



BROOKHAVEN NATIONAL LABORATORY
ASSOCIATED UNIVERSITIES, INC., UPTON, L. I., N. Y. 11973

410337

MEDICAL DEPARTMENT

TELEPHONE: (516) 345-3577

May 8, 1974

Dr. James L. Liverman, Director
Division of Biomedical and Environmental Research
U. S. Atomic Energy Commission
Washington, D. C. 20240

Dear Dr. Liverman:

Enclosed is a brief summary of the 1974 medical survey of the Rongelap and Utirik peoples including radiological surveys on Utirik, Rongelap and Bikini. Attached also is a summary of the village meeting with the Rongelap people which shows continued "misunderstandings." Up-dated tables of thyroid lesions are included also.

The Bikini data, I am sure, has added importance in view of the requests for information from the Micronesian legal people and we shall try and prepare more detailed reports as soon as possible.

The three new Rongelap people with thyroid nodules (two exposed and one control) will be brought to Brookhaven the last of this month for complete studies and possible surgery in Cleveland in early July.

I shall probably plan a trip to Germantown in the near future to discuss some of the current Marshall Island problems with members of your staff. In the meantime if I can be of further help, let me know.

Sincerely,

Robert A. Conard, M. D.

RAC/es
Enc.

SUMMARY OF THE 20TH POST EXPOSURE MEDICAL SURVEY OF
THE RONGELAP AND UTIRIK PEOPLE

The twenty year survey was highlighted by several special examinations and the use for the first time of an LCU newly acquired by the AEC for medical and radiological surveys in the Marshall Islands. In addition to routine medical examinations several special medical studies were conducted, a thyroid reserve study and a diabetic and genetic study. Radiological surveys including personnel monitoring by γ -spectroscopy and environmental radiation studies were carried out at Utirik, Rongelap and Bikini. Results of these examinations must be considered quite preliminary at this time.

The survey team consisted of 19 members: from the U. S. - 4 M.D.'s, 2 P.H.D.'s and 7 technical specialists; from the Trust Territory 1 M.D., 1 practitioner, 1 Medex and 3 technicians. Also Mr. William Streenan from the AEC and Mr. John Rosario representing the Congress of Micronesia accompanied the team. On the LCU there were 8 men in the crew plus a cook and as assistant making a total of 31 people on the ship. Medical examinations were conducted on a total of about 500 people at Majuro March 18-23, at Ebeye (Kwajalein) March 25-29; then via LCU to Utirik April 1-3, Rongelap, April 5-10 and Bikini, April 11-15. A roster of team personnel is attached.

Village meetings were held at Utirik and Rongelap during which the objectives of the survey were discussed, team members introduced and questions answered. The meeting at Utirik was pleasant and uncomplicated, but the Rongelap meeting was disappointing in that there were questions presented by the Rongelap Rallout Survivors Association which indicated continued misunderstanding about the medical examinations and results. A transcript of this village meeting is attached. It appears that there must have been outside influence in presenting the questions since the people could not have read our reports, those of the medical observers or the Congress of Micronesia since they have not been translated into Marshallese. Further education of the people is necessary and a booklet written in Marshallese is being prepared by the Trust Territory which will help answer many of their questions. Support of the medical surveys voiced last year at Rongelap by Senator Borja and Congressman Balos needs further reinforcement by these congressmen.

SURVEY FINDINGS

Thyroid. Two additional exposed Rongelap people were found to have thyroid nodules, one in a 45-year old woman exposed on Ailingnae Island (whole body gamma dose estimated at 69 rads) and in a 20-year old boy who was exposed in-utero near the end of the second trimester. The latter case is interesting since this is the first thyroid abnormality developing in any of the four in-utero exposed children. There was also one unexposed 41-year old Rongelap

woman in the control group who had developed a thyroid nodule. All of these cases are being brought to Brookhaven for more complete thyroid studies followed possibly by surgery in Cleveland by Dr. B. Dobyns. There were two other exposed Rongelap people with borderline thyroid lesions and they will be observed carefully on thyroid treatment.

