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May 19, 1983

Dr. Edward T. Lessard
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Upton, Long Island, NY 11973

Dear Ed:

Thank you very much for your May 2 letter and the update on the Marshallese data. I am glad Charlie asked you to review the SC-57, TG-7 report on Thyroid Cancer. I felt it didn't cover the Marshallese data adequately and suggested in my comments that you be contacted.

I noted that your table lists six total thyroid cancer whereas TG-7 report gives seven. Also, I think seven was the number in Bob Conard's report and the number also appears in the UNSCEAR report. I assume this difference of one is the Utrik case you mentioned in your note to Charlie.

I probably told you that in our meeting at Majuro in December, the Marshallese expressed their belief that they are experiencing a great excess of thyroid cancer as well as birth defects. I don't know how these erroneous perceptions can ever be corrected.

Thank you again for your letter.

With best regards,

Bill

W. J. Bair, Ph.D.
Manager
Environment, Health and
Safety Research Program

WJB:lm

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MAY 9 1983

W. J. BAIR

May 5, 1983

Dr. William J. Bair, Manager
Environmental, Health and Safety
Research Program
Battelle Pacific Northwest Laboratories
P.O. Box 999
Richland, WA 99352

Dear Dr. Bair:

Thank you for your letter of February 28, 1983. I waited to fulfill your request for a copy of the July 1983 abstract because it did not provide information I felt you wanted. Enclosed is a copy of that abstract which deals with both the protracted phase of dose equivalent and the acute thyroid absorbed dose. I have also provided a recent letter from myself to Charles Meinhold which presents updated estimates of thyroid dose which may be useful to you.

The methods used in the thyroid absorbed dose assessment fit together well and the absorbed dose values given in Table One of the letter to Charlie make use of data from four different approaches. I am compiling the initial draft and tabulating intermediate results, therefore, the data in Table One are tentative. The range of thyroid dose is estimated to be about four times the mean values.

Best regards.

Sincerely,

Edward T Lessard

Edward T. Lessard

ETL/cc

Enclosures

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May 2, 1983

Mr. Charles B. Meinhold, Head
Safety & Environmental Protection Division
Brookhaven National Laboratory
Upton, New York 11973

Dear Charlie:

This is in response to your request to review portions of a report of Task Group 7 of Scientific Committee 57 entitled, "Thyroidal Carcinogenesis Following Exposure to Ionizing Radiation". I am familiar with background material related to estimates of thyroid absorbed dose to Rongelap and Utirik Atoll residents who were exposed as a result of the U.S. Pacific Weapons Testing Program. Specifically, my colleagues and I have reassessed thyroid absorbed dose. Details of the methods for the reassessment are in draft form and are going through initial review. Results of the study, which are tentative, are given in Table One.

I have consulted with the Marshall Islands Medical Program Director, William Adams, M.D. in order to determine the total number of people and the total thyroid effects since the time of exposure, March 1954. These data are given also in Table One. The data include the most recent thyroid nodules detected in the exposed population.

Dr. Adams and I estimated the excess cases of nodules and thyroid cancer based on Robert Conard's twenty-six year report (Co80). However, thyroid cancer and nodule data from the Marshallese comparison populations are being thoroughly re-examined by us due to possible low-level exposure of some of these people from the testing program. The average time at risk per irradiated subject was assumed to be the time from radiation exposure on March 1-3, 1954 to time of surgery. One person in the Utirik exposed population was assumed not to be an excess thyroid cancer. Debate continues and a clear distinction of either carcinoma or adenoma for this individual may never be resolved.

One implication of the dose reassessment was that the thyroid dose to each population (see Table One) was from different relative amounts of external and internal radiation. Also, the internal radiation dose rate was different for each atoll population due to differences in nuclide composition as a function of fallout age. The greatest portion of thyroid absorbed dose was reassessed to be from the shorter lived iodine isotopes I-133 and I-135 and not from I-131.

Dr. Adams feels that several cases of nodule incidence may be fortuitous. Dr. Adams based his opinion on surgical notes and must confer with members of the early medical teams directly before reaching a conclusion. For completeness these data have been included in Table One. To date no lethal thyroid cancers have been observed in the exposed population.

