Radiological Surveillance Measures in Support of Rongelap Atoll Resettlement and Minimizing Radiation Exposure from Residual Nuclear Fallout Contamination

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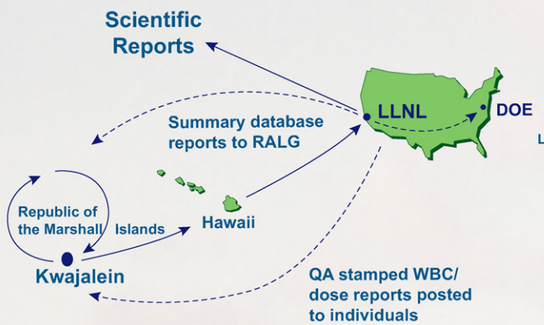
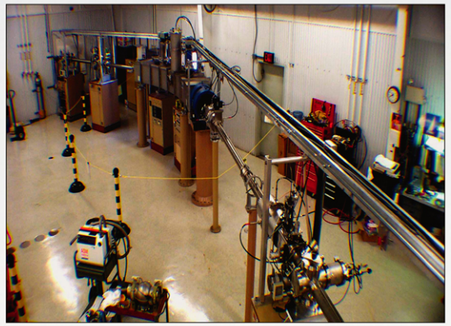
Introduction

The Marshall Islands Program provides individual and environmental measurement data and dose assessments to characterize current radiological conditions and minimize exposure of resettled and resettling populations. The program is conducted under the auspices of Office of Health Studies within the U.S. Department of Energy and is implemented through a series of strategic initiatives to address long-term radiological surveillance needs at former U.S. nuclear test sites in the Marshall Islands. Cooperative radiological surveillance programs have been developed in whole body counting and plutonium bioassay under formal agreements between the Rongelap Atoll Local Government, the Department of Energy and the Republic of the Marshall Islands. In a significant development, the people of Rongelap Atoll may be "homeward bound" after living in exile for two decades. In preparing for resettlement, Rongelap contractors are employing remediation techniques developed by Livermore scientists. The Lawrence Livermore National Laboratory has also responded to requests to develop individual and environmental radiological surveillance measures to ensure radiation related health risks to resettlement workers (and future residents) remain at or below applicable safety standards.



Web posting

LLNL is making the results of the individual monitoring program publicly available at: http://en-env.llnl.gov/mi/



AMS Heavy Element Line. Improving the quality and reliability of plutonium bioassay exposure assessments by using innovative measurement technologies.

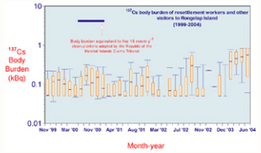
Strategic Initiatives in Support of Rongelap Resettlement

There are two main strategic initiatives developed under the Marshall Islands Rongelap Resettlement Support Plan:

1. To establish a high-quality radiation protection monitoring program on Rongelap Island to assess exposure to resettlement workers from internally deposited fallout radionuclides. This information will be then used to make predictions about the average and 'high-end' doses delivered to a resettled population, and evaluate whether or not additional cleanup or institutional controls may be required.
2. To provide environmental characterization and verify effects of the environmental cleanup program.

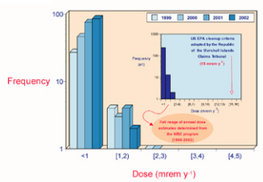
Whole Body Counting

The whole body counting system acquired from the Brookhaven National Laboratory is modeled after the "Masse-Bolton Chair" design and contains a shallow shielded chair with a thallium-activated sodium iodide (NaI) detector mounted on a pivoting arm. The positioning of the detector is such that it provides maximal observation of the entire body of the person sitting in the chair. The availability of a whole body counting system on Rongelap Island offers resettlement workers (and future residents) an unprecedented level of radiation protection monitoring. Information about individual uptakes and potential 'high end' health risks can be assessed from measurement data rather than relying on assumptions based on a range of possible intake scenarios. In combination with environmental monitoring data, workers and future island residents who receive a whole body count showing the presence of cesium-137 can make an informed decision about their eating habits or life-style based on what is considered a 'safe' or acceptable health risk.



