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MARSHALL ISLANDS DOSE ASSESSMENT AND RADIOLOGICAL PROGRAM

BIKINI • ENEWETAK • RONGELAP • UTRŌK

Individual Radiation Protection Monitoring in the Marshall Islands: Enewetak Atoll (2002-2004)

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As a hard copy supplement to the Marshall Islands Program website (http://eed.llnl.gov/mi/), this document provides an overview of the individual radiological surveillance monitoring program on Enewetak Island (Enewetak Atoll) along with a full disclosure of all verified measurement data (2002-2004).

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Table of Contents

List of Tables

List of Figures

INTRODUCTION

The United States Department of Energy (U.S. DOE) has recently implemented a series of strategic initiatives to address long-term radiological surveillance needs at former U.S. nuclear test sites in the Marshall Islands. The plan is to engage local atoll communities in developing shared responsibilities for implementing radiation protection monitoring programs for resettled and resettling populations in the northern Marshall Islands. Using the pooled resources of the U.S. DOE and local atoll governments, individual radiological surveillance programs have been developed in whole body counting and plutonium urinalysis in order to accurately assess radiation doses resulting from the ingestion and uptake of fallout radionuclides contained in locally grown foods.

Permanent whole body counting facilities have been established at three separate locations in the Marshall Islands including Enewetak Island (Figure 1) (Bell *et al.*, 2002). These facilities are operated and maintained by Marshallese technicians with scientists from the Lawrence Livermore National Laboratory (LLNL) providing on-going technical support services. Bioassay samples are collected under controlled conditions and analyzed for plutonium isotopes at the Center for Accelerator Mass Spectrometry at LLNL using state-of-the art measurement technologies. We also conduct an on-going environmental monitoring and characterization program at selected sites in the northern Marshall Islands. The aim of the environmental program is to determine the level and distribution of important fallout radionuclides in soil, water and local foods with a view towards providing more accurate and updated dose assessments, incorporating knowledge of the unique behaviors and exposure pathways of fallout radionuclides in coral atoll ecosystems. These scientific studies have also been essential in helping guide the development of remedial options used in support of island resettlement.

Together, the individual and environmental radiological surveillance programs are helping meet the informational needs of the U.S. DOE and the Republic of the Marshall Islands. Our updated environmental assessments provide a strong scientific basis for predicting future change in exposure conditions especially in relation to changes in life-style, diet and/or land-use patterns. This information has important implications in addressing questions about existing (and future) radiological conditions on the islands, in determining the cost and estimating the effectiveness of potential remedial measures, and in general policy support considerations. Perhaps most importantly, the recently established individual radiological surveillance programs provide affected atoll

Figure 1. The Enewetak Radiological Laboratory located on Enewetak Island, Enewetak Atoll.

communities with an unprecedented level of radiation protection monitoring where, for the first time, local resources are being made available to monitor resettled and resettling populations on a continuous basis.

As a hard copy supplement to Marshall Islands Program website (http://eed.llnl.gov/mi/), this document provides an overview of the individual radiation protection monitoring program established for the Enewetak Atoll population group along with a full disclosure of all verified measurement data (2002-2004). Readers are advised that an additional feature of the associated web site is a provision where users are able calculate and track doses delivered to volunteers (de-identified information only) participating in the Marshall Islands Radiological Surveillance Program.

BRIEF HISTORY OF NUCLEAR TESTING IN THE MARSHALL ISLANDS

Immediately after WWII, the United States created a Joint Task Force to develop a nuclear weapons testing program. Planners examined a number of possible locations in the Atlantic Ocean, the Caribbean, and the Central Pacific but decided that coral atolls in the northern Marshall Islands offered the best advantages of stable weather conditions, fewest inhabitants to relocate and isolation with hundreds of miles of open-ocean to the west where trade winds were likely to disperse radioactive fallout. During the period between 1945 and 1958, a total of 67 nuclear tests were conducted on Bikini and Enewetak Atolls and adjacent regions within the Republic of the Marshall Islands. The most significant contaminating event was the Castle Bravo test conducted on March 1, 1954 (Figure 2). Bravo was an experimental thermonuclear device with an estimated explosive yield of 15 MT (USDOE, 2000), and led to widespread fallout contamination over inhabited islands of Rongelap and Utrōk Atolls, as well as other atolls to the east of Bikini. Today, the United States Department of Energy (U.S. DOE) through the Office of Health Studies continues to provide environmental monitoring, healthcare and medical services on the affected atolls.

Key directives of the Marshall Islands Dose Assessment and Radioecology Program conducted at the Lawrence Livermore National Laboratory are (1) to provide technical support services, data and oversight in establishing radiological surveillance monitoring programs for resettled and resettling populations in the northern Marshall Islands; (2) to develop comprehensive assessments of current (and potential changing) radiological conditions on the islands; and (3) provide recommendations for remediation of contaminated sites and verify the effects of any actions taken.

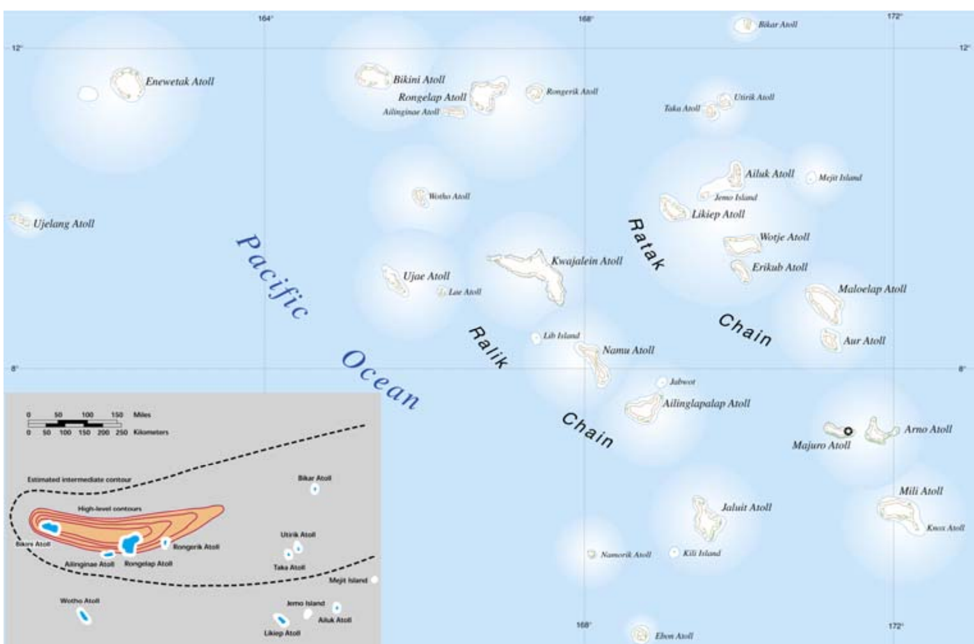
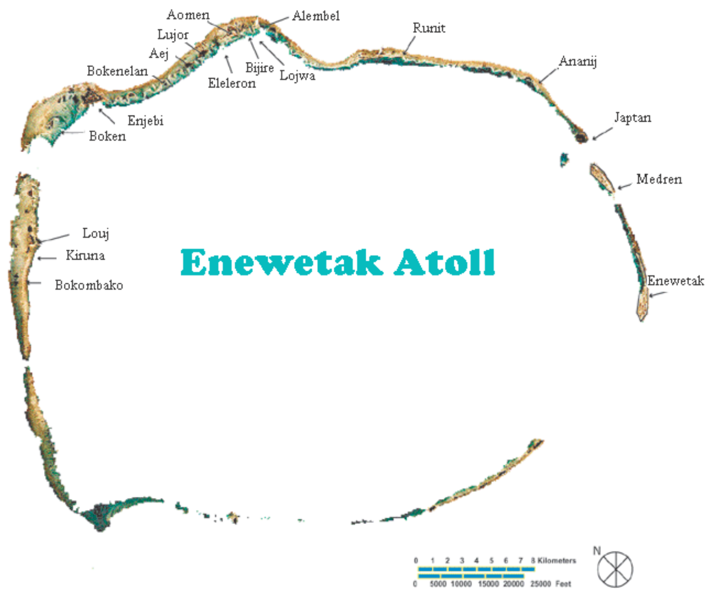


