

considerable linguistic and grammatical limitations that hinder precise, unambiguous communication of scientific and medical concepts.

Question 1

- a. It is my understanding that the 1978 survey of nuclear radiation in the northern Marshall Islands was undertaken to characterize the radiological environment of the islands for use in making decisions about their future use.
- b. Since I was not a participant I was not given information about the general directions advanced by DOE to the survey team.
- c. Since I was not a participant, I was not given information about specific tasks that were to be undertaken. It is my understanding that the results of the survey were to be documented in reports prepared by the

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participants in the survey and published by the contractor organization, the Lawrence Livermore National Laboratory.

- d. I do not have copies of the scope, general directives, work documents, work plans or other documents which discuss the purpose of the survey.
- e. I do not have information about the total budget for the survey.
- f. The following are costs incurred in the preparation and publication of the DOE-1982 booklet, "The Meaning of Radiation for Those Atolls in the Northern Part of the Marshall Islands That Were Surveyed in 1978."

Question 2

- a. I do not have precise information about when the survey was initiated.
- b. I assume the survey was completed with the publication of Lawrence Livermore National Laboratory's report, UCRL-52853 Pt 4, September 30, 1982.
- c. I do not know what the Rongelap people were told about the survey. They subsequently received copies of the DOE-1982 booklet.
- d. Marshallese government officials, including representative of the Rongelap people, attended a presentation of the information in the Marshallese language in the DOE-1982 booklet in Majuro in December 1982. Also, in the spring of 1983 a DOE team visited Rongelap. I was not a member of that team.
- e. I do not have knowledge about studies, reports, briefings, or other communications given the Rongelap people during the time the study team was engaged in its work.

Question 3

- a. Changes made between the first two books and the DOE-1982 booklet included:
 - (1) Improved description of radioactivity and radiation from atomic bombs and from natural sources.
 - (2) Improved description of transport of radioactive materials from soils to the food chain and to man.
 - (3) A more detailed approach to describing how radiation causes changes in cells which lead to biological effects.
 - (4) Information was omitted that pertained specifically to Enewetak and Bikini.
 - (5) Information was added describing how the survey was performed by scientists from the Lawrence Livermore National Laboratory.
 - (6) Radiological information was added for all the northern Marshall Islands.
- b. Based on experience with the first two books, changes were made to improve communication of information about radiation. Also, information specific to Enewetak and Bikini was omitted, and information specific to all the northern Marshall Islands was added.
- c. In the Enewetak and Bikini books, specific information was given for plutonium and americium because the tests of nuclear weapons on these atolls distributed readily detectable quantities of these radionuclides. According to the survey results published in the Lawrence Livermore National Laboratory Report, UCRL-52853 Pt 4, September 30, 1982, the contribution of plutonium to the 30 year integral bone marrow dose of 3.3 rem was 0.00051 rem from ingestion and 0.0078 rem from inhalation.

Local food only from long-island (not grown on other more-continental islands) in addition to imported food is about 400 millirem from radioactive material deposited by the bomb tests plus an estimated 50 millirem from natural sources and any radiation they might receive from medical tests.

- e. The authors of the Lawrence Livermore National Laboratory report, UCRL-52853 Pt 4, September 30, 1982 developed a figure of 135 millirem. The authors of DOE-1982 booklet multiplied it by 3 to obtain an estimate for the highest dose any person might receive.

Question 7

- a. The worldwide estimate for cancer deaths was given in BEIR III as 17.5%. The authors of the DOE-1982 booklet rounded this down to 15%. The value of 10 deaths in 30 years from non-radiation related cancer among the Rongelap population was estimated by first calculating the number of deaths using information from the final draft of the Marshall Islands Five Year Health Plan prepared by the Trust Territories Department of Health Services, Office of Health Planning and the Resources Department. From this Plan, the following were obtained:

1. Rate of increase of the population had been ~3.8% per year
2. Infant death rate ~3.2% per birth
3. Overall death rate ~0.54% per year
4. Birth rate is 4.2% per year

Total population at end of 30 years (beginning with 233 people), P₃₀:

$$P_{30} = 233 (1 + 0.038)^{30} = 713$$

Number of Births, B:

$$B = 0.042 \times 233 \int_0^{30} (1.038)^x dx \quad (x = \text{time between 0 and 30})$$

$$B = 541$$

$$\text{Deaths} = 0.034 \times 233 \int_0^{30} (1.038)^x dx = 70$$

Assuming 15% of deaths are due to naturally occurring cancer, 15% of 70 = ~10.

