclotrons, it costs less than a surgical operation.

DR. SAUL HERTZ, instructor in Medicine at the Medical School, who has announced the establishment of the Radioactive Isotope Research Institute. The foundation will apply the products of atomic fission to the treatment of malignant growths.

Dr. Hertz feels that the application of isotope research to the cancer problem will be along "tracer" lines, since it has been demonstrated that the majority of cancerous thyroids do not take up the radioactive iodine in the manner in which do the glands of patients suffering from Graves' disease.

Dr. Hertz was born in Cleveland and is a graduate of the Harvard Medical School Class of 1930. After an internship and residency in Medicine at Mt. Sinai Hospital in Cleveland, he returned to Boston and has been active in research in thyroid disease since 1931. He has contributed numerous scientific articles in endocrinology and is a member of the Society for Clinical Investigation and the Federation of Experimental and Biological Societies. He is also a member of Phi Beta Kappa. He has been on the staff of the Massachusetts General Hospital and was in charge of the Thyroid Clinic until his entry into the Naval service.

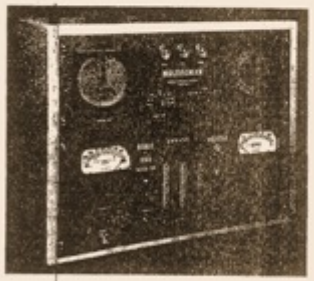
Stresses Interaction

In an interview yesterday, Dr. Hertz stressed the production of this new form of treatment as an example of the need for close interaction between technological science and the medical profession for full utilization of these fields. He warned that, in a sense, this discovery might tend toward a complacency attitude in regard to pushing forward

Two New England science teachers get first hand information on the arrival of the Atomic Age. FLETCHER G. WATSON, Associate Professor of Education, demonstrates to E. J. MORGAN and VINTON R. RAWSON that sand from the scene of the first atomic explosion is still radioactive. The exhibit, at the Atomic Energy Workshop of the American Academy of Arts and Sciences, was part of the New England School Science Council's program to impart accurate teaching on atomic energy to schools of this region.

toward the development of even more fundamental forms of treatment of Grave's disease. However, he emphasized this example in therapeutic application as a beacon in utilizing the tracer methods employing radioactive substances for the analysis of cellular function, growth, metabolism and nutrition in the body and in other organs than the thyroid. His point out that knowledge gained about the thyroid has already led him and others to many stimulating theories in the cancer and enzyme fields.

Radioactive isotopes of phosphorus have been employed in palliative therapy in such conditions as leukemia and polycythemia; but the better treatment by means of radioactive iodine as here, represents a "first" in what he hopes will be a long series of diffusive treatment based upon the applications of fundamental researches of the nuclear physicists.



Uptake Test Multiscaler

$3.40 Goiter Cure Involves Orange Juice, Iodine Isotope

[Boston Herald-N. Y. Times Dispatch]

MADISON, Wis., Sept. 13—Dr. Saul Hertz of Harvard Medical School told scientists attending the University of Wisconsin symposium on radioactive isotopes here today of a complete treatment for poisonous goiter which consists merely of taking a dose of radioactive iodine in a glass of orange juice.

The activated iodine is taken up by the cells of the thyroid glands and produces internal radiation that stops the action of the poisonous goiter, Dr. Hertz said, adding that persons cured as far back as 1939 under this treatment have had no recurrence.

This cure takes the places of operations running into hundreds of dollars, and the non-surgical treatment costs about $3.40, he declared.

Dr. Hertz stated similar treatments for cancer of the thyroid also have brought encouraging results. The radioactive iodine is administered and immediately is "blotted up" by the cancerous growths. By use of a Geiger counter, the cancer can be located and in many cases checked.

Dr. Byron E. Hall, of the Mayo Clinic, Rochester, Minn., said radio-active phosphorus, known by scientists as P32, had cured many cases of polycythemia, a disease in which the red corpuscles increase to the extent of forming fatal blood clots. Dr. Hall said the isotopes suppress the formation of red blood cells and the count soon returns to normal.

The four-day symposium, attended by 600 scientists from all over the nation, concluded here today.

Boston Sunday Herald, September 14, 1947

The American Weekly article generated a strong response from patients. The treatment of RAI cost less than $5.00. Surgery was several hundred dollars.

June 3, 1946.

Mrs. Anna D. Dane
100 Walnut Street
Watertown, Mass.