Figure 2. Map of the Republic of Marshall Islands showing the fallout pattern from the Bravo thermonuclear test conducted on March 1 of 1954.

ENEWETAK ATOLL

People & Events on Enewetak Atoll | Post Testing Era and Initial Cleanup Activities



People and Events on Enewetak Atoll

After an initial series of nuclear tests on Bikini Atoll in 1946, local inhabitants of Enewetak Atoll were relocated to a new home on Ujelang Atoll in December 1947 in preparation for scheduling of the first series of nuclear tests on Enewetak. Operation Sandstone commenced in April 1948 and included 3 tests on top of 60 m high steel towers located separately on the islands of Enjebi, Aomen, and Runit. An additional 4 near surface tests were conducted on towers as part of Operation Greenhouse during 1951. Operation Ivy, in 1952, set the stage for the first test of a large thermonuclear device. The Mike thermonuclear blast of 31 October 1952 had an explosive yield of 10.4 Mt (USDOE, 2000) vaporizing the island of Elugelab and leaving behind a deep crater about 1 km in diameter. Early analysis of Mike fallout debris showed the presence of two new isotopes of plutonium, plutonium-244 (^{244}Pu) and plutonium-246 (^{246}Pu), and lead to the discovery of the new heavy elements, Einsteinium and Fermium. Operation Castle involved a single test on Enewetak in 1954 and 5 high-yield tests on Bikini. A total of 11 nuclear tests were also conducted on Enewetak in 1956 as part of Operation Redwing including an air burst from a balloon located over water.

In 1958, the United States anticipated the acceptance of a call for suspension of atmospheric nuclear testing and assembled a large number of devices for testing before the moratorium came into effect. From April through August 1958, 22 near-surface nuclear denotations were conducted on Enewetak Atoll either on platforms, barges or underwater, 10 tests at Bikini Atoll, 2 tests near Johnson Atoll, and a high altitude test about 100 kms west of Bikini Atoll. Most nuclear tests conducted on Enewetak Atoll were detonated in the northern reaches of the atoll and produced highly localized fallout contamination of neighboring islands and the atoll lagoon. As a consequence, the northern islands on Enewetak received significantly higher levels of fallout deposition containing a range of fission products, activation products and unfissioned nuclear fuel. By the time the test moratorium came into effect on 31 October 1958, the United States had conducted 42 tests on Enewetak Atoll.

Post Testing Era and Initial Cleanup Activities

Enewetak Atoll continued to be used for defense programs until the start of a cleanup and rehabilitation program in 1977. There were five feasible approaches considered by the Defense Nuclear Agency (DNA, 1981) for cleanup of Enewetak Atoll. The final plan called for 1) removing all radioactive and non-radioactive debris (equipment, concrete, scrap metal, etc.), 2) removing all soil that exceeded 14.8 Bq (400 pCi) of plutonium per gram of soil 3) removing or amending soil between 1.48 and 14.8 Bq (40 and 400 pCi) of plutonium per gram of soil, determined on a case-by-case basis depending on ultimate land use, and 4) disposing and stabilizing all this accumulated radioactive waste into a crater on Runit Island and capping it with a concrete dome. Over 4,000 U.S. servicemen assisted in the cleanup operations, with 6 lives lost in accidents, in what became known as the Enewetak Radiological Support Project (DOE, 1982). Over 73,000 cubic meters of soil from the surface of 6 islands was removed and deposited in Cactus crater on Runit Island. The Nevada Operations Office of the Department of Energy was responsible for certification of radiological conditions of each island upon completion of the project. The Operations Office also developed several large databases to document radiological conditions before and after the cleanup operations, and to provide data to update available dose assessments. The Enewetak cleanup was largely focused on the removal and containment of plutonium along with other heavy radioactive elements. However, even during this early period of cleanup and rehabilitation, the adequacy of cleanup of the northern islands on Enewetak was brought into question because predictive dose assessments showed that ingestion of cesium-137 and other fission products from consumption of locally grown terrestrial foods was the most significant route for human exposure to residual fallout contamination on coral atolls affected by the nuclear test program.

The people of Enewetak remained on Ujelang Atoll until resettlement of Enewetak Island in 1980. Between 1980 and 1997, the resettled population living on Enewetak Island was periodically monitored for internally deposited radionuclides by scientists from the Brookhaven National Laboratory using whole body counting and plutonium urinalysis (Sun *et al.*, 1997a; 1997b). More recently, the Department of Energy agreed to design and construct a radiological laboratory on Enewetak Island, and help develop the necessary local resources and technical expertise to maintain and operate the facility. This cooperative effort was formalized in a Memorandum of Understanding signed by the U.S. Department of Energy, the Republic of the Marshall Islands, and the Enewetak/Ujelang Local Atoll Government in August of 2000 (MOU, 2000). Construction on the Enewetak Radiological Laboratory was completed in May of 2001. The laboratory facility incorporates both a permanent whole body counting system–to assess radiation doses from internally deposited cesium-137–and clean living space for collecting *in vitro* bioassay samples. Scientists from the Lawrence Livermore National Laboratory continue to support the operation of the facility and are responsible for systems maintenance, training and data quality assurance.

WHOLE BODY COUNTING

What is Whole Body Counting? | What Will the Whole Body Counting Show? | Estimating Doses from Cesium-137 Based on Whole Body Counting | Dose to Enewetak Island Residents from Internally Deposited Cesium-137

What is Whole Body Counting?

The whole body counting systems installed in the Marshall Islands contain large volume sodium iodide radiation detectors that measure gamma rays coming from radionuclides deposited in the body. The detector systems are modeled after the ‘Masse-Bolton Chair’ design (Figure 3) and can be used to detect high-energy gamma-emitting radionuclides from the decay of cesium-137, cobalt-60 and potassium-40 in most of the body and all of the internal organs. Using established protocols the whole body counting measurement data are converted into an annual effective dose using specially designed computer software (Canberra, 1998a; 1998b).

