



BROOKHAVEN NATIONAL LABORATORY
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Safety & Environmental Protection Division

August 30, 1979

Dr. Walter H. Weyzen
Manager, Human Health Studies Program
Division of Biomedical &
Environmental Research
U. S. Department of Energy
Washington, D. C. 20545

Dear Dr. Weyzen:

Enclosed is a copy of the paper to be presented at the Mid Year Symposium on Health Physics Training sponsored by the Hawaii Chapter of the Health Physics Society. This Symposium will take place in Hawaii on December 10-13, 1979.

We would like to express our thanks for your support of this unique educational experience.

Yours truly,

A handwritten signature in dark ink, appearing to read 'Janakiram R. Naidu', written over a horizontal line.

Janakiram R. Naidu, Ph.D.
Ecologist

JRN/slg

Enclosure

cc: V. P. Bond, MD
H. S. Pratt, MD
C. B. Meinhold



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Safety & Environmental Protection Division

August 29, 1979

Mr. Philip Manly
P. O. Box 430
Wahiawa, HI 96786

Dear Mr. Manly:

Enclosed is the manuscript of the paper to be presented at the Mid Year Symposium of the Health Physics Society.

Thank you for giving us the opportunity to present this unique educational experience.

With regard.

Yours truly,

A handwritten signature in cursive script, appearing to read 'J. R. Naidu', written over a horizontal line.

Janakiram R. Naidu, Ph.D.
Ecologist

JRN/slg

Enclosure (Manuscript)

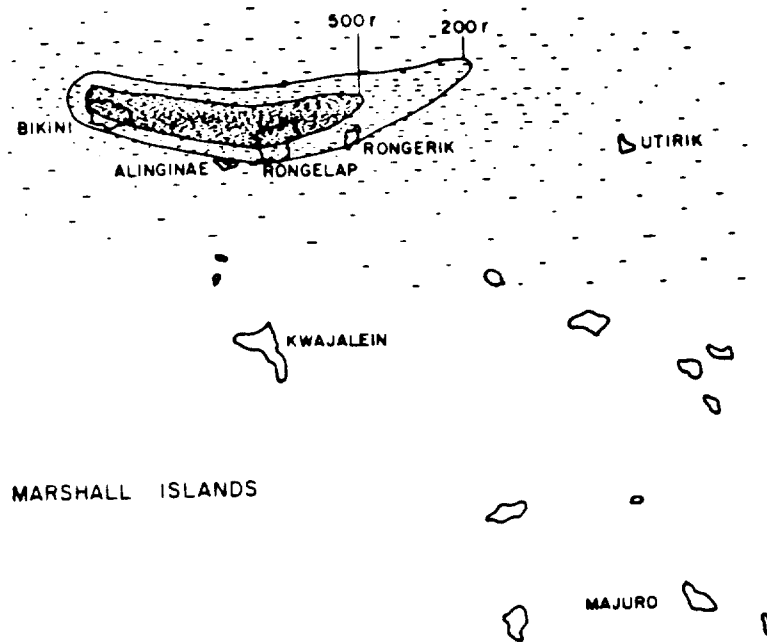


Figure 1

Distribution of Fallout from the BRAVO Test, March 1954

A number of laboratories in the US were involved in these studies with Brookhaven National Laboratory (New York), and the Laboratory of Radioecology, University of Washington (Seattle), being the prime contractors for the medical and environmental monitoring programs respectively. These followup studies resulted in the Utiirik and Rongelap inhabitants being returned to their islands 120 days and 3 years respectively after evacuation.

Since their return, the medical and environmental monitoring programs have identified:

- a. the occurrence of thyroid nodules in the exposed population
- b. the existence of regions showing radiation levels significantly above natural background, and
- c. food from such areas, such as coconuts, coconut crabs, etc., also exhibiting significant amounts of fallout radioactivity.