- b. I do not know whether DOE has a position on whether non-radiation cancers are a greater threat and risk to the Rongelap people than radiation-related cancers.
- c. If the estimates of radiation doses published in Lawrence Livermore National Laboratory Report, UCRL-52853 Pt 4, September 30, 1982, are correct and if the risk coefficients for radiation induced cancer published by the National Academy of Sciences can be accepted, then as shown on page 39 of the DOE-1982 booklet, less than one additional cancer death due to radiation from the atomic bomb tests would be expected compared with 10 occurring naturally over the next 30 years.

- ii. The figures 2500 million and 3500 million apply exclusively to Rongelap Island and the consumption of local food grown only on Rongelap Island plus imported food as described on pages 29 and 43 in the Lawrence

Pt 4, September 30, 1982 and risk factors from the National Academy of Sciences BEIR III report.

- g. -
- h. The authors of DOE-1982 booklet prepared the health defects at birth projections using doses from the Lawrence Livermore National Laboratory Report, UCRL-52853 Pt 4, September 30, 1982 doses and risk factors from the National Academy of Sciences BEIR III risk report.
- i. -

Question 11

Some of the values reported in the Lawrence Livermore National Laboratory Report, UCRL-52853 Pt 4, September 30, 1982 exceeded U.S. guidelines.

They were included in the DOE-1982 booklet. Examples are on page 39 in reference to Naen, Namen and Melu Islands.

- a. -
- b. -

Question 12

The Lawrence Livermore National Laboratory report did not calculate separate doses for children and adults.

Question 13

The DOE-1982 booklet made *no* statement about Rongelap or any Marshall Island being safe or unsafe.

Question 14

- a. Not all radiation issues were addressed in the DOE-1982 booklet.
- b. DOE-1982 booklet did not address radiation doses already received by the Marshallese nor the potential health effects that might result.
- c. The authors of the DOE-1982 booklet were asked only to communicate the results of the 1978 survey, which were reported in the Lawrence Livermore National Laboratory Report, UCRL-52853 Pt 4, September 30, 1982.

Question 15

- a. When the information in DOE-1982 booklet was presented to the Marshallese government officials and representatives from the northern islands at Majuro in December 1982, the representatives from Rongelap expressed concern about past exposures to radiation.
- b. I do not have information about what might have been done.
- c. In the spring of 1983, DOE officials and scientists from Lawrence Livermore National Laboratory and possibly others visited most of the northern Marshall Islands to explain the DOE-1982 booklet. None of the authors were able to participate.
- d. I do not believe I have any documents, letters, memorandum or other materials which address this matter.

Question 16

- a. I did not perform a detailed assessment of the Kohn Report. I commented only on those points that dealt with the DOE-1982 booklet.
- b. I do not believe Dr. Kohn understood the purpose of the DOE-1982 booklet. His report purported to be a review of the DOE-1982 booklet when, in fact, it appeared to be a review of the work of the Lawrence Livermore National Laboratory team and Report, UCRL-52853 Pt 4, September 30, 1982.
- c. Copies of my letters to Dr. Kohn regarding his report are enclosed.
- d. A copy of my September 10, 1988 letter to Dr Robison is enclosed.

Question 17

I am not aware of anything further that the Committee should know about Rongelap Atoll, the people of that atoll, or the DOE-1982 booklet, "Melelen Radiation Ilo Ailin ko Ituion Ilo Majol, ko Rar Etali Ilo 1978."

Question 18

I have never withheld any information regarding the preparation of the DOE-1982 booklet. I worked on the booklet in response to a request from the DOE because I was sympathetic to their interest in wanting to communicate technical information to the Marshallese people that they might be better prepared to make decisions about the future uses of the islands contaminated by the U.S. weapons tests. While the DOE-1982 booklet may not have provided answers that the Rongelap and other Marshallese wanted, it appears to have stimulated their thinking and led them to air their concerns before the world's scientific and political communities.