Thyroid Reserve Study. Drs. Jan Wolff and Kund Knudsen were in charge of this study. In view of uncertainty of complete compliance with the thyroid treatment program in some people a test of thyroid reserve was done in 41 people in this group who had not developed thyroid abnormalities. Thyroid hormone treatment was discontinued for 2 months prior to our examinations and then plasma samples were taken before and after the injection of 10 units of TSH for later analysis of hormone levels. Plasma samples for hormone levels were also taken on other people. In order to test environmental iodine levels on Rongelap diet and urinary samples were taken for iodine analysis.

Diabetic Study. Dr. Reed Larson, headed this survey. This disease which is known to be of high incidence along with cataracts of the eyes in the Marshalls, and this survey was carried out in Rongelap and Utirik people to determine its prevalence and attempt to advise the Trust Territory medical people concerning this serious medical problem. The volunteer response for this study was most gratifying - a total of 360 people being tested. Diabetic questionnaires and pre and post prandial blood sugars are being analyzed. Judging by the number of positive urine sugars, there appears to be a high prevalence of the disease mainly in those greater than 40 years of age. Infections and need for amputations are a source of great concern to the Marshallese medical personnel.

Genetic Studies. Studies for possible inherited defects in children of people of exposed parents was under my supervision, and is being carried out in collaboration with Dr. James Neel and Dr. Arthur Bloom of the University of Michigan. During this survey blood samples were collected for a variety of tests for metabolic defects and bucal smears for sex chromatin studies on 71 children of exposed parents, 24 exposed parents, 58 children of unexposed parents and 37 unexposed parents were examined in this study. A brief physical examination was carried out on each child. No obvious congenital defects were noted. In view of the general negative nature of the studies of the first generation Japanese children of exposed parents it seems unlikely that positive results will be seen in this group. However, the psychological benefit associated with negative findings would be reassuring to the people.

Radiological Surveys. Radiological surveys were carried out at Utirik, Rongelap and Bikini Islands. At Bikini there were about 80 people living there, 30 of whom (3 families) of Bikinians who have moved back, and the remainder are workmen and their families. In view of the anticipated return of larger number of Bikini people to their home island in the near future additional data collected on this island will be given prompt attention.

Whole-body gamma spectrographic analyses were carried out by Dr. Cohn and Mr. Rothman and environmental sampling by Messrs. Greenhouse and Ash and Dr.

Nelson. At Rongelap and Utirik samples were gathered to attempt to correlate radiation levels in soil with adjacent fruit trees (pandanus, coconut; bread-fruit) and arrowroot, messerschmidia, scaveola plants for a possible extrapolation purposes at Bikini and Eniwetak where vegetation samples are limited. Other samples collected included 24-hour urine samples, water, coconut crabs and certain marine specimens. It will be some time before radiochemical analyses of these samples is completed and the data analyzed.

Gamma spectrographic analysis (whole-body counts) were carried out on 22 people at Utirik, 46 at Rongelap and 31 people at Bikini, including members of the families who had returned. These data are undergoing computer analysis. Preliminary analysis of these data give the following estimated average body burdens of ^{137}Cs :

	<u>MALES</u>			<u>FEMALES</u>		
	No.	μCi Body burden	% MPC*	No.	μCi Body burden	%MPC*
Bikini	18	0.129	4.3	13	0.073	2.6
Utirik	9	0.262	8.7	13	0.133	4.4
Rongelap	22	0.475	15.8	24	0.317	10.6
U.S. Medical Team	6	0.0021	0.07			

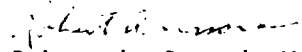
* Using 3 μCi MPC-based on the standard 1/10 of the maximum permissible burden for industrial populations which is 30 μCi according to the Recommendations of the International Commission on Radiological Protection, ICRP Public.2 (1959).