The suddenness of the BRAVO event had the US ill prepared to truly understand the magnitude of the problem. There were many facts of radiation exposure of this kind that were not known, thus, the programs instituted at that time were essentially investigative and structured to address acute effects. The atmosphere therefore was one of caution and the need to assure the exposed inhabitants was limited by the lack of adequate information about the effects of radiation. Therefore, it was not surprising that certain circumstances beyond the control of either party began to create an environment of doubt which in turn lead to distrust. A few of these circumstances were:

- a. The Rongelap people cooperated during the annual examinations, but naturally, since they felt well after the acute effects subsided, they questioned the need for continuation of the examinations. However, the annual examinations were continued and the explanation given that there might be possible late effects from their initial exposure which could develop even though they were feeling well now. The later incidences of thyroid nodules and one leukemia victim demonstrated the need for continuing the medical examinations but pointed out the fact that the doctors were not certain of the degree of exposure of the thyroid due to fallout. This was especially true with respect to the children because their thyroids being

smaller received higher doses than adult thyroids with the same radioiodine burden. The occurrence of thyroid nodules in the Utirik population further complicated our analysis of the situation especially when their exposure was considered negligible in comparison to the Rongelap population.

- b. The visit of the Japanese scientists who mentioned their own experience following their exposure to nuclear bombs was further disquieting. This was also picked up by the political leaders of the Marshalls and construed as a deliberate exposure to facilitate research on the effects of radiation exposure on human beings and that the Marshallese were indeed "guinea pigs".
- c. The results of the environmental programs were often interpreted by scientists in differing ways among themselves adding to the confusion of the Marshallese.
- d. Small island life is particularly conducive to the perpetuation of fear and rumors especially where little or nothing is understood about radiation.
- e. Their subtle mode of communications, many times referred to as "the coconut telegraph", has resulted in widespread discussions of the problems at Bikini, which if translated to the situation at Rongelap, could mean that they too would have to evacuate.
- f. Radiation in their perception, became the cause of all their problems, such as,
 - i. arrowroot plant blight, which is presently found throughout the Marshalls,
 - ii. increase in breadfruit tree parasite infestation, and
 - iii. body pain or any other symptom that could not be explained.
- g. they are living on an island where radiation is higher than natural background, but the decision to leave and return to the island was not of their making.

In short, our efforts and services to the Marshallese have been misunderstood, best explanations not believed, or due to education and language barriers, only vaguely comprehended. After 24 years, the people still believe that their individual islands or atolls contain dangerous levels of radioactivity (which they, for lack of an adequate word in Marshallese, refer to as "poison") and despite explanations to the contrary, they are still concerned about eating island produce. This situation has

been further complicated because the islanders are culturally hesitant to speak of unpleasant thoughts, they do not respond to questions readily upon being asked, and they do not often reveal their fears and inner thoughts at public meetings.

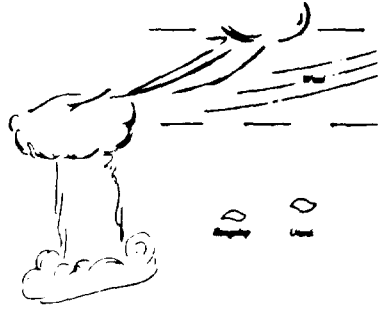
Early Educational Efforts

Against this backdrop of misunderstandings, the Department of Energy (previously Energy Research Development Administration and Atomic Energy Commission) began developing methods of communicating the medical and environmental findings to the inhabitants of Rongelap and Utirik. The most direct method used was the village meetings held prior to and after a survey, when through an interpreter, the objectives and the preliminary results of the survey were presented. A "Question and Answer Booklet on Effects of Fallout on Rongelap and Utirik" (TTPI74) was developed and circulated in July 1974 through the Trust Territory of the Pacific Islands and the Brookhaven National Laboratory's Medical Division. This booklet presented answers to the most often asked questions, on radiation, radiation effects, radiation in the environment and the medical examinations, in English and Marshallese along with pictures depicting the activity being addressed (Figure 2). A similar booklet entitled "Radiological Conditions at Enewetak Atoll and Protection of Future Residents" (USERDA75), was produced in March 1975 by ERDA. Once again, the booklet presented information on radiation in the environment in English and Marshallese with appropriate illustrations in color (Figure 3). Though these methods were well received, the Marshallese felt that we had oversimplified the information which seemed to indicate to them that we had treated them as individuals incapable of understanding what we were saying unless we reduced the technical explanations to a minimum. Furthermore, such booklets appeared to the Marshallese as "impersonal" since all their information gathering has always been through "the spoken word" in an atmosphere of face to face meetings such as village meetings and group conversations. It was therefore felt that the most direct way of informing the Marshallese would be for one of the scientists to live with them on their island. In doing so, the scientist would be able to:

- a. partake in their activities especially in eating their food and thereby proving to them through example that their food is safe to eat.