Dear Mrs. Dane:

I read your article in the American Weekly on your cured goitre with much interest, as I also have a toxic goitre. I have taken xray treatments, and at present I am taking iodine, which controls it enough so I am doing office work and some housework I have not been able to bring myself to consent to an operation, and all this time I have been praying for a cure without surgery. I have had one major operation, and I do not want to go through another one if I can help it. The operation I had was not for goitre.

If the question is not too personal, I would like to have an idea as to the expenses inv . and the te Dr. re refer to his article in the medical journal that he would take the necessary steps. Before I do this I would like to know more about it. As you know from your own expe I am very nervous, however, my weight has gone up since taking the xray treatments. I used to weigh from 89 to 96 lbs. and now weigh 118 lbs. but I would like to get r of all the symtoms, particularly the nervousness. Like you I am up and doing every of my life, but so tired. I am wondering if my own physician who is a goitre-sur would be able to give this treatment and if it would be safe for him to do it. Do think there is any danger in this treatment?

… we are not in the money…

Any information you can give me will be greatly appreciated. Thanking you, I am

Very truly yours,

(Mrs.) U. Frank Dane

122 N. 21st Street
Olean, N. Y.

48 yrs. old.

THE ASPEN INSTITUTE MEETING

Katie Couric interviews
Dr. Siddhartha Mukherjee
Pulitzer Prize winner for *An Emperor of All Maladies*

“Now, almost 80 years later, we are internally targeting other tumors with radionuclides such as Y 90 and Lu177 using Peptide Receptor Radio-Nuclide Therapy….”

Dr. Thomas O’Dorisio
University of Iowa

Dr. Richard Baum

Peptide Receptor Radionuclide Therapy of Neuroendocrine Tumors: The Bad Berka Approach

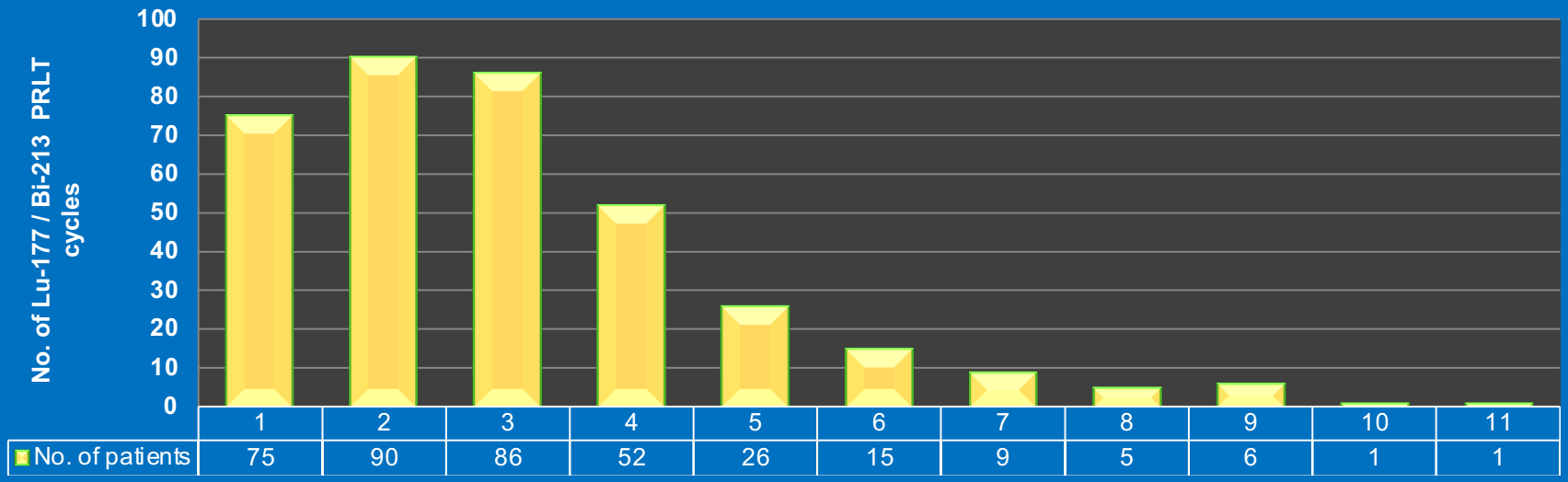

5th
THERANOSTICS
WORLD
CONGRESS 2019
MARCH 1 - 3, 2019
THE SHILLA JEJU HOTEL,
JEJU, KOREA
1st Germany
Bad Berka
2nd India
Chandigarh
3rd USA
Baltimore
4th Australia
Melbourne
5th Korea
Jeju