A gamma survey was carried out on Bikini Island using a scintillation type survey meter calibrated for ^{137}Cs which represents about 95% of the gamma radiation on the island. Preliminary analyses showed roughly the following levels on the island:

A. Village (Living area)	Average $\mu\text{R/hr.}$
Inside cement houses with coral covered yards	2.38
Outside cement houses with coral covered yards	3.95
Inside cement houses without yard covered coral	2.98
Outside cement houses without yard covered coral	9.44
Along village road	13.1
B. Interior-coconut groves	41.6

It is gratifying that the levels are below those previously reported. Assuming that the average Bikini person spends 85% of their time in the village and 15% in the interior area the whole body dose would be about the same as the average U. S. citizen receives from natural background, the background level being higher in the United States than on Bikini. A more definitive gamma survey with thermoluminescent dosimeters will be made at Bikini on the next survey.

The LCU. The newly acquired LCU immensely improved the survey procedures and living conditions. The ship was clean and freshly painted (quite a contrast to the previous cargo ships used) and the air-conditioned sleeping trailer, clean galley with wholesome foods served and canvas covered afterdeck for eating and lounging greatly improved living conditions even though crowded. The vessel was slow. For instance, only an average of 4.8 knots were made between Kwajalein and Utirik (about 240 miles) hitting into the winds and waves. Beaching the vessel was a distinct advantage allowing easy access for people coming aboard for whole body counts and for moving equipment back and forth. On my return from the islands, I attended a meeting held at the University of Hawaii, Marine Biology Laboratory, at Coconut Island. LCU alterations for improved specialized operations and scheduling of the vessel were discussed. It is obvious that from the number of people who want to use the vessel that supervised prior scheduling of the vessel will be necessary.


Robert A. Conard, M. D.

Meeting with Rongelap People - April, 1974

The following is an account of the meeting on Rongelap Island on April 4, 1974 on the day of our departure following the examinations. Our survey at Rongelap turned out successfully. However, on our arrival there was considerable discontent among the people. There had been a shortage of food for some time and the territorial ships that had come to the island had insufficient food to give to the people. The following meeting shows some of this discontent and reflects misunderstandings that still exist among some of the people concerning the medical examinations that we carry out. The Rongelap Survivors Fallout Association presented to me a list of questions and requests to be discussed at this meeting. These questions have been translated into English by Mr. Robert Harrison a peace corp man on the island. The context of the questions prompted the Marshallese medical practitioner who was with us to suggest that there had been some outside influence involved.

The following is a summary of my remarks to the people. "Friends of Rongelap. This morning I will try to answer some of the questions and requests that have been presented to our medical team by the Rongelap Fallout Survivors Association. I will attempt to answer some of the questions, but others are outside our province and will be submitted to other authorities for action. I assure you we will do everything possible to get these requests presented before these authorities at the earliest opportunity. I feel that many of your questions have stemmed from lack of understanding. I was particularly disappointed to see the statement that the people did not trust the results of our reports. I have known you for some 20 years and feel that you have always been my close friends and that you have trusted us. We have greatly regretted the injuries that have been done to you by the fallout, and have wanted to help you in every way possible. I was with Lekoij when he was sick and was very sad when he died. I felt as though I had lost a brother or a son. Doctors on our medical team are honorable men and highly esteemed. They have helped to write these reports. This includes the Trust Territory medical personnel, such as Dr. John Iaman, Dr. Ezra Riklon, Triglar, Ishoda, and others. I am willing to forgive you for doubting our reports since I know that many of you have not read these reports and even if you have, the medical language would be difficult for you to understand.

In September of 1972 there were four medical observers who accompanied our team for the survey. These included Drs. Kumatori and Izaki of Japan, Dr. Pochin from England, who is with the World Health Organization, Dr. Cole from the National Health Service. The doctors read all of our medical reports carefully and took part in the examinations. They each made separate reports to the Congress of Micronesia. Senator Borja and Congressman Balos who were with us here on the island last year told you about the results of these observers reports and that the surveys were good for the people. They requested that you continue to cooperate