Table 2 on Page 42 of the Report has numbers of people which are not in agreement with data gathered by us (compare Table 2 to Table One of this correspondence for specific differences). Table 2 also has a footnote for the Internal Dose columns regarding an assumption without indicating the basis for the assumption. The relationship between thyroid absorbed dose from I-131 to that from I-132, I-133 and I-135 was dependent upon the age of the fallout and not constant with time. A factor of 2.5, as indicated in the footnote, could not apply equally to Ailinginae, Rongelap and Utirik groups since they were irradiated at different times post detonation of BRAVO, the accident which led to their exposure. On Page 41, line 14 of the Report was written that "7 total cases of thyroid cancer... whereas 2 were expected...". We feel an accurate statement to be that: 4 cases of thyroid cancer were found in the irradiated group at Rongelap Atoll whereas 0.56 were expected and 2 cases of thyroid cancer were found in the irradiated group at Utirik Atoll whereas 1.4 were expected.

It is our concern that careful gathering and representation of basic data may not have been done consistently throughout the Report. We feel all statements and calculations be independently verified prior to approval of the Report by the NCRP.

Sincerely yours,

Edward T. Lessard

ETL:lm
Attachment: Table One

Co80 - Conard, Robert, M.D., 1980, Review of Medical Findings in a Marshallese Population Twenty-six Years After Accidental Exposure to Radioactive Fallout, Brookhaven National Laboratory, Upton, N.Y., BNL #51261.

Table One

Thyroid Data

Age Group At Exposure	Total Number	No. with Surgically Proved Nodules	No. with Carcinoma	Expected Nodules[B]	Expected Cancers[B]	Mean Dose Rads	Mean Years[C] At Risk, (Cancers)	Nodule[D] Risk, $10^{-6}rad^{-1}y^{-1}$	Cancer Risk, 10^{-6} $rad^{-1}y^{-1}$
Rongelap									
In Utero	3	1	0	0.078	0.026	600	20 (-)	25	-
<10	19[A]	14	1	0.49	0.17	4000	13 (15)	14	0.73
10-18	11	2	1	0.84	0.14	1700	20 (22)	3.1	2.1
>18	32	3	2	2.5	0.22	1300	17 (13)	0.71	3.3
All Ages	65	20	4	3.9	0.56	2100	15 (16)	8.0	1.5
Ailingnae									
In Utero	1	0	0	0.026	0.0087	610	- (-)	-	-
<10	7	2	0	0.18	0.063	1100	22 (-)	11	-
10-18	-	-	-	-	-	-	- (-)	-	-
>18	11	3	0	0.93	0.077	410	17 (-)	27	-
All Ages	19	5	0	1.1	0.15	700	19 (-)	15	-
Utirik									
In Utero	8	0	0	0.21	0.069	130	- (-)	-	-
<10	54	4	1	1.4	0.47	490	25 (21)	3.9	0.95
10-18	19	3	0	1.5	0.24	220	20 (-)	18	-
>18	86	8	1	6.7	0.59	170	23 (22)	3.9	1.3
All Ages	167	15	2	9.8	1.4	280	23 (21)	4.8	0.61
All Exposed									
In Utero	12	1	0	0.31	0.10	290	20 (-)	9.9	-
<10	80	20	2	2.1	0.70	1400	16 (18)	10	0.65
10-18	30	5	2	2.1	0.38	760	20 (22)	5.9	1.2
>18	129	14	3	10	0.80	470	20 (16)	3.3	2.2
All Ages	251	40	6	15	2.1	780	18 (18)	7.1	1.1

[A] There were two infants with atrophy of thyroid which were not counted.

[B] Co 80.

[C] Assumed to be time between March 1954 and time of surgery.