PSMA radioligand therapy (PRLT) at Zentralklinik Bad Berka

Worldwide 1st PRLT with ^{177}Lu-PSMA I&T was performed at ZBB in Feb. 2013

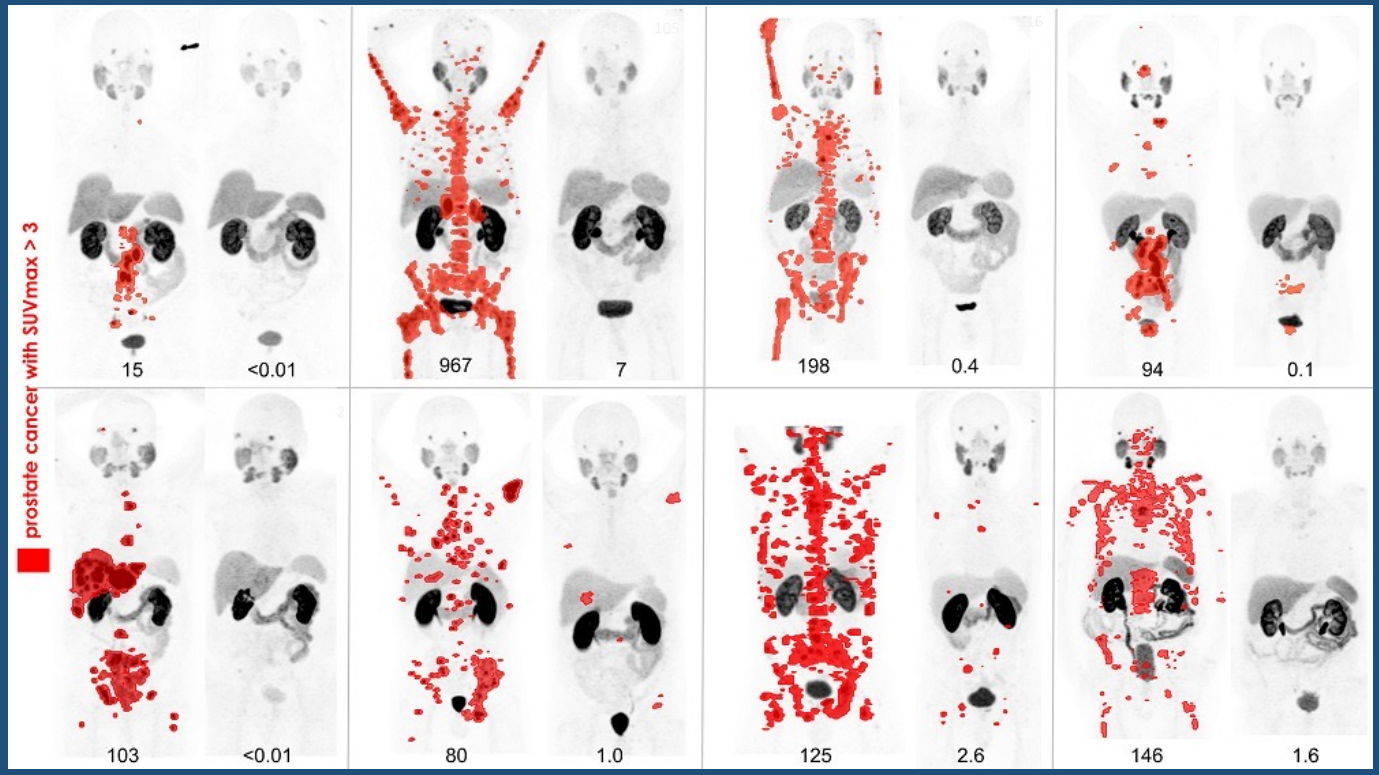
Large number of cycles with ^{177}Lu-PSMA (I&T / 617) until May 31, 2019

Total number of patients treated	366
Total number of cycles administered	1119
Mean administered radioactivity per cycle	6.9 GBq



THERANOSTICS Center for Molecular Radiotherapy, Zentralklinik Bad Berka

PSMA-Targeted Radionuclide Therapy in Prostate Cancer



Dr. Michael Hofman, Peter MacCallum Cancer Center
Melbourne, Australia – Image of the Year SNNMI 2018

"...to calculate patient specific dosimetry showed an early understanding of the medical use of radionuclides that is now being investigated on a large scale to personalize treatment. Hertz and Roberts were truly visionary."