with our medical team since we were doing what was good for you. Since the Congress of Micronesia recognized that a lot of the misunderstandings were due to lack of communication between the medical team and the people, they have advocated several measures which they hope will improve this situation. We are cooperating with the Congress of Micronesia and the Trust Territory in doing this. First let me say that at the time we examine you that we try to let you know through a Marshallese practitioner or interpreter what the results of the examination are, and what treatment we recommend, if you are sick. As you know the Congress of Micronesia through their committee on Rongelap and Utirik has written a long report concerning the medical surveys. They have written a summary report of this which is being translated into Marshallese to be distributed to you. This summary will include a summary also of the medical observers reports. The Trust Territory is also preparing a booklet on the effects of fallout radiation on the Rongelap and Utirik people. This booklet is based on answers to questions that you have asked about fallout. This booklet is in preparation and will be distributed to you before long. It is also planned to have visits by the Trust Territory Health Service personnel to Rongelap and to Utirik to talk to the people about effects of radiation and answer questions.

I would like to talk now a little bit about what happened to the Japanese people who were exposed to the bomb in 1945. There were thousands and thousands of people there who were exposed to more radiation than the Rongelap people received. Many of these people died because of the large amount of radiation that they received. Children of the exposed Japanese people have been examined by the best doctors in the world to see if there was any radiation sickness that was handed down from the parents to the children. These doctors could find no evidence that there was any radiation sickness handed down from the parents. We have examined the children of the Rongelap people who were exposed and we have not seen any effects that have been handed down to your children. I am glad to be able to reassure you on this point. Some of the Japanese people have developed leukemia, a cancer of the blood. With the possible exception of Leko, we have not seen any case of death from any effect that could be related to radiation exposure in the Rongelap or Utirik people. In 1954 the same accident that affected the Rongelap people also affected 23 Japanese fishermen who were 100 miles north of Rongelap. Some of these fishermen received larger doses than did the Rongelap people. One death occurred among the fishermen but the doctors do not believe that this death was related to radiation effects. The Japanese fishermen received about one half the compensation that the Rongelap people received. At this point I would like to say that I had a great deal to do with helping get compensation for the Rongelap people in 1964, and want you to know that I am in favor of your receiving further compensation for your injuries.

I would like now to say a few words about the little bit of radiation that is left on Rongelap Island. Some of the people have been worried about radiation in the food. Some will not eat arrowroot flour because they believe that it contains "radiation poison." I would like to say

that with the exception of coconut crabs from the northern islands of the Rongelap Atoll, all foods can be eaten. Last night we all joined together in a feast of coconut crabs that were caught on the southern islands. These crabs are delicious and you can eat one a day of those caught in the southern part of the atoll. We have crabs which were taken from the northern and southern parts of Rongelap which we will take back for analysis. We hope that soon we will be able to lift the ban entirely on eating coconut crabs.

Before answering specific questions posed by the Rongelap Fallout Survivors Association, I would like to say that there are some misunderstandings which arise because we on the medical team are not familiar with the customs of the people. I hope that you will forgive us when we do something that goes against the customs. We would appreciate being told when we do this. I would like now to take the questions up, one by one. Some of them have already been answered in the discussion I have made prior to this.

1. "We request that the children of the irradiated be included in compensation that may be forthcoming from the A. E. C. We request this because we know that damage done to our bodies by the radiation may be passed on to our children through heredity. This compensation for our children is of the greatest concern to we people of Rongelap."

This question is not within our area of authority, and will be turned over to the authorities as soon as possible. Though I cannot speak for the U. S. Government I feel sure that if any radiation-connected disability should arise in any of the children, which was inherited from exposed parents, they would be given due compensation.

2. "We request that the United States hasten to complete their arrangements with the Congress of Micronesia and be quick to pay the money you owe us for having damaged our islands."

This question is also out of the realm of our authority and will be passed on to the proper authorities.

3. "We request that the A. E. C. and the B. N. L. team pay the same respect to the people of Rongelap that the people pay to them. We submit that one way to do this would be to fulfill all of our requests with great haste."

We will pass these requests on to the proper authorities as soon as possible.

4. "We request that the B. N. L. team serve rice, bread, and meat at the time of the examinations instead of the proposed cookies and coffee. We request this food because the examinations and the presence of the B. N. L. team interfere with our food gathering, and food preparation to the point of halting them completely."