There are currently three operational whole body counting facilities in the Republic of the Marshall Islands. These facilities are located on Enewetak, Rongelap and Majuro Atolls. The whole body counting systems are calibrated using a mixed-gamma point source. The point source calibration procedure was developed by cross-reference to a Bottle Man-akin Absorption (BOMAB) phantom (or human surrogate) calibration source containing a standard mix of gamma-emitting radionuclides traceable to the U.S. National Institute of Standards and Technology (NIST).

Wherever possible, the whole body counting program in the Marshall Islands is conducted using the same quality requirements as established under the U.S. Department of Energy Laboratory Accreditation Program (DOELAP) for internal dosimetry. Background and other quality control check counts are performed on a daily basis to ensure that the measurement system conforms to all applicable quality requirements. Also, each whole body counting facility participates in external performance testing exercises with the Hazards Control Department at the Lawrence Livermore National Laboratory using ‘5 bottle phantoms’ prepared under contract by the Oak Ridge National Laboratory. These performance test samples are distributed around each of the facilities including a *mirror* whole body counting system located at Livermore. The performance of the facilities is then evaluated by comparing results with those obtained by the Hazards Control Department at the Lawrence Livermore National Laboratory–a DOELAP accredited facility–and with the reference values supplied by the Oak Ridge National Laboratory. Under this quality assurance program, the data returned by these remote facilities in the Marshall Islands has consistently exceeded ANSI 13.30 criteria for measurement accuracy and precision.

Local Marshallese technicians are responsible for all daily operations within the facilities including scheduling of personal counts, performing systems performance checks, data reduction, and reporting to program volunteers. The technicians receive an initial six weeks of intensive training at the Lawrence Livermore National Laboratory and are employed to run the facilities for up to 40 hours per week. Scientists from the Lawrence Livermore National Laboratory provide on-going technical support services, advanced training in whole body counting and basic health physics, and perform a more detailed data quality assurance appraisal before any data are released in reports or posted to the world-wide web.

Figure 3. The Enewetak Radiological Laboratory whole body counter with a plastic calibration phantom seated in the chair.

What Will the Whole Body Counting Show?

The main pathway for exposure to residual fallout contamination in the northern Marshall Islands is through ingestion of cesium-137 contained in locally grown foods such as coconut, *Pandanus* fruit and breadfruit. The strategic objective of the Marshall Islands Whole Body Counting Program is to offer island residents an unprecedented level of radiation protection monitoring until such time that it is clearly demonstrated that radiation surveillance measures can be relaxed. The value of this type of radiation protection monitoring program lies in the fact that whole body count data provides a direct measure of the full range of radionuclide uptakes into the local population. Information about potential *high-end* health risks and seasonal fluctuations in the body burden of cesium-137 within exposed Marshallese can be assessed from measurement data rather than relying on a range of assumptions from different dietary scenarios.

In combination with environmental monitoring data, residents who receive a whole body count showing the presence of cesium-137 can now make an informed decision about their eating habits or life-style based on what is considered a “safe” or acceptable health risk. The Republic of the Marshall Islands Nuclear Claims Tribunal has adopted a standard for cleanup of radioactively contaminated sites of 0.15 millisievert (mSv) per year (or 15 mrem per year) [EDE, Effective Dose Equivalent] using a lifetime cancer risk criterion recommended by the U.S. Environmental Protection Agency (EPA). As displaced communities return to their ancestral homelands, the Marshall Islands Whole Body Counting Program will allow the U.S. Department of Energy to monitor the return of the people and help ensure that the radiation related health risks remain at or below these established standards.

Estimating Doses from Cesium-137 Based Whole Body Counting

People living in the Marshall Islands may be exposed to cesium-137 contained in their diets from eating locally grown food crop products such as coconut. Whole body counting provides a direct measure of the amount of cesium-137 inside the body of people. The biokinectic behavior of cesium-137 inside the human body is well known and allows information from the whole body counter to be converted to a radiation dose. The radiation dose is what is used to quantify the potential human health risk associated with radiation exposure. The dosimetric data displayed in graphics presented in this report and the associated web site are based on the calendar year committed effective dose equivalent (CEDE) from intakes of radionuclides in the year of measurement projected over 70 years [details on methodologies can be found in Appendix 3, Technical Basis Document, see under Daniels *et al.*, (2006)]. Dose equivalent is given in units of rem, the conventional units used by federal and state agencies in the United States. The SI unit of dose equivalent is the joule per kilogram or sievert (Sv). Doses from exposure to environmental radioactivity (natural or manmade) are normally expressed as 1/1000th of the base unit, i.e., in millirem (mrem) or millisievert (mSv). 1 mSv is equal to 100 mrem.

INFORMATION NOTE

We have recently updated our methodologies for computing doses from the whole body counting and plutonium urinalysis programs (refer to the Technical Basis Document, Daniels et al., 2006). This new methodology uses a 50 y dose commitment and complies more fully with ICRP methodology. The algorithms developed to allow users to compute doses directly from the measurement data made available on the web site (post 2004) are also consistent with this new methodology.

Doses to Enewetak Island Residents from Internally Deposited Cesium-137

The individual (de-identified) measurement data developed under the whole body counting program on Enewetak Island are tabulated in Appendix I, TABLE 1.

The frequency distribution of the committed effective dose equivalent received by Enewetak Island residents from exposure to dietary cesium-137 annualized to the year of measurement is shown in Figure 4.

The majority of people living on Enewetak Island received internal doses from intakes of cesium-137 of less than 1 mrem per year. The population average committed effective dose equivalent for each measurement year was 0.5±0.5 mrem in 2001 (N = 417), 0.8±0.8 mrem in 2002 (N=131), 0.5±0.7 mrem in 2003 (N = 197) and 0.7±1.3 mrem in 2004 (N = 316). The corresponding maximal individual committed effective dose equivalent for each measurement year was 3.2 mrem, 4.9 mrem, 4.0 mrem and 11.5 mrem, respectively

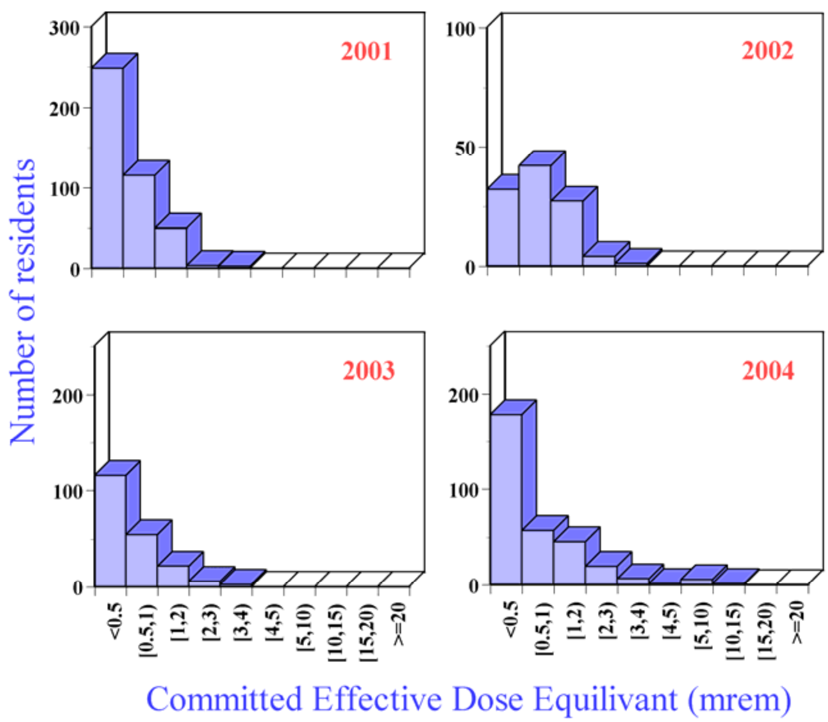


Figure 4. Frequency distribution of the committed effective dose equivalent for the Enewetak population group from internally deposited cesium-137 annualized to the measurement year (2001 to 2004). Summary graphics for each measurement year are based on committed dose received over 70 years; refer supporting documentation (Daniels et al., 2006, Appendix 3).