Why didn't the AEC remove the radiation from the soil and plants?
 It was impossible to do so and even the radiation is so small there is no reason to do this.

Why didn't the U.S. explain to the people the dangers of the fallout before the test?
 The people were not aware of the dangers of the fallout because the information that fallout would be in the rain and there was considerable information to people warning the people. The occurrence of fallout is an unexpected event after the Bravo Test was the first accidental event of this kind to happen after a nuclear explosion.



Bravo explosion

Why didn't the U.S. use better containment?
 The U.S. used the procedure of trying to keep people out of the area where the expected fallout would be.

Why AEC, apak jaha paman na pro bring an breakout?
 AEC na chae komanan diprediksi by paman na clap na de na, an nyah kama komanan manan.

Why U.S. nae job komanan diprediksi by paman na clap na de na?
 AEC job komanan diprediksi by paman na clap na de na, an nyah kama komanan manan.



Bravo na other test

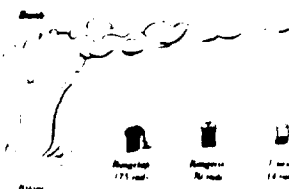
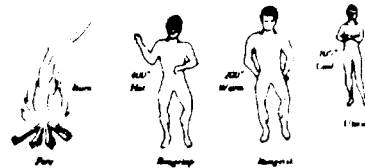
Why U.S. nae job komanan diprediksi?
 U.S. kama komanan diprediksi by paman na clap na de na, an nyah kama komanan manan.

Figure 2

Examples of Information Presented in the Booklet: (TTPI 74)
 Trust Territory of the Pacific Islands, July 1974
 Question and Answer Booklet on Effects of Fallout on Rongelap and Utirik

Did not people on Utirik get as much radiation as the people on Rongelap?
 No. The wind is from the north and from Rongelap. The wind is from the north and from Rongelap. Below is the number of rads for people on 17-4.

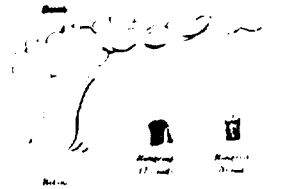
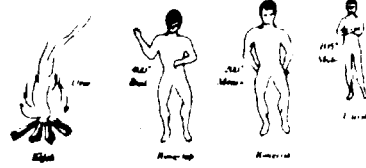
People on Rongelap	175 rads
People on Ailinginae	65 rads
People on Utirik	14 rads



Why did the people on Utirik get less radiation than the people on Rongelap?
 The wind is from the north and from Rongelap. The wind is from the north and from Rongelap.

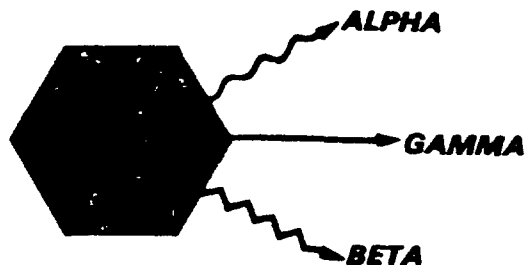
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People on Utirik	14 rads



Why did the people on Utirik get less radiation than the people on Rongelap?
 The wind is from the north and from Rongelap. The wind is from the north and from Rongelap.

WHAT IS NUCLEAR RADIATION?



You cannot see, hear, feel, taste, or smell nuclear radiation. It can only be seen by instruments. We cannot stop radioactive materials from sending out radiation. It cannot be turned off.

- *Gamma* radiation can go through thick layers of heavy materials.

Radiation like this is used to make x-rays.

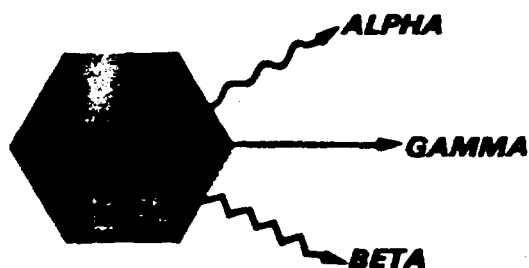
- *Beta* radiation can go through only a few feet of air.
- *Alpha* radiation cannot go through even one inch of air.
- *Beta* and *Alpha* radiation cannot go through even a thin sheet of paper.