We had not been aware that so much time was involved in gathering food for the families. We brought with us this time a gift of food of several hundred pounds, including rice and sugar, so in view of the shortage of food on the island, we turned over the food that had been brought for the feast to the people to use more conservatively. However, in the future, in view of this request, we shall attempt to serve prepared food to the members of the families on the day that they come in for examinations.

5. "We request of the A. E. C. that the B. N. L. team be either replaced by, or accompanied by observers from the United Nations or neutral nations of the world, because we do not believe the reports of the B. N. L. team, or the reports of the English and Japanese observers who are allies of the United States."

If after reading the reports of the Congress of Micronesia and the medical observers the people of Rongelap wish to have another medical team we will cooperate fully and help the Trust Territory to bring this about. I do not believe that after reading the reports of the medical observers you will request any further medical observers to accompany the medical team.

6. "Why was Shiko's thyroid operated on, since she was not exposed? We have never heard of Marshallians from other islands having any trouble with their thyroids."

All over the world a certain number of people have thyroid trouble which is not related to radiation exposure. This is true throughout the Marshall Islands. We visited Likiep Atoll several years ago for examination of thyroid troubles and we found that about 4 people out of every 100 had trouble with their thyroid glands. We find this is about the same number of people who have thyroid troubles in the unexposed Rongelap people. Therefore, when we find someone in the control population that needs a thyroid operation, we recommend it to be done because we are treating the control people the same as the exposed people. The special thyroid radiation or "thyroid poison" was only present on Rongelap for a few weeks after the fallout. By the time the people moved back to the Island, there was none of the thyroid poison left on the Island so none of the unexposed could have received any radiation from this poison. We do not believe the unexposed Rongelap people will get any radiation sickness from living on Rongelap since there is practically no radiation left on the island.

7. "We would like a doctor to come to Rongelap to live, so that he may treat our illness from day to day. This would be better than just coming once a year."

We will pass this request for a doctor to live on Rongelap to Dr. Iaman, Head of the Health Services of the Trust Territory in Majuro. It would be impossible for us to furnish a doctor to live on Rongelap since our doctor must take care of the Utirik people and also the Rongelap people, many of whom now live in Ebeye and Majuro.

8. "We request that when called to Majuro or Ebeye by the B. N. L. team that the patient will receive an adequate per-diem to cover all of his living expenses during his stay."

The health bill which covers this request is now being negotiated in Washington between the Trust Territory, Department of the Interior and the AEC. I cannot comment on this further since I do not have more information.

9. "We would like to know for how much longer does the B. N. L. team plan to continue their experiments on Rongelap."

I do not know how long it will be necessary for us to carry out the examinations for the people of Rongelap. These examinations should not be called experiments. In no way have we carried out experiments on the people. We carried out only medical examinations and treatment. In 1964 before the thyroid troubles developed in the Rongelap people we found nothing of great importance wrong with the Rongelap people. At that time some people in the Marshall Islands and even some American doctors said "Why do you continue to examine the Rongelap people since you are not finding anything?" If we had stopped examining the Rongelap people at that time many people would have gotten sick from thyroid troubles that developed later, which would not have been discovered, and would not have been treated. We examine your blood twice a year to be sure that no one is developing leukemia, such as Leko died of. I would like, however, to reassure the people that it is very unlikely that any other cases of leukemia will develop since we know that we have passed the period where we would any longer expect this disease from radiation exposure. I hope you understand therefore that these examinations must continue since we can never be certain that other things may not develop in the exposed Rongelap people.

10. "We request that the A. E. C. find some way of ridding our cocoanut crabs of radioactivity or of replacing them with new and clean crabs, as they are a very important part of our diet."

I would like for Mr. Greenhouse to answer this question for you. (Remarks by Mr. Greenhouse: There is no way known to rid the coconut crabs of radioactivity; however, it will eventually disappear through natural processes. Also, there is no practical way to replace the radioactive crabs with clean ones since nobody could be sure that all of the radioactive crabs had been found.)