The average annualized committed effective dose equivalent to adults (N = 767), teenagers (N = 235), pre-teenagers (N = 109) and children (47 individuals) over the history of the surveillance program (2001-2004) was 0.64±0.71 mrem per year, 0.5±1.2 mrem per year, 0.56±1.2 mrem per year and 0.45±1.7 mrem per year, respectively. The average population dose for adult males of 0.74±0.75 mrem per year (N = 508) was slightly higher than that observed in adult females of around 0.43±0.56 mrem per year (N = 259). It should be noted that the body burden of cesium-137 in about 1 of every 3 volunteers on Enewetak Island fall below the critical level of measurement (Lc~0.05 kBq).

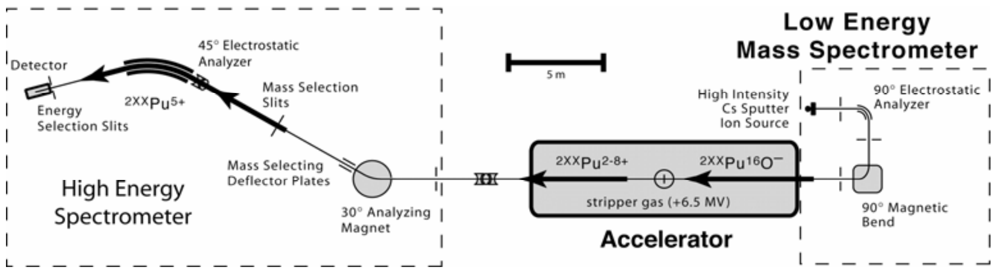
The committed effective dose equivalent delivered to Enewetak Atoll residents from ingestion of cesium-137 can be compared with natural background doses of 140 mrem per year in the Marshall Islands and 300 mrem per year in the United States. Enewetak Atoll residents are also receiving doses from ingestion of cesium-137 that are significantly below the annual dose criteria of 100 mrem per year, excluding medical irradiation, imposed in 10CFR Part 20 (NRC, 1994) for protection of the public. Consequently, these results appear to demonstrate that Enewetak residents are not being exposed to significantly elevated levels of cesium-137 in their diets. In terms of assessing doses to maximally exposed individuals, people who consume foods from the northern islands are more likely to acquire a higher whole body burden of cesium-137. The continuing whole body counting program on Enewetak Island should take steps to ensure that people who occasionally 'binge' on foods from the northern islands are carefully monitored. Under these circumstances, the annual dose delivered to an individual may be dominated by intakes of cesium-137 from occasional visits to the northern islands where local terrestrial foods typically contain higher average concentrations of cesium-137 (as well as other fallout radionuclides).

PLUTONIUM URINALYSIS (BIOASSAY) MONITORING

What is Plutonium Urinalysis | Routes of Exposure | Purpose of Plutonium Urinalysis Monitoring | Methods of Detection | Method Validation | Plutonium Urinalysis Monitoring on Enewetak | Plans for the Future

What is Plutonium Urinalysis Monitoring?

Plutonium urinalysis is a very sensitive *in-vitro* bioassay measurement technique used to determine the amount of plutonium in human urine as a means of estimating the systemic burden (or total amount of plutonium) in the human body. Plutonium urinalysis



Schematic diagram of the systems configuration for measuring plutonium isotopes using Accelerator Mass Spectrometry (AMS). AMS is about 200 to 400 times more sensitive than standard techniques commonly employed in routine internal dosimetry programs, and far exceeds the standard requirements established under the latest United States Department of Energy regulation 10CFR 835 for in vitro bioassay monitoring of alpha-emitting radionuclides such as plutonium-239.

tests are performed by collecting urine from individuals over a 24-hour period. The test turns a urine sample into a powder which scientists analyze by counting the number of plutonium atoms contained in the sample. Under the Marshall Islands Radiological Surveillance Program, we have developed a new state-of-the-art technology for measuring the amount of plutonium in urine based on Accelerator Mass Spectrometry.

Everybody has a small amount of plutonium in their bodies. Plutonium occurs in nature at very low concentrations but human exposure to plutonium increased dramatically through the 1950s as a result of global fallout from atmospheric nuclear weapons testing. Marshall Islanders are potentially exposed to higher levels of contamination in the environment as a result of close-in and regional fallout deposition.

Routes of Exposure

Plutonium is an important radioactive element produced in nuclear explosions. Plutonium emits alpha particles (or alpha-rays). Alpha-particles have a short range in tissue (about ~40 μm) and cannot be measured by detectors external to the body. However, as heavy slow moving charged particles they have a high relative effectiveness to disrupt or cause harm to the content of biological cells. As a consequence, *in-vitro* bioassay tests have been developed to test for the presence of systemic plutonium in the human body based on measured urinary excretion patterns and modeled metabolic behaviors of the absorbed isotopes.

The main pathway for exposure to plutonium in humans is inhalation of contaminated dust particles in the air that people breathe. Inhaled or ingested plutonium may eventually end up in various organs–especially the lung, liver and bone–resulting in continuous exposure of these tissues to alpha particle radiation. Plutonium remains in the body for a long time but the systemic uptake of plutonium for people living in the northern Marshall Islands is still expected to be very low (Robison *et al.*, 1980; 1982; 1997).

Inhalation exposure can be estimated from the product of the soil concentration, resuspension enhancement factors and inhalation dose conversion factors for radionuclides of interest. These estimates show that the projected dose contribution from exposure to plutonium in the Marshall Islands is less that 5% of the total lifetime dose from exposure to residual fallout contamination in the environment (Robison *et al.*, 1980; 1982; 1997). However, plutonium is a major concern to people living in the northern Marshall Islands because of its long half-life and persistence in the environment. Radioactive debris deposited in lagoon sediments of coral atolls formed a reservoir and source term for remobilization and transfer of plutonium through the marine food chain and potentially to man. Also, elevated levels of plutonium in the terrestrial environment from close-in fallout deposition represent potential long-term inhalation and/or ingestion hazards. Early characterization of the terrestrial environment also revealed the presence of hotspots containing milligram-sized pieces of plutonium metal that clearly required some form of remediation (DOE, 1982). Consequently, dose assessments and atoll rehabilitation programs in the Marshall Islands have historically given special consideration to monitoring plutonium uptake in resettled and resettling populations.

What is the Purpose of Plutonium Urinalysis Monitoring in the Marshall Islands?