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Figure 3

Example of Information Presented in the Publication: (USERDA 75)
United States Energy Research and Development Administration, March 1975
Radiological Conditions at Enewetak Atoll and Protection of Future Residents

TA IN NUCLEAR RADIATION?



Nuclear radiation kwo ban loe, enjake, nemake, ak at bwin. Jemaron lo wot kin kein jerbai. Jejeb maron kabwijrak an jabdrewot men eo e radioactive kettelok baijin in radiation kein ie. Ejae kwini.

- *Gamma* radiation emaron in kabeflok jabdrewot maal ak jimen jakdron ne emejel. Radiation jab in rej kerjerbai ilo x-ray.
- Kejur in an tellok *Beta* radiation jet wot ne.
- *Alpha* radiation eban ie jen juon inch ilo mejatoto.
- Eban bijlok juon peba kin *Alpha* im *Beta* radiation.

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- b. take part in discussions and answering questions whenever they want to do so and thereby develop an atmosphere of trust.
- c. develop and present an educational program on radiation, what it is, what it can do and finally what it means to them as they continue to live on an island which has residual radioactivity.

The education program was basically presented under three headings, there were:

- a. radiation and effects of radiation
- b. environmental monitoring, and
- c. medical programs

Very early in the program, it was recognized that the village meetings would be the best forum for presenting the lecture on radiation and the informal discussions should be encouraged whenever possible. The fact that the senior author lived for a while on the island with them lent itself to the latter method quite easily. Also the need to encourage them to ask questions was always emphasized. This procedure permitted informal discussions to be made among the people and the scientist (educator). These discussions provided the forum for seeking the right way to present the right answer to their questions. It also helped to ensure true communication as one translates back and forth between English and Marshallese.

In discussing radiation and its effects, it was also recognized that the Marshallese language is not equipped to explain radioactivity, the radioactive element, the types of radiation and other concepts of the interaction of radiation with matter. It was felt that a lot would be gained by addressing their basic fears about living on an island which received radioactive fallout and continued to be radioactive today. This basic fear seems to be built around the fact that the adopted Marshallese word for radioactivity was the English word "poison" and like their experience with poison, it was capable of injuring and even killing. By the use of radiation detection instruments, we were able to demonstrate that unlike poison, radiation could be detected without touching or tasting it, and that unlike poison, it decreases with time. This latter concept was demonstrated very effectively by using a square paper and sequentially tearing into half. It was emphasized that the reduction in activity with time

is not the same for all kinds of substances that give off radiation, but rather like the vegetation on the island had different life times. This simple demonstration also helped the people to understand why the clicking of the radiation detection instruments had decreased so much over the years and that the levels measured today could be essentially harmless. Also, this demonstration pointed out dramatically that a lot of radiation must be present to do significant harm. This was analogous to their own experience with the parasites attacking their breadfruit tree. This visual demonstration, which they were aware of, concerned the effect of a small number of parasites attacking the breadfruit tree and yet permitting the tree to produce breadfruit as compared to the increase in the number of parasites attacking the tree with drastic results in the total absence of any breadfruit. The parallel to radiation effects seemed obvious in the light of the above examples. The need to develop analogies related to their daily activities and observations was constantly kept in focus. This method seemed to be the most effective way to communicate the concepts of radiation.

The greatest assurance came from the demonstration that a scientist would be ready to live with them and be exposed to the same radiation as they were experiencing. This action served as the best example of the fact that there are other parts of the world where populations are being exposed daily to radiation levels exceeding 100 times their levels without significant harm. Although the latter was difficult to comprehend, since it was not a visual experience, the presence of a scientist among them lent an air of credibility to the statements.

Expanded Education Program

The tremendous success of this initial personal, on-site, one-on-one educational program as conducted by the senior author has prompted this Laboratory to develop an extensive educational program for the inhabitants not only of Rongelap and Utirik, but also those returning to Enewetak and Bikini. This program will adequately meet the mandate dictated by the US Congress wherein such an educational program will be conducted for the express purpose of assisting the people of Bikini, Enewetak, Rongelap and Utirik, to more fully understand nuclear radiation, to assure that unrealistic fears will be minimized and measures aimed at preventive radiation exposure will be more

effective. To supplement the program, a comprehensive companion effort by the Medical Division will be put into effect. This program will be directed towards education requested by the Marshallese to explain the most common pathologic conditions, e.g., diabetes, high blood pressure, malnutrition and dental problems. Each island will set their own priorities for these health education programs. This will help the Marshallese understand the relative risk of exposure to radioactive material in perspective to their overall health status.