[D] Absolute Risk = $\frac{\text{No. of excess cases due to radiation} \times 10^6}{\text{mean thyroid dose} \times \text{No. of subjects at risk} \times \text{mean years at risk}}$

EXPOSURE TO FALLOUT: THE RADIATION DOSE EXPERIENCE AT RONGELAP AND UTIRIK ATOLLS

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From June 1946 to August 1958, the U.S. Department of Defense and the Atomic Energy Commission conducted nuclear weapons tests in the Northern Marshall Islands. On March 1, 1954, BRAVO, an aboveground test in the Castle series, produced a large amount of radioactive debris, some of which subsequently fell on Rongelap and Utirik Atolls due to an unexpected wind shift. In order to avoid external and internal dose from the deposited radioactivity, the inhabitants of these atolls were relocated out of the affected area. They returned to Utirik in June 1954 and to Rongelap in June 1957. Environmental and personnel radiological monitoring programs were initiated in the mid 1950's by Brookhaven National Laboratory. The objective was to maintain a comprehensive radiological safety program. Post-return body-burden histories and activity-ingestion rate patterns were determined as were estimates of internal committed effective dose equivalent. External exposure rate and living pattern data were also collected. Relationships between body burden or urine activity concentration and a declining continuous intake scenario were developed in order to model retrospective and prospective dose equivalent (See Figure 1). The dosimetric conclusions for the protracted exposure are summarized in Table 1.

Figure 1: Body burden history for Rongelap adults post return to their home atoll.

Table 1. Dosimetric conclusions for the protracted exposure of Rongelap and Utirik adults from day of return to 50 years.

Nuclide	Rongelap Committed Effective Dose Equivalent, Sv±S.E.	Utirik Committed Effective Dose Equivalent, Sv±S.E.
Fe-55	$4.8\times10^{-4} \pm 2.5\times10^{-4}$	$3.6\times10^{-4} \pm 2.0\times10^{-4}$
Co-60	$3.4\times10^{-3} \pm 1.3\times10^{-3}$	$4.4\times10^{-2} \pm 3.3\times10^{-2}$
Zn-65	$1.9\times10^{-4} \pm 1.0\times10^{-4}$	$3.0\times10^{-4} \pm 4.4\times10^{-5}$
Sr-90	$5.3\times10^{-2} \pm 8.0\times10^{-2}$	$1.0\times10^{-2} \pm 5.0\times10^{-2}$
Cs-137	$2.2\times10^{-2} \pm 1.1\times10^{-3}$	$1.3\times10^{-2} \pm 1.0\times10^{-3}$
External External	$1.7\times10^{-2} \pm 3.4\times10^{-3}$	$4.1\times10^{-2} \pm 8.2\times10^{-3}$

A decline in the daily activity ingestion rate greater than that due solely to radioactive decay was estimated to be 9 % per year for Cs-137, 8% per year for Sr-90, 80% per year for Zn-65 and 60% per year for Co-60. A tentative value of 3% per year for Pu was estimated from sparse data. Current studies are aimed at determining more accurately the dosimetric impact of Pu. These values for the % per year decline in activity ingestion rate were observed at both atolls and do not account for the additional decline due to radioactive decay.

The accidental acute exposure during March 1 and 2, 1954 was considered separately from the protracted post-return exposure. The thyroid absorbed dose was reevaluated due to the fact that incidence of thyroid nodules, benign and malignant, in the exposed populations of Utirik and Rongelap has indicated critical differences relative to that reported for other radiation exposed groups. Reanalyses of thyroid absorbed dose was based on a comprehensive fallout model in conjunction with dietary and living pattern data at the time of acute exposure. Four studies were used to generate thyroid absorbed dose estimates, they were: (1) archival soil-sample analysis for I-129, (2) evaluation of radiochemical analyses data for "Bikini Ash", the BRAVO fallout which fell on a Japanese fishing vessel in the vicinity of Rongelap Atoll on March 1, 1954, (3) weather and source-term data for BRAVO coupled with current fallout transport and deposition models and (4) evaluation of the radioiodine analysis of the single initial pooled urine sample reported for the Rongelap people. Tentative results indicate thyroid doses were underestimated for the Rongelap people by a factor of 2 to 10. Thyroid nodule incidence will be evaluated in terms of new estimates for thyroid absorbed dose for both atoll populations.