The people had also expressed concern about eating other foods on the island. I would like to assure you that there is no need for concern. There are small amounts of radioactivity in all foods, even in the United States. This is due to natural radioactivity, and to world-wide fallout.

We have reason to believe from our present survey that the radioactivity in foods grown on Rongelap is not substantially different from that in the U. S. I have eaten and enjoyed the food on Rongelap, and I would not hesitate to eat it again. I feel that there is no need to worry about its safety.

We are taking coconut crab samples from the southern islands back with us for analysis in the laboratory; and we are hoping that the radioactivity will be low enough so that no restrictions will be needed. We do expect that the crabs from the northern islands will continue to be restricted.

11. "We request that the B. N. L. team send food to Rongelap with Dr. Knudsen when he comes on his quarterly trips."

Dr. Knudsen answered this question. He was willing to bring certain supplies of food to the Rongelap people on our LCU provided the payment of such food could be handled by the Marshallese directly with the coop. company at Ebeye.

- 12: "What new findings have you made on this April '74 survey, with the whole-body-counter, the diabetes experiment, and the other examinations?"

The special examinations that have been carried out on the Rongelap people will have to be analyzed later. The blood specimens that we have taken in studying diabetes, a blood sugar disease, in the Marshallese people, will have to be taken back to Brookhaven for analysis. Following this we will give the data on this disease to the Health Services of the Trust Territory so that they will be in a better position to treat you. The whole-body counting that we have been doing shows a very low level of activity in the people and these results also need to be further analyzed before any statements can be made. In general we found that the people were in good health and sanitation conditions on the Island were generally improved. We found no thyroid troubles on Rongelap Island that need to be treated at this time with surgery. We did find on Ebeye two exposed Rongelap people that will be taken back to Brookhaven and the United States for possible surgery. In addition there was one unexposed woman whom we feel should have a thyroid operation, and we will see if she is willing to be taken back. There were 4 Rongelap people on this Island who needed treatment at the Majuro Hospital, and we will take them back with us on the LCU to Bikini and by plane on down to Majuro.

That is all of the questions. I would like to say that we are doing everything we can to improve the examinations. We now have our own LCU which has been equipped to take care of the medical team. In this regard I have heard rumors that the people felt that we were living on the ship because we were disappointed about their using some of our fuel while we were away. This is not true. Our sleeping quarters now leak badly when it rains and we have our own sleeping facilities on the LCU. We hope to have a medical trailer which will be fully equipped as a doctor's office placed on this trailer in the near future. Having our own LCU will allow us to visit the islands at quarterly intervals on a regular basis and will

be a great help in your health care. Dr. Knudsen is going to have to return to the United States for a year beginning next fall. We hope to have another doctor to replace him by that time who will continue to visit Rongelap and Utirik." (End of remarks).

Following this there were very few questions for discussion from the people. Several people got up and thanked the medical team for all they had done for the people in the past. The only man to refuse examination got up and said he was sorry that he was not examined and now that we were willing to give him food, he would certainly be examined next year. The meeting broke up in a very friendly attitude - the people shaking hands with all members of the medical team. I cannot help but feel that we did some good in correcting some of the misunderstandings that had existed. However, I believe that the Educational Booklets and the summaries from the Congress of the Micronesia will do a great deal to help the situation. I would like to see Senator Borja's speech of last year translated into Marshallese and presented to the people also. I believe we must have more positive support from the Congress of Micronesia.

Robert A. Conard, M.D.

THYROID LESIONS IN MARSHALLESE¹ 1947-1974

<u>GROUP</u>	<u>THYROID DOSE</u> ²	<u>LESIONS</u>
<u>CHILDREN</u> ³		
R (exposed in utero)	175 + ?	33.3 (1/3)
R (exposed at < age 10)	675 - 1440	89.5% (17/19) (1 cancer)
R (exposed at < age 10-16)	335-675	12.5% (1/8)
A (exposed in utero)	69 + ?	0.0 (0/1)
A (exposed at < age 10)	300 - 480	33.3% (2/6)
U (exposed at < age 10)	40 - 80	0.0% (0/53)
R (non-exposed < age 10)	0	1.6% (1/61)
L (exposed < age 10)	0	0.0% (0/31)
<u>ADULTS</u>		
R (exposed > age 16)	335	8.1% (3/37) (2 cases cancer)
A (exposed > age 10)	132	25.0% (3/12)
U exposed > age 10	22	5.8% (6/104) (1 cancer)
R(c) (non-exposed > age 10)	0	5.3% (7/133)
L non-exposed > age 10	0	4.7% (5/106)