Glenn Flux
Head, Radioisotope Physics
Royal Marsden Hospital, UK

Yale's Dr Nancy Carrasco:
NIS… Sodium Iodine Symporter

Targeted Radioiodine Therapy of Neuroblastoma Tumors following Systemic Nonviral Delivery of the Sodium Iodide Symporter Gene

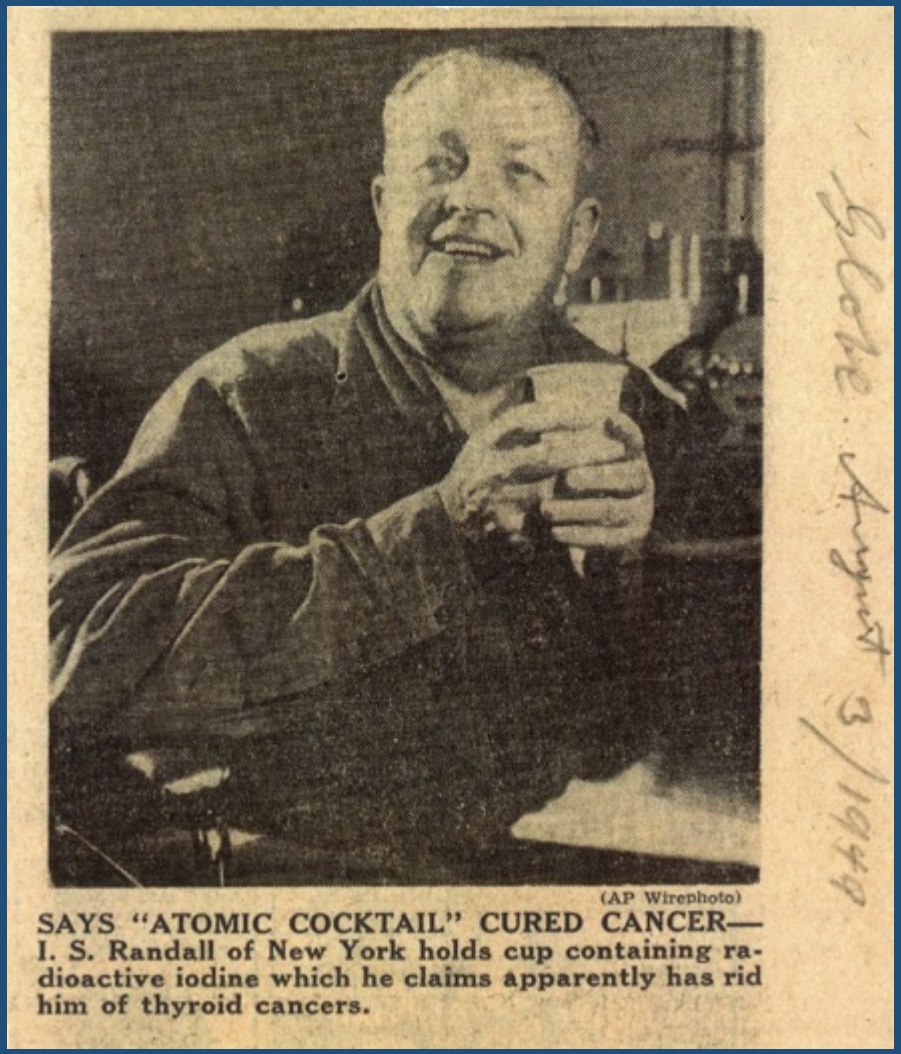
Kathrin Klutz, Verena Russ, Michael J. Willhauck, Nathalie Wunderlich, Christian Zach, Franz Josef Gildehaus, Burkhard Göke, Ernst Wagner, Manfred Ogris and Christine Spitzweg
DOI: 10.1158/1078-0432.CCR-09-0851 Published October 2009

Targeted Alpha Therapy

Dr. Leszek Krolicki

Chair, Department of Nuclear Medicine
Medical University of Warsaw

Iodine I 131 Monoclonal Antibody BC8 Before Autologous Stem Cell Transplant in Treating Patients With Relapsed or Refractory Hodgkin Lymphoma or Non-Hodgkin Lymphoma



(AP Wirephoto)

SAYS "ATOMIC COCKTAIL" CURED CANCER—
I. S. Randall of New York holds cup containing radioactive iodine which he claims apparently has rid him of thyroid cancers.

Globe. August 3/1949

"Treatment with radioactive iodine knocked the thyroid cancer right out of me."

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