

U. S. Department of Energy
Washington, DC 20545

Dear Bruce:

Enclosed is the final version of the paper that will be presented at the Health Physics Society Symposium in Hawaii, December 10-13, 1979. This paper has been reviewed by Mr. A. P. Hull and it also incorporates comments made by Dr. W. Bair.

Yours truly,



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JRN/slg

Enclosure

cc: Dr. V. P. Bond
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A. P. Hull
C. B. Meinhold

To be presented at the Symposium on Health Physics Training sponsored by the Hawaii Chapter, Health Physics Society in Honolulu, Hawaii, December 10-13, 1979.

An Educational Program on the Effects of Fallout
from Nuclear Tests for the Inhabitants of
Bikini, Enewetak, Rongelap and Utirik (Marshall Islands)

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Historical Summary

The BRAVO test consisted of a 15 MT thermonuclear device which was detonated on Bikini Atoll (Marshall Islands) on March 1, 1954. It resulted in the unintentional deposition of radioactivity on the inhabited islands of Rongelap, Ailinginae, Rongerik and Utirik (Figure 1) due to an unexpected wind shear at higher altitude, which in turn caused the fallout cloud to depart from the predicted pattern, which was intended to exclude inhabited areas. The Department of Defense instituted rescue procedures and evacuated the inhabitants of Ailinginae, Rongelap, Rongerik and Utirik. Initial personnel decontamination procedures were instituted on the islands. The inhabitants were then taken to Kwajalein, where they were thoroughly decontaminated and given appropriate medical treatment. Estimates were made on the amount of external and internal radiation exposure received by these inhabitants during the period of exposure to fallout (Cr 56).

Once the significance of the exposure ^{was} ~~were~~ recognized, medical followups of the exposed inhabitants and environmental monitoring of their atolls were instituted. The inhabitants were taken to other islands, while environmental monitoring programs began to assess the radiological impact of the fallout so as to determine the time frame in which the inhabitants could be returned safely to their respective islands.

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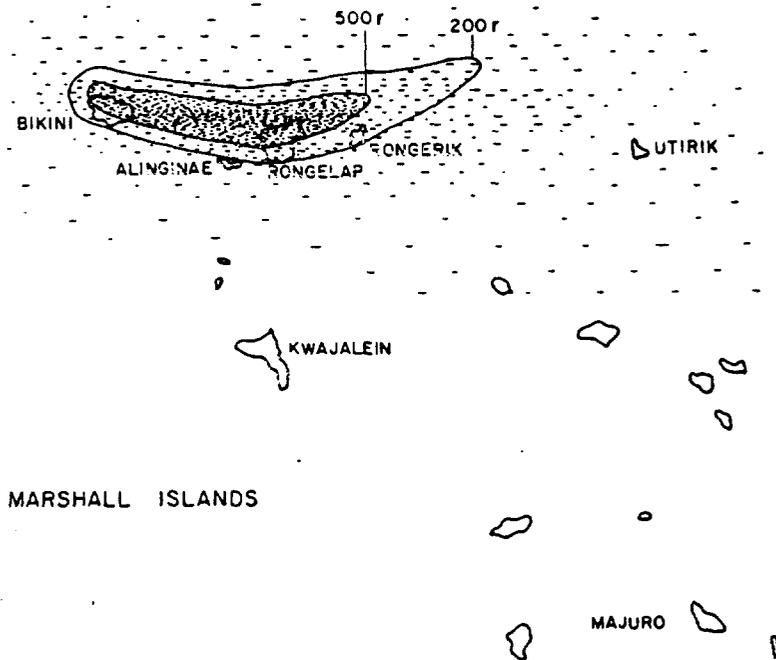


Figure 1

Distribution of Fallout from the BRAVO Test, March 1954 (Cr 56)

University of Washington (Seattle) were the prime contractors for the medical and environmental monitoring programs, respectively. These studies were instrumental in making the decision to allow the return of the Utirik and Rongelap inhabitants to their islands 120 days and 3 years respectively after evacuation. ?

Since their return the medical and environmental monitoring programs, which were continued and are still in progress, have indicated:

- a. the existence of regions exhibiting radiation levels above the natural background for these islands (Co 67), *§*
- b. that food items obtained locally, such as coconuts, coconut crabs, pandanus, breadfruit, etc., have accumulated fallout radionuclides, and as a result certain items have been restricted from their diets (Co 67),
- c. the occurrence of thyroid nodules in the exposed populations (Co 66).