ACKNOWLEDGEMENTS

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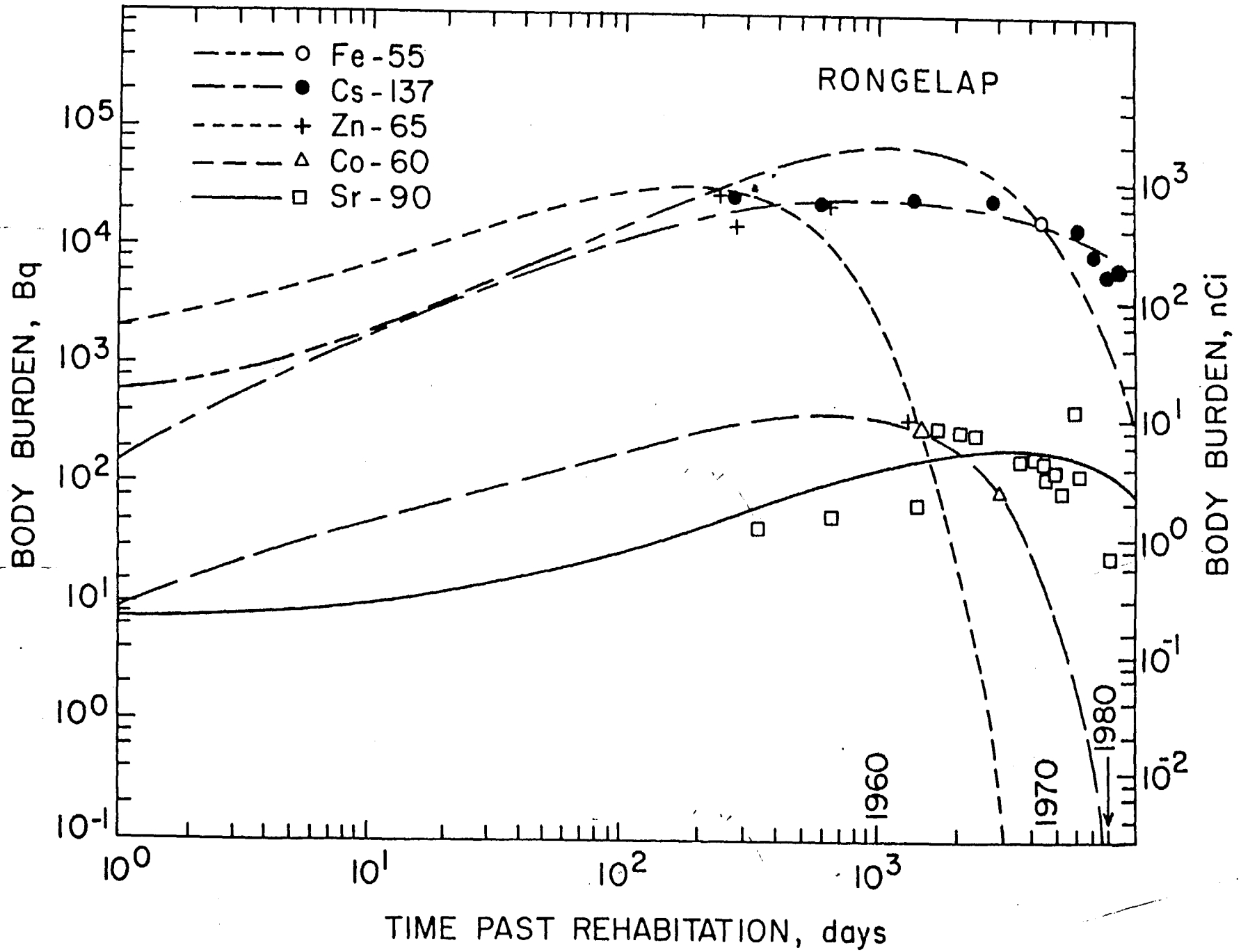
Fe-55
Cs-137
Zn-65
Co-60
Sr-90
RONGELAP
BODY BURDEN, Bq
BODY BURDEN, nCi
TIME PAST REHABITATION, days
1960
1970
1980