1. Statistics based on original number people.
2. Thyroid dose from I - 131 - 132 - 133 - 135 plus gamma.
3. R = Rongelap exposed to 175 rad gamma dose; A = Rongelap people on nearby island receiving 69 rad gamma dose; U = Utirik people exposed to about a 14 rad gamma dose; R(c) = Unexposed Rongelap control group; L = Likiep people on an atoll with no radiation exposure.

THYROID LESIONS IN MARSHALLESE EXPOSED TO FALLOUT
(AS OF MAY, 1974)

Marshall Island Group (radiation dose-gamma)	Age at Exposure	Estimated Thyroid dose-rads ¹	Thyroid Lesions Percent ²	Thyroid Surgery	Malignant Lesions Percent ²
Rongelap (175 rads gamma exposure)	In-utero	175 + ?	33.3 (1/3)		
	<10	675 - 1440	89.5 (17/19)	15	5.3 (1/19)
	11-16	335 - 675	12.5 (1/8)	1	-
	>16	335	8.1 (3/37)	3	5.4 (2/37)
	all	-	32.8 (21/64)	17	4.7 (3/64)
Rongelap (on Ailingne Island -69 rads gamma exposure)	In-utero	69 + ?	0.0 (0/1)		
	<10	300 - 480	33.3 (2/64)	1	-
	>16	132	16.6 (2/12)	2	-
	all	-	22.2 (4/18)	3	-
Utirik ⁵ (14 rads gamma exposure)	<10	40 - 80	0.0 (0/53)	0	-
	>10	22 ⁶	5.8 (6/104)	4	1.0 (1/104)
	all	-	3.2 (5/157)	4	0.6 (1/157)
Rongelap unexposed	<10	-	1.6 (1/61)	0	-
	>10	-	4.5 (6/133)	2	-
	all	-	3.6 (7/194)	2	-
Likiep unexposed (1970)	<10	-	0.0 (0/31)	0	-
	>	-	4.7 (5/106)	0	-
	all	-	3.6 (5/137)	0	-

¹Dose from ¹³¹I, ¹³²I, ¹³³I, ¹³⁵I plus gamma dose.

²Based on number of original people exposed. In parentheses number of cases/total number in group.

³The thyroid is considered fully developed by age 16.

⁴Difference of opinion as to whether or not one lesion was malignant. Majority opinion was that it was benign.

⁵The more energetic shorter-lived isotopes of iodine contributed less to the total thyroid dose in the Utirik people due to later fallout. One might surmise also that the biological effectiveness of the thyroid dose per rad would be less in that group.

⁶Fifteen children 10-17 years of age at exposure in this group received estimated thyroid doses between 22 and 40 rads.

⁷In addition to thyroid lesions, one case of acute myelogenous leukemia was discovered in September 1972 in a 19-year-old Rongelap boy who had received 175 rad gamma radiation at one year of age. He died November, 1972.

1974 Medical Survey Team

Brookhaven National Laboratory

Dr. R. A. Conard
• Dr. K. Knudsen (Resident Physician Marshall Islands)
Dr. S. Cohn
 W. Scott
 D. Clareus
 J. Rothman
 P. Heotis
 R. Brown
 N. Greenhouse
 J. Ash

Trust Territory of Pacific Islands

Dr. J. Steele
S. Shoniber
P. Bien
N. Zetkeia
K. Mizutoni
S. Laigo

University of Washington

Dr. V. Nelson

University of Pittsburg School of Medicine

Dr. R. Larsen

National Institutes of Health

Dr. J. Wolff

AEC, Pacific Support Office

W. Streenan

Congress of Micronesia Observer

John Del Rosario