Both programs will be carried out initially by Brookhaven National Laboratory personnel, the effects of radiation program will be taught by a member of the health physics team while the medical program will be carried out by a RN in conjunction with a MD. To be successful, however, the program must involve Marshallese as much as possible, from the beginning. In fact, the program should eventually be run entirely by Marshallese, with BNL personnel serving only in an advisory capacity.

In essence, it must be a synthesis of two worlds and two frames of understanding. To bridge this cross cultural gap, Marshallese with the required qualifications, a degree of science for the environmental aspect and for the medical programs local residents will be hired. In the latter case, the BNL Marshallese nurse practitioner will be available to avoid any cultural bias. The key liaison on each island will be the president of the women's club, the queen, the health aide and minister and the school teacher. As the medical program progresses, a health educator/RN or Medex (trained either in the US or Fiji) will be recruited for each island to work with the local resident to maintain the continuity of the program.

Both programs will be constantly evaluated to ensure that they are culturally sound and realistic. Ultimately, the goal is to have a full-time Marshallese on each island responsible for the medical program who will be in touch with the environmental program as well. The primary importance of the health education program is realistic because medical problems are usually the first ones to be recognized with environmental problems being less clearly defined. Therefore, the environmental monitoring educator could restrict his/her presence to the field visits while the health educator can cover for the environmental monitoring educator during the interim.

The thrust of the EM program will be to present to the Marshallese the concepts of radiation, such as the radioactive element, the way radiation interacts with living things, what the EM program is doing on the island, the type of analysis it makes on the island, and in the US, what the results are and what they indicate, why scientists change their statements with time, and finally, the importance of Federal standards on radiation and how they come about using them in reference to their living on the island.

Eventually, we will establish a two way dialogue that will lead to an informed educational perspective on the nature of the radiation problem as well as the endeavors of BNL in their interest.

Summary

A combined presentation of the environmental (radiological) and medical educational programs to the Marshallese will,

- a. clear the misunderstandings that radiation is not a poison, that it is easy to recognize and measure with the instruments used by scientists, and that the levels present today on their islands are not hazardous,
- b. serve to minimize groundless fears and assure the people that through discussions, they could learn to express their concerns and expect to receive answers that are meaningful to them,
- c. prepare them to help make a decision, based on "informed consent", about living on an island where radioactivity will continue to exist far beyond their life expectancy,
- d. give the people an identifiable forum for interacting with the BNL Medical and Environmental programs,
- e. meet the needs for medical programs already requested by Rongelap and Utirik and expected on Enewetak and Bikini, and
- f. put into perspective for all Marshallese their responsibility for maintenance of health since they will be active participants.

This unique experience has revealed the machinations of the unusual drama between the forces of ignorance and fear on the one hand and knowledge and trust through education on the other. All of you gathered here attest to the role that education has

played in your lives. It has revealed a facet of their nature that was overwhelming. Throughout the program, the Marshallese always conducted themselves with complete dignity. Theirs was the wisdom born of many sorrows and hardships. They were responsible and objective in their statements apologizing for being emotional when their conduct was the essence of composure and restraint. They are a proud and sensitive people, with good reason for being so. At each lecture meeting, three flags always flew in the stiff wind--the UN, the TT, and the United States--the latter flag honoring a nation known for its sincerity in keeping to its commitments and its humanitarian beliefs.

Acknowledgements

Our sincere thanks to Drs. V. Bond, R. Conard, K. Knudsen, Mr. C. Meinhold and Mr. A. Hull for giving us this most unique opportunity in the realm of education. To Dr. W. Weyzen (DOE), our gratitude for recognizing the urgent need and funding us to carry out the task. And finally, to the Health Physics Society and you ladies and gentlemen our thanks for sharing this experience of ours.

References

- TTPI74 Trust Territory of the Pacific Islands, July 1974, Question and Answer Booklet on Effects of Fallout on Rongelap and Utirik.
- USERDA75 United States Energy Research and Development Administration, March 1975, Radiological Conditions at Enewetak Atoll and Protection of Future Residents.

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