Plutonium urinalysis is a measurement technique that ultimately provides information to individuals on the amount of plutonium they have in their bodies. Although plutonium is expected to be a minor contributor to the total manmade dose, it is a concern to people living in the northern Marshall Islands who are potentially exposed to elevated levels of plutonium in the environment from close-in or regional fallout deposition. Consequently, the United States Department of Energy has agreed to monitor resettlement workers and perform a limited number of urinalysis tests on island residents using advanced measurement technologies available at the Lawrence Livermore National Laboratory. The measurement technique currently employed at the Lawrence Livermore National Laboratory is based on Accelerator Mass Spectrometry. AMS is about 200 to 400 times more sensitive than monitoring techniques commonly employed in internal dosimetry monitoring programs in the United States, and far exceeds the standard requirements established under the latest Department of Energy regulation 10CFR 835 for *in vitro* bioassay monitoring of alpha-emitting radionuclides such as plutonium-239.

The Marshall Islands Plutonium Urinalysis Monitoring Program was implemented under the following action plan:-

1) To provide more reliable and accurate data to assess *baseline* and potentially significant incremental uptakes of plutonium within resettled and/or resettling populations in the Marshall Islands.

2) To monitor plutonium exposure in critical populations groups such as field workers engaged in soil remediation or agriculture.

3) To determine occupational and/or public exposures to plutonium in the Marshall Islands and confirm they are below levels that will impact human health.

4) To participate in analytical proficiency testing programs to ensure that the accuracy and reliability of our measurement data meets all applicable quality requirements and that procedures are carefully documented.

5) To document and test the reliability of using environmental data to assess human exposure (and uptake) to plutonium in a coral atoll ecosystem.

Methods of Detection of Plutonium in Urine

Researchers from the Brookhaven National Laboratory (BNL) were the first to use whole body counting and plutonium urinalysis techniques to assess intakes of internally deposited radionuclides in Marshallese populations (Sun *et al.*, 1992; 1995; 1997a; 1997b; 1997c; Conard 1982; Lessard *et al.*, 1984; Miltenberger *et al.*, 1981; Greenhouse *et al.*, 1980). Classical methods for evaluating intakes of plutonium in bioassay samples include alpha-spectrometry and fission-track analysis. Alpha spectrometry cannot distinguish between plutonium-239 and plutonium-240, and results are normally reported for the sum of the two isotopes. Moreover, alpha spectrometry lacks the necessary detection sensitivity to accurately assess systemic plutonium uptake and dose in the Marshall Islands (Hamilton *et al.*, 2004). Fission Track Analysis is limited to the quantification of plutonium-239 but with a reported detection limit (MDA, Minimum Detection Amount) of around 1 to 3 microBecquerel (μBq) of plutonium-239, offers greatly improved potential for assessing likely uptakes associated with low-level chronic exposure to plutonium in the environment.

Under the Marshall Islands Plutonium Urinalysis Program, urine samples were initially sent to the University of Utah for analysis of plutonium using fission track analysis. Fission is a process where heavy nuclei such as plutonium and uranium break up into two large fragments. Fission may occur spontaneously or be induced by collisions with neutrons. During fission track analysis samples are exposed to a source of neutrons in a reactor in contact with a quartz or plastic slide. Any resulting fission fragments leave behind tracks on the slide that can be counted under an optical microscope to determine the amount of plutonium present. Historically, fission track analysis has been plagued with a number of deficiencies including the use of less than reliable and tedious preparative methods, low chemical yields, contamination issues and inaccurate quantification. The University of Utah and the Brookhaven National Laboratory improved on the fission track process methodology, and adopted a more rigorous approach to data reduction and quality assurance in support of urinalysis testing programs in the Marshall Islands.

More recently, scientists from the Lawrence Livermore National Laboratory have developed a low-level detection technique for determination of plutonium isotopes in bioassay samples based Accelerator Mass Spectrometry (Brown *et al.*, 2004; Hamilton *et al.*, 2006). The technique has vastly improved the quality and reliability of assessments of urinary excretion of plutonium from Marshall Islanders and avoids many of the disadvantages of using conventional atom counting techniques or other competing new technologies.

INFORMATION NOTE

There are two main isotopes of plutonium in the environment–namely plutonium-239 (^{239}Pu) and plutonium-240 (^{240}Pu). The isotopic composition of plutonium (i.e., the relative amounts of ^{239}Pu and ^{240}Pu) may vary significantly depending on the source of plutonium. For example, the $^{240}Pu/^{239}Pu$ content of nuclear fallout from high−yield atmospheric nuclear tests in the Marshall Islands produced $^{240}Pu/^{239}Pu$ atom ratio signatures of ~0.35 compared with that present in integrated global fallout deposition (~0.18) or unfissioned nuclear fuel (~0.05). Consequently, it may be possible to use urinalysis testing and plutonium isotope measurements as an investigative tool to assess source specific exposures to Bravo as well as other nuclear test events.

Method Validation

Method validation is the process used to monitor and document the quality of the measurement data. Methods validation testing under the Marshall Islands Plutonium Urinalysis Program has included the labs participation in an interlaboratory exercise organized by the U.S. National Institute of Standards and Technology (NIST). The results of this exercise clearly demonstrate that Accelerator Mass Spectrometry is well suited for detection of μBq concentrations of plutonium-239 and plutonium-240 in urine (Figure 5) (Marchetti *et al.*, 2002). An independent report on the results of this intercomparison exercise was recently published in the open scientific literature (McCurdy *et al.*, 2005).

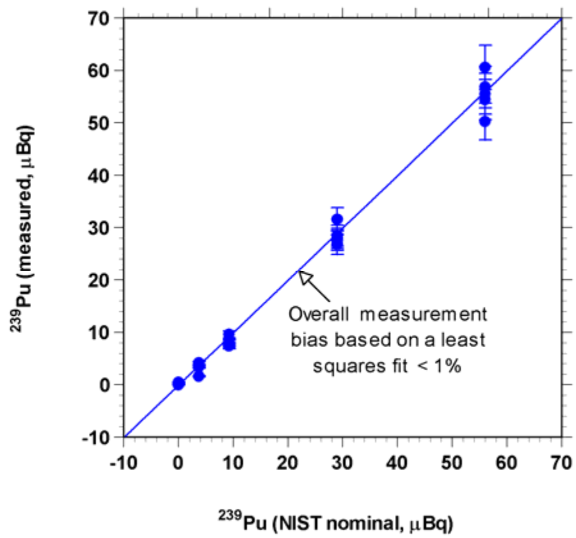


Figure 5. Results of a NIST interlaboratory exercise on determination of plutonium-239 in synthetic urine in the microBecquerel (μBq) range.

