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REPOSITORY
COLLECTION Marshall Islands
BOX No. 5684
FOLDER Bikini - 1981

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RADIATION HEALTH EFFECTS ESTIMATES FOR BIKINI ATOLL RESIDENTS

Radiation dose estimates for persons returning to Bikini Atoll under several residence and dietary scenerios have been provided by Dr. William L. Robison (February 19, 1980). These allow a comparison of risks for the Enewetak and the Bikini people. Because the information available as yet is limited, however, such a comparison must be based upon simple relative risk estimates, and some of our previous Enewetak risk estimates must be converted (i.e., from 50 year to 30 year doses) in order to provide a common basis for comparison. The Enewetak numerical estimates presented here will thus not be exactly the same (though not greatly different either) as those presented in our October, 1979 detailed estimates.

Dose Estimates

Using Robison's (1980) whole body, 30 year dose estimates, one can calculate the average population doses to returning Bikinians for various living circumstances analogous to those assumed for the Enewetak/Engebi people in our earlier assessment (Bender and Brill, Oct. 1979). These presume that imported food supplies will be available for 75% of each year, and that total dependance upon local foods will occur during the remaining 25%. Table 1 shows the population dose estimates for the different residence circumstances for which dose data are available.

TABLE 1: Whole Body Radiation Dose Estimates Averaged Over 30 Years for Different Living Patterns

Living Pattern (%)		Total Dose (rem)	mrem/year
Eneu	Bikini		
100%	0	2.95	98.3
90%	10%	3.35	111.7
50%	50%	14.5	483.3
0	100%	25.8	858.0

Comparable estimates for Enewetak assuming residence of the 180 dri-Engebi on Engebi and the remaining 273 dri-Enewetak on Enewetak are 2.4 rem average 30 year exposure, or 80 mrem per year. The average dose for those residing on Engebi only is 5.5 rem in 30 years, or 184 mrem per year, while those residing on Enewetak are expected to receive 0.35 rem in 30 years, or only about one mrem per year.

Genetic Effects

The basis for our previous genetic effects estimates for Enewetak Atoll was the most recent draft for the Report of the National Academy of Sciences Committee on the Biological Effects of Ionizing Radiation (the BEIR III Report) which estimates that between 5 and 75 added cases per

million live births per rad of added parental radiation would be expected among the first generation of offspring, and notes that this number must be considered in relation to the current "spontaneous" incidence of such cases of about 10.7%, or 107,000 per million live births. Put another way, each rad of parental exposure is expected to cause an increase of from 0.0047% to 0.07% of the normal risk. This radiation risk estimate may be used to calculate the added risk attributable to any other average population 30 year dose by simply multiplying by that dose. Table 2 presents such estimates for the entire Enewetak Atoll population, for the people residing on Engebi, and for the various Bikini Atoll residence patterns, presented as risks per 100 live births. They should be compared with the normal expectation of about 11 cases per 100 live births in the absence of any added radiation exposure.

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Population	Living Pattern	Added Cancer Deaths per [redacted]
Enewetak	Enewetak 100%*	0.0001 to 0.003
	Engebi 40% Enewetak 60%*	0.001 to 0.02
Bikini	Eneu 100%	0.002 to 0.02
	Eneu 90% Bikini 10%	0.002 to 0.03
	Eneu 50% Bikini 50%	0.007 to 0.11
	Bikini 100%	0.013 to 0.19
United States (current incidence)**		10.7

* Percent of population.

**United States population estimate is used because data for the Marshall Islands is unavailable.

Obviously, the genetic risks are greatest for the estimated 30 year dose, but even in this case, the added risk is at most less than 2% of the normal "spontaneous" risk.

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Table III.

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Living Pattern	Dose (30 yr - mrem/yr)	Relative Risk
Enewetak	12	.07
Eneu (100%)	98	.53
Eneu (90%), Bikini (10%)	112	.61
Engebi	184	1.00
Eneu (50%), Bikini (50%)	483	2.63
Bikini (100%)	858	4.66

In order to appreciate the magnitude of the risk associated with the different living patterns on Bikini and Eneu comparisons can be made with the Enewetak/Engebi resettlement. The DOE dose estimates for Bikini present the dose averaged over 30 years for the living patterns shown in Tables I and III.

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**The geometrical mean is $\sqrt{\text{low x high estimate}}$.