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Medical Follow-up in the Marshall Islands: an Overview of Sixty Years of Clinical Experience

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Between 1946 and 1958 the US conducted nuclear tests in the Pacific Islands. During one of these tests in March 1954, higher levels of fallout than predicted reached the atolls of Rongelap and Utrik. The ash fell for a total of about 12 hours. The people from Rongelap received higher amounts of radiation while the people from Utrik had about a ten-fold lower exposure. Children were at greater risk from the accumulation of short and long-lived radioisotopes of iodine.

A total of 86 people from Rongelap and 167 people from Utrik were exposed. Almost half of those exposed were below the age of 18 years. The immediate effects of the fallout included skin lesions, abdominal discomfort with loss of appetite and transient lowering of the white blood cell count. Medical evaluations were conducted immediately and have been ongoing for the past sixty years. These include comprehensive annual evaluations for the detection of cancers or other medical conditions. A comparison group of 147 people who were matched for age and gender to the Rongelap people have also been followed up.

Thyroid nodules were detected as early as 8 years after the fallout and a total of 72 patients with nodules were operated. There were 48 benign nodules, 9 occult and 15 overt papillary thyroid carcinomas (10 female and 5 male). Of the 10 patients with overt thyroid cancer who were below the age of 18 years at the time of the fallout, six were female (3 Rongelap, 3 Utrik) and four were male (1 Utrik exposed, 3 comparison). A total of 17 patients were *in utero* at the time of the fallout. None of these patients developed thyroid cancers. Thyroid hormone replacement is provided to all hypothyroid and post-operative patients. There have been no deaths directly related to thyroid cancer. One child with persistently low white blood cell count developed and died from acute myelogenous leukemia. Other causes of death include breast, prostate and lung cancers.

The longevity of the deceased patients appears to be same between the exposed (Rongelap 61 patients, mean age 71 years; Utrik 125 patients, mean age 69 years) and comparison (94 patients, mean age 69 years) population. Currently, the 120 patients are offered annual comprehensive medical evaluations. Thyroid ultrasound is done for all patients and biopsies performed on clinically suspicious nodules or nodules > 1 cm. Their most prevalent disease is type 2 diabetes mellitus (71/120 patients).

Environmental protocols were set up for monitoring/dosimetry for radiation effects. Samples of soil, plants and aquatic life continue to be analyzed at Lawrence Livermore Laboratory. Remediation of the topsoil and supplementation with potassium was carried out to minimize the effect of environmental Cesium-137. Whole body counting facilities have been established at Majuro, Rongelap and Enewetak for measurement of Cesium-137 and to date over 5,500 volunteers have participated in the program. Vegetable farming areas have been established where population relocation is underway.