We also continue to test the performance of the technique by analyzing externally-prepared quality control natural urine samples artificially spiked with known amounts of plutonium. The quality control samples are prepared under contract with the Oak Ridge National Laboratory and analyzed along with routine bioassay samples collected from the Marshall Islands. The activity concentration of plutonium-239 in the quality control samples is kept below 200 μBq in order to avoid possible cross-contamination problems, and the plutonium-240/plutonium-239 atom ratio approximates that observed in integrated worldwide fallout deposition, i.e., ~0.2. The results of the quality control analyses are sent to Oak Ridge National Laboratory researchers for review who, in return, prepare a data quality assurance report. All quality control data must pass ANSI 13.30 performance criteria for accuracy and precision before acceptance of any routine bioassay measurement data. The average combined measurement bias and precision based on spiked quality samples analyzed through March 2004 were −1.2% and ±5.1% for plutonium-239, and +6.1% and ±10.3% for plutonium-240, respectively. The results of the plutonium-239 measurements are shown in Figure 6. Based on the results from these performance tests we consider that the methodologies employed under the Marshall Islands Urinalysis Program to represent the current state-of-the-art in the field.

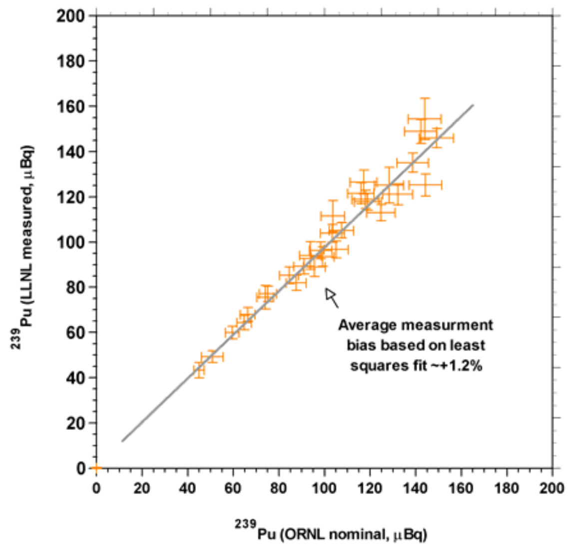


Figure 6. Results of plutonium-239 measurements in externally-prepared natural matrix spiked quality control samples

Plutonium Urinalysis Monitoring on Enewetak

The Individual (de-identified) measurement data developed under the Marshall Islands Plutonium Urinalysis Monitoring Program on Enewetak Island are tabulated in Appendix I, TABLE 2.

The bioassay sampling program on Enewetak Atoll has involved 4 periodic sample collections of 40 to 50 volunteers. At the request of the Enewetak-Ujelang Atoll Local Government priority has been given to collecting bioassay samples from three main cohorts; (1) agricultural workers, (2) Enewetak Island residents born during the 1950-60s at the peak of the nuclear test program in the Marshall Islands, and (3) those people who were born on the island and who remained as residents of Enewetak Atoll.

The geometric mean in the urinary excretion of plutonium-239 by Enewetak residents during the period between 2001 and 2003 was ~0.2 µBq per 24-hour void (N = 196). No plutonium-239 was found (based on the geometric mean) in a comparable set of field blanks (N = 24) prepared and analyzed over the same period. A more detailed statistical analysis of these data will be given elsewhere (Bogen *et al.*, 2006).

Urinary excretion of plutonium from Marshallese populations will consist of a long-term baseline component from residual systemic burdens acquired from all previous exposures plus any prompt (new) contributions (and eventual long-term excretion) resulting from recently acquired systemic burdens of plutonium. It is reported that people living in the Northern Hemisphere have acquired sufficiently high systemic burdens of plutonium from exposure to global fallout contamination to produce urinary excretion rates of around 2-4 μBq per 24-h void (Boecker *et al.*, 1991). Based on fission track analysis of urine samples collected by scientists from Brookhaven National Laboratory, the systematic deposition of plutonium from exposure to global fallout contamination in the Marshall Islands is estimated to produce background urinary excretion rates of plutonium of around 1-2 μBq per 24-h void (National Research Council, 2004) or about an order of magnitude higher than levels observed in our studies. Consequently, we believe that the more precise and higher quality bioassay data based on Accelerator Mass Spectrometry will provide a more accurate basis for assessing small incremental uptakes of plutonium in resettled populations. Similarly, the sensitivity of the method is such that we may be able to track long-term changes in the availability and transfer of plutonium through the marine and/or terrestrial pathways to man.

The vast majority of the individual bioassay samples collected from Enewetak Island residents contained less than the critical level of plutonium to provide measurements with an acceptable level of precision and accuracy. Nonetheless, we can say that the systemic burden of plutonium in Enewetak residents is generally very low and well within the background range expected for people living elsewhere in the Northern. This would normally negate the necessity to assign doses to the individual measurements. However, for completeness, we attempt to assign a dose to all the measurement data using <u>default assumptions</u> (refer associated Technical Basis Document, Daniels *et al.*, 2006).

The range of estimates for the committed effective dose equivalent from systemic burdens of plutonium measured in the Enewetak Atoll agricultural workers and island residents during measurement years between 2001 and 2003 are shown in Figure 7. The committed dose shown in summary graphics on this web page is the dose received over 70 years from the year of measurement; refer supporting documentation (Daniels *et al.*, 2006, Appendix 3). Please note that the annualized dose criteria developed for remediation of radioactively contaminated sites (NCRP, 2004) is usually based on estimates of the total effective dose equivalent (TEDE) over 50 years and consists of the

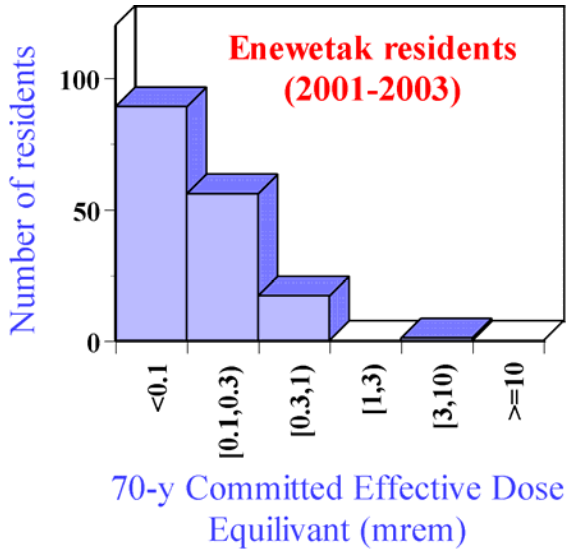


Figure 7. Frequency distribution of the committed effective dose equivalent from measured urinary excretion of plutonium from Enewetak Island residents during the year of measurement (2001 thru. 2003). Summary graphics are based on committed dose received over 70 years from the year of measurement; refer supporting documentation (Daniels *et al.*, 2006, Appendix 3).

sum of the committed dose due to intakes of radionuclides during the measurement year (of which, plutonium is just one potential component) and the deep dose equivalent from external exposures in that year.

Plans for the Future

Some of the early urinary excretion data for plutonium in the Marshall Islands is of questionable quality because of the poor quantification sensitivity of the methods employed and/or general lack of adequate quality control. Consequently, we plan to expand the plutonium urinalysis program over the next two years to include monitoring studies of background urinary excretion rates on Utrōk Atoll.