The confidence of the Marshallese that their situation is safe has been further jeopardized by the following situations:

- a. the visit of Japanese scientists who described the experience of their populations following exposure to nuclear bombs, which led the Marshallese to feel that the United States (U. S.) had deliberately exposed them, so that it could conduct research on the effects of radiation exposure on human beings, and therefore they were indeed 'guinea pig'. *reference*
- b. their involuntary residence on islands where radiation is higher than natural background, since the decision to leave or return was not theirs, ?
- c. their naive interpretation of radiation as the cause of diverse problems, such as,

been misunderstood, our best explanations have not been believed, in large part 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 response to questions readily upon interrogation, and they do not often reveal their fears and inner thoughts at public meetings.

Early Educational Efforts

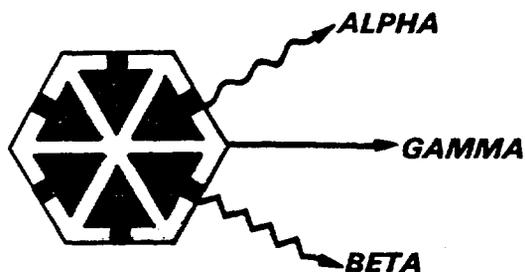
Recognizing the urgent need for an effort to mitigate the growing concern of the Marshallese over what has happened since 1954, the predecessor agencies of the Department of Energy (DOE), the Energy Research Development Administration (ERDA), and Atomic Energy Commission (AEC), began developing methods 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, its objectives and the preliminary results were presented. A "Question and Answer Booklet on Effects of Fallout on Rongelap and Utirik" (TTPI74) was developed by the Trust Territory of the Pacific Islands and the Brookhaven National Laboratory's Medical Division and circulated in July 1974. This booklet presented answers

Marshalllese as "impersonal", since their information gathering has traditionally been through "the spoken word" in an atmosphere of face-to-face meetings, such as the village meetings and group conversations. It was suggested by the Marshalllese that the most effective way of informing them would be for a knowledgeable scientist to live with them on their island and talk to them about radiation. By doing so, this scientist, in our opinion, would be able to:

- a. --partake in their activities, especially in eating their food, thereby proving to them through example that their food is safe to eat,
- b. take part in discussions and answer questions on the spot, and thereby develop an atmosphere of trust,
- c. develop and present an educational program on radiation in Marshalllese, including what radiation is, what radiation can do, and finally, how it might affect them as they continue to live on an island which has residual radioactivity.

This preliminary "in residence" education program was basically

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.

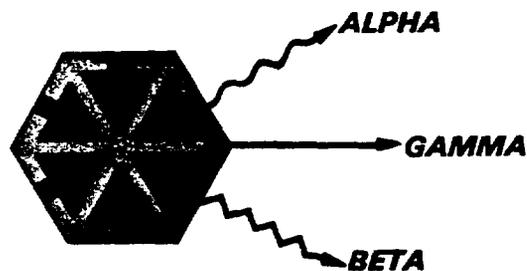
- *Gamma* radiation can go through thick layers of heavy materials.
Radiation like this is used to make x-rays.
- *Beta* radiation can go through only a few feet of air.
- *Alpha* radiation cannot go through even one inch of air.
- *Beta* and *Alpha* radiation cannot go through even a thin sheet of paper.

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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. Jejab maron kabwijrak an jabdrewot men eo e radioactive kettelok baijin in radiation kein ie. Ejaje kwin.

- *Gamma* radiation emaron in kabejlok jabdrewot maal ak jimen jekdron ne emejel. Radiation jab in rej kerjebai ilo x-ray.
- Kajur in an tellok *Beta* radiation jet wot ne.
- *Alpha* radiation eban le jen juon inch ilo mejatoto.
- Eban bijlok juon peba kin *Alpha* im *Beta* radiation.

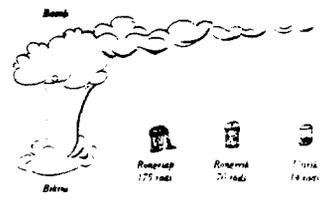
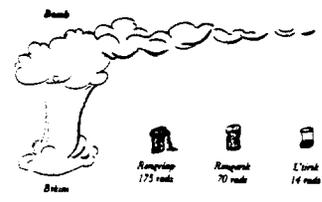
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sure radiation is by counting the "rads". Below is the number of rads the people got in 1954:

People on Rongerap	175 rads
People on Ailingnae	99 rads
Americans on Rongerik	70 rads
People on Utrik	14 rads

lin "rads" Lajrak in ilal ej number in rad ko rar waiok non arnij ilo 1954:

Arnij in Rongerap	175 rads
Arnij in Ailingnae	99 rads
Dri America ro ilo Rongerik	70 rads
Arnij in Utrik	14 rads



No, because Utrik is farther away from Bikini. It is like fire. The closer you get to the hotter it gets. Heat is measured in degrees. Radiation is measured by rads.