Whole body counting has been performed on Rongelap resettlement workers since November 1999 (refer to adjoining plot). The average cesium-137 body burden observed in resettlement workers through June 2004 was 0.11 ± 0.15 kBq. The maximal exposed individual contained a cesium-137 burden of 0.83 kBq.

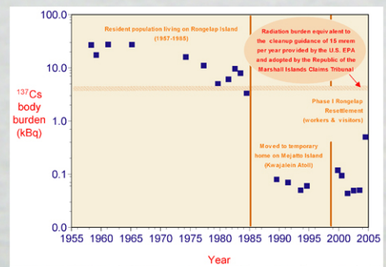
The results of the whole body counting measurements and environmental verification monitoring clearly indicates that the cleanup guidance of 15 mrem per year adopted by the Republic of the Marshall Islands Claims Tribunal is readily achievable. Furthermore, it appears that the safety standard may be reached without any restrictions on the resident population especially after full implementation of remedial measures.



This work was performed under the auspices of the U.S. Department of Energy by the University of California, Lawrence Livermore National Laboratory under contract No. W-7405-Eng-48.

Phase I Resettlement Activities

Local contractors have completed the soil remediation work around the community center (an area of approximately 38 acres). Results of an extensive in-situ gamma survey show a 20 to 25-fold reduction in external gamma exposure rates within this region. The addition of clean crushed coral fill has the added benefit of reducing inhalation and/or ingestion exposure to contaminated soil containing elevated levels of plutonium and americuium-241. Remediation work on the application of potassium fertilizer is continuing. Some preliminary results will become available in 2004 and enable the Rongelap local government to make an early determination about the merits and cost-benefits of fertilizing the remainder of the island.

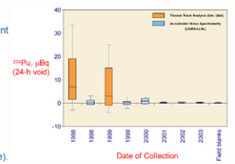


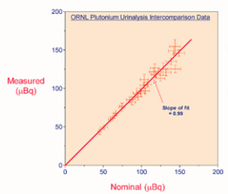
From a historical perspective, the ceisum-137 body burdens observed in resettlement workers over the past 5 years are not significantly different to the levels detected by the Brookhaven National Laboratory in people from Rongelop Atoll after they relocated to Majetto Island on Kwajalein Atoll in 1985.

Plutonium Bioassay

In collaboration with the Center for Accelerator Mass Spectrometry (CAMS) at LLNL, the Marshall Islands Program has greatly improved the quality and reliability of plutonium exposure assessments at former U.S. nuclear test sites in the Marshall Islands. The measurement capability employed at Livermore based on accelerator mass-spectrometry (AMS) is 200 to 1000 times more sensitive than classical decay counting techniques commonly used for monitoring of exposures to plutonium. AMS far exceeds the requirements of the latest Department regulation 10CFR 835 for in vitro bioassay monitoring of plutonium-239 where classical techniques fail.

AMS offers a number of advantages over competing measurement technologies such as fission track analysis. Early measurements of plutonium excretion from resettlement workers on Rongelap based on fission track analysis could not rule out the possibility that workers had (or are) been exposed to plutonium. Results using AMS show that plutonium excretion rates from resettlement workers are not clearly discernible from background levels expected from previous exposures to worldwide fallout contamination. Moreover, as the measurement technique has evolved at CAMS over the past few years all the bioassay results fall below the critical value of the measurements and are equivalent to that observed in collection bottles containing acid preservative (field blanks). (Refer to the adjoining figure).





Results of plutonium-239 measurements in blind intercomparison bioassay samples prepared by the Oak Ridge National Laboratory.

Conclusions

Recent initiatives developed under the DOE Marshall Islands Program demonstrate a continuing commitment by the United States to help ensure the safety of resettled and resettling atoll populations in the Marshall Islands. The Rongelap Atoll Local Government has made significant advances towards unrestricted resettlement of Rongelap Island. By developing shared responsibilities, building infrastructure and training local health physics technicians in radiation protection under the Livermore Marshall Islands Program, DOE is enabling Marshall Islanders to invest in their own futures and leveraging program assets to support similar actions on other islands or atolls.