In addition, we plan to collect bioassay samples from Rongelap Island to establish a baseline for people resettling the island. After resettlement, any increase in the systemic burden of plutonium will result from very low-level chronic exposure to plutonium in food and/or soil or from inhalation of plutonium resuspended in the air. High quality baseline urinary excretion data will therefore be required to provide a measure against which all future urinalysis tests on this population can be compared. Such provisions should help provide assurances to the resettled population that we will be able to adequately monitor the return of the population and assess any changes in the systemic uptake of plutonium associated with resettlement. Similarly, high quality baseline data for other resettled communities such as the Enewetak and Utrōk Atoll population groups will provide essential information in helping track and monitor potential long-term changes in exposure conditions, especially in relation to the remobilization and transfer of plutonium through the aquatic food chain or from other changes in land use patterns.

MEASUREMENT DATA FROM THE INDIVIDUAL RADIOLOGICAL SURVEILLANCE PROGRAM

Introduction | Individual Measurement Database

Introduction

The individual (de-identified) measurement database developed for the Enewetak population group is accessible over the world-wide web (Figure 8; http://eed.llnl.gov/mi/);

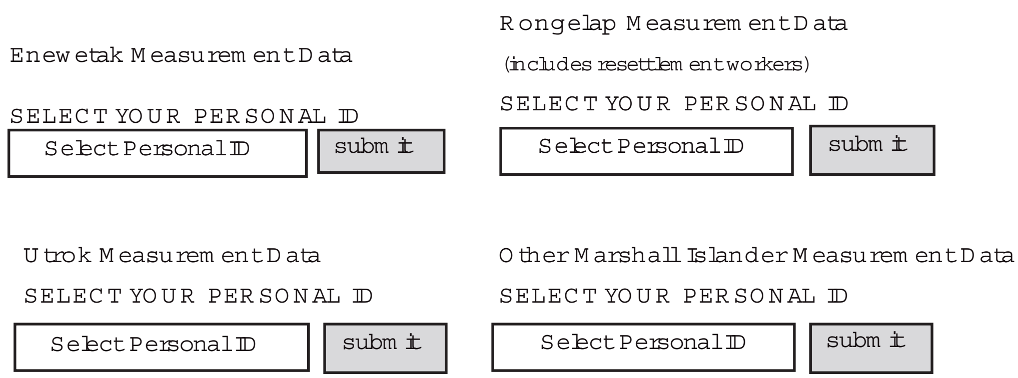


Figure 8. Layout of the menu to access measurement data from our whole body counting and plutonium urinalysis programs over the world-wide web (http://eed.llnl.gov/mi/).

Whole-body counting provides a direct measure of the total amount of cesium-137 present in the human body at the time of measurement. The amount of cesium-137 detected is usually reported in activity units of kilo-Becequerel (kBq), where 1 kBq equals 1000 Bq and 1 Bq = 1 nuclear transformation per second (t s^{-1}). The detection of plutonium-239 (^{239}Pu) and plutonium-240 (^{240}Pu) in bioassay (urine) samples indicates the presence of internally deposited (systemic) plutonium in the body. At Livermore, these measurements are performed using a state-of-the-art technology based on Accelerator Mass Spectrometry (AMS) (Brown *et al.*, 2004; Hamilton *et al.*, 2004; 2006). Under the Marshall Islands Plutonium Urinalysis Program, the urinary excretion of plutonium from program volunteers is usually described in activity units, expressed as micro-Becquerel (μBq) of $^{239+240}Pu$ (the sum of the ^{239}Pu and ^{240}Pu activity) excreted (lost) per day (d^{-1}); where 1 $\mu Bq\ d^{-1} = 10^{-6}\ Bq\ d^{-1}$ and 1 Bq = 1 t s^{-1}.

Individual Measurement Database

The website provides electronic access to verified whole body counting and plutonium urinalysis data developed under the Marshall Islands Radiological Surveillance Program at the Lawrence Livermore National Laboratory (2001-present). Please note that measurements data developed for Enewetak residents incorporates counts from any one our three whole body counting facilities and may include people from other affiliations with the exception of permanent residents from Rongelap and Utrōk Atolls.

DOSIMETRIC DATA AND METHODOLOGY

Introduction | Dosimetric Methodology

Introduction

The individual (de-identified) dosimetric database developed for the Enewetak population group is accessible over the world-wide web (Figure 9, http://eed.llnl.gov/mi/);

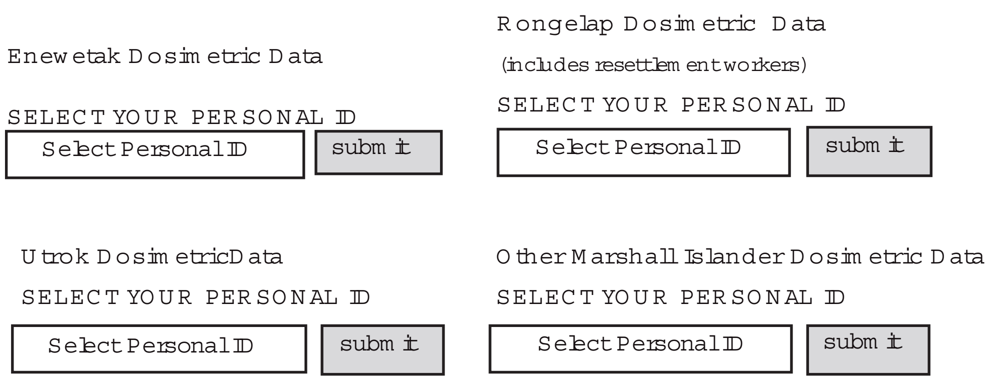


Figure 9. Layout of the menu to access dosimetric data from our whole body counting and plutonium urinalysis programs over the world-wide web (http://eed.llnl.gov/mi/).

In general, nuclear transformations emit energy and/or particles in the form of gamma rays, beta particles and alpha particles. Tissues in the human body may adsorb these emissions with the potential for any deposited energy to cause damage and disrupt biological function of cells. The general term used to quantify the extent of any health risk from radiation exposure is referred to as the dose. The equivalent dose is defined by the average absorbed dose in an organ or tissue weighed by the average quality factor for the type and energy of the radiation causing the dose. The effective dose equivalent (as applied to the whole body) is the sum of the average dose equivalent for each tissue weighted by tissue weighing factors. The SI unit of effective dose equivalent is the joule per kilogram (J kg^{-1}), named the sievert (Sv). The conventional unit often used by federal and state agencies in the United States is called a rem; 1 rem = 0.01 Sv.

Based on measurements of the internally deposited ^{137}Cs and/or the urinary excretion of plutonium, an estimate can be derived for either or both radionuclides of the annual number of nuclear transformations (t y^{-1}) that occurred in the body during the measurement year. For both radionuclides, this result is the time integral of activity in the body of an individual normalized over a one-year measurement period. In addition to nuclear transformations occurring during the year of measurement, additional transformations may occur in the future due to the presence of residual activity in the body at the end of the measurement year. The number of transformations derived from the residual radioactivity is usually evaluated up to 50 y in the future (a conservative maximum as defined by the United States (U.S.) Environmental Protection Agency (EPA) for members of the public) resulting in a committed dose. Accordingly, these future transformations will commit additional dose to the individual according to the biological half-life of the radioactive element of concern. For this reason, it is considered appropriate and conforming with the national and international recommendations of the United States Environment Protection Agency (U.S. EPA) and the International Commission on Radiological Protection (ICRP) that this additional dose commitment be assigned to the year of measurement. Consequently, dose reports issued under the Marshall Islands Radiological Surveillance Program are based on the Committed Effective Dose Equivalent (CEDE).