Jan, kinae othiak Utrik in Bikini. Eim othiak. A othiak othiak... (The text is partially obscured and difficult to read.)

necessary to address their basic fear about living on an island which had received radioactive fallout and which continued to be radioactive today. This basic fear seems to be built around the fact that the adopted Marshallese word

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capable of injuring and even killing. By using radiation detection instruments, it was possible to demonstrate that unlike poison, radiation could be detected without touching or tasting it; and that unlike poison, it decreased with time. This latter concept was demonstrated by using a square paper and by repeatedly tearing that paper in half. The difference in size between the

1)

whole square paper and what was left after tearing the paper for about seven times brought home the fact that indeed radioactivity reduces with time. This understanding was further confirmed when the Marshallese commented on a singular observation. They had noticed that the clicking of the radiation detection instruments had decreased so much over the years, since their observation of the first measurements with similar instruments in 1954. It was emphasized that the reduction in radioactivity 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 lifetimes. Another analogy which was developed related the difference between the effects seen on themselves at the time of fallout (epilation, burns, etc.) and the lack of obvious effects on them today when comparison was made to the effect of the parasites on the breadfruit tree. This visual demonstration, which they readily comprehended had to do with the attack of a small number of parasites on a breadfruit tree, yet permitting the tree to produce breadfruit, as compared to the effect of an increased number of parasites attacking the tree, resulting in the total absence of any breadfruit. This example served to indicate that a lot of radioactivity must be present in the environment to cause harm. The parallel to radiation effects seemed obvious to them in the light of the above examples. During the implementation of the preliminary "in residence" educational program, the need to develop analogies related to their daily activities and observations was constantly kept in focus, since this method seemed to be the most effective way to communicate the concepts of radiation.

The presentations of the environmental and medical programs were essentially explanations of the role of these programs in relation to their continued stay on the islands. The first was accomplished by detailed descriptions of the various activities of the scientists who came to their islands

periodically to do environmental monitoring, including what the instruments told them and what is done to the samples that were collected when they were analyzed in the U. S. Such explanations permitted the Marshallese, as one commented, to recognize the tremendous task that went behind the simple act of sample collection or instrument reading. In the case of the medical programs, a similar explanation was presented. It was indicated to the Marshallese that many inhabitants of the U. S. could not afford the cost of undergoing such examinations, and that they were fortunate in that eminent doctors did not come to examine them each year.

The greatest assurance, however, came from the personal demonstration that a scientist was willing to live with them and be exposed to the same radiation as they were experiencing.

Proposed Expansion of Educational Program

The success of this initial personal, on-site, one-to-one educational program, as conducted by the senior author, has prompted the development of an extensive educational program for the inhabitants not only of Rongelap and Utirik, but also those returning to Enewetak and Bikini. If presented, this program would assist the people of Bikini, Enewetak, Rongelap and Utirik to more fully understand nuclear radiation and its effects, whereby giving them the assurance that their unrealistic fears would be minimized and measures aimed at preventive radiation exposure would be more effective. One of the key lessons learned in the initial program was the need, as expressed by the Marshallese, to educate them not only about radiation and its effects, but as well about the most common pathologic conditions which affect them, e.g., diabetes, high blood pressure, malnutrition, and dental problems. It is proposed by us that the BNL medical team would address these questions in the same format as the initial program, wherein a qualified medical personnel would stay on the island and live with them. In this way, the overall program would

medical program and who would also be familiar with the environmental program.

The 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

(EM) educator could restrict his/her presence to the field visits, while the health educator could cover for the environmental monitoring educator during the interim.

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

Eventually, such a program should be able to 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 the U. S. Government in the interest of the Marshallese.

Summary

A preliminary 'in residence' educational program indicates that a combined presentation of the environmental (radiological) and medical educational programs to the Marshallese should:

- a. -clear the misunderstandings that radiation is not a poison, that it is easy to recognize and to measure with the instruments used by scientists,
- b. serve to minimize groundless fears and to assure the people that through discussions they can learn to express their concerns and to expect to receive meaningful answers,
- 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 them an identifiable forum for interacting with the various

ongoing programs in the environmental and medical areas,

e. meet the needs for medical programs which have already been requested by the residents of Rongelap and Utirik, and which may presumably be anticipated by the future residents on Enewetak and Bikini, and

f. put into perspective for all Marshallese their responsibility for maintenance of health, since they will be active participants.

The unique initial 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. This same experience has also revealed a facet of their nature that was impressive, for the Marshallese throughout the program always conducted themselves with complete dignity. There is a 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.

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