Dosimetric Methodology

The calendar year dose represents the sum of radionuclide-specific, age-dependent, committed effective dose equivalent for each monitored radionuclide. The total calendar years dose is calculated over a calendar year but only applies to the sum of the committed dose from cesium-137 and the 50-y integrated dose from plutonium (based on a time integral of any whole body counting and any available plutonium bioassay measurements performed during that year). When only one radionuclide is measured, the total dose assigned in a year and the CEDE for a specific radionuclide are identical. When more than one radionuclide is measured, the total annual ‘calendar year’ dose is the sum on the CEDE for each measured radionuclide. The calendar year dose estimates based on whole body counting and plutonium bioassay are conservative in nature, especially in relation to plutonium, and is only be comparable to the internal dose component of the EDE standard of 15 mrem per year as adopted by the Marshall Islands Nuclear Claims Tribunal for cleanup and rehabilitation of radioactively contaminated sites (to view the full report on the dose methodology, see Daniels *et al.*, 2006).

PROVIDING FOLLOWUP ON RESULTS

All volunteers participating in the Marshall Islands Radiological Surveillance Program are issued a preliminary copy of their dose report immediately after they receive a whole body count. Scientists from the Lawrence Livermore National Laboratory verify the measurement data and, if required, issue a revised dose report. Annualized doses of 0.10 mSv (10 mrem) or above will normally evoke a pre-determined action or investigation for the particular radionuclide concerned. These actions may include follow-up verification measurements, a dietary evaluation and/or a work history review. Below this level, default assumptions for assigning doses (Daniels *et al.*, 2006) are assumed to be valid and no further action is taken. Data may be withheld from the website or hard copy reports while these investigations are on-going. Our action level is one-tenth of the investigation level used throughout the U.S. Department of Energy and is well below the 15 mrem per year standard adopted by the Republic of the Marshall Islands Nuclear Claims Tribunal for cleanup of radioactively contaminated sites. In addition, at the end of each calendar year, all program volunteers receive a final written report containing an estimate of their "*calendar year* dose" based on available data for the measurements year.

ACKNOWLEDGMENTS

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GLOSSARY OF TERMS

Absorbed Dose

The absorbed dose is the energy deposited in an organ or tissue per unit mass of irradiated material. The common unit for absorbed dose is the rad, which is equivalent to 100 egs per gram of material. The international scientific community has adopted the use of different terms. The SI unit of absorbed dose is the joule per kilogram (J kg^{-1}) and its special name is the gray (Gy). One Gy is the same as 100 rad.

Activity

Activity is the rate of transformation or decay of a radioactive material. The SI unit of activity is the reciprocal second (s^{-1}) and its special name is the Becquerel. Federal and state agencies in the United States use conventional units where activity is given in curies (Ci); 1 Ci = 3.7 x 10^{10} Bq.

Alpha Particles

Alpha particles are one of the primary types of radiation associated with radioactivity and exist as energetic nuclei of helium atoms, consisting of two protons and two neutrons. Alpha rays are heavy, slow moving, charged particles that travel only one or two inches in air, and can be stopped by a piece of paper or the outer dead layer of human skin.

Background Radiation

The average person in the United States receives about 3.6 mSv (360 mrem) of ionizing radiation every year. About 3.0 mSv (300 mrem) per year comes from natural background radiation including cosmic radiation, radiation emitted by naturally occurring radionuclides in air, water, soil and rock, and radiation emitted by natural radionuclides deposited in tissues of organs; and about (0.6 mSv) 60 mrem from man-made sources such as exposures to diagnostic X-rays and consumer products (e.g., from smoking tobacco). The general worldwide contribution from radioactive fallout contamination is <0.3% of the average total annual dose. Exposures to natural background radiation vary depending on the geographic area, diet and other factors such as the composition of materials used in the construction of homes. The natural background radiation dose in the Marshall Islands is around 1.4 mSv (140 mrem) per year and is significantly less than what most people receive around the world.

Baseline

We have all been exposed to some level of worldwide fallout contamination. In the United States, the general population receives up to 0.015 mSv (1.5 mrem) or about 0.3% of the average total annual dose from exposure to worldwide fallout contamination from atmospheric nuclear weapons testing and about 0.005 (0.5 mrem) or about 0.1% of the average total annual dose from operations related nuclear power generation. Similarly, people living in the Marshall Islands will have very small quantities of internally deposited fallout radionuclides such as cesium-137, strontium-90 and plutonium in their bodies from worldwide contamination of food, air, water and soil. Assessments of possible increases in radiation exposure from elevated levels of fallout contamination in the northern Marshall Islands can only be made on the basis of comparisons with residual systematic burdens of radionuclides acquired from previous exposures to global fallout contamination. Under the Marshall Islands Radiological Surveillance Program, efforts are being made to improve on the reliability of measurements of background urinary excretion rates of plutonium from Marshallese populations against which the results of future bioassay measurements can be compared to accurately assess the impacts of resettlement on radiation exposure and dose.

Becquerel (Bq)

A Becquerel (abbreviated as Bq) is the International System (SI) unit for activity of radioactive material. One Bq of radioactive material is that amount of material in which one atom is transformed or undergoes 1 disintegration every second. Whole body counting and plutonium bioassay measurements are usually reported in activity units of kBq (kiloBecquerel) (1000 x 1 Bq) and μBq (microBecquerel) (1×10^{-6} x 1 Bq), respectively.

Biokinectic

The word 'biokinectic' is used here to describe the adsorption (uptake), distribution and retention of elements in humans.

Calibration

Calibration is the process of adjusting or determining the response or reading of an instrument to a standard.

Committed Dose Equivalent

Committed dose equivalent is the time integral of the dose-equivalent rate in a particular tissue that will be received by an individual following an intake of radioactive material into the body by inhalation, ingestion or dermal absorption. For adults the committed dose is usually the dose received over 50 years. For children, the committed dose is usually calculated from the age of intake to age 70 years. For these age groups the term 'integrated dose equivalent' is used.

Committed Effective Dose Equivalent (CEDE)

The committed effective dose equivalent is the committed dose equivalents to various tissues or organ in the body each multiplied by an appropriate tissue-weighing factor and then summed. The conventional unit for committed effective dose equivalence (CEDE) used by federal and state agencies within the United States is the rem. The international scientific (SI) unit of committed effective dose equivalent is called a sievert (Sv). One Sv is the same as 100 rem.

Critical Level (L_C)

The critical level is the amount of a count or final measurement of a quantity of an analyte at or above which a decision is made that the analyte is definitely present ($L_C \approx$ MDA/2).

Default Assumptions (used in assignment of dose)

The largest dose contributions attributable to exposure to residual nuclear fallout contamination in the Marshall Islands result from either internal exposure from intakes of radionuclides through ingestion, inhalation and/or absorption through the skin or external exposure from radionuclides distributed in the soil. External exposure rates can be measured directly using instrument surveys of the radiation field. The assignment of dose to internally deposited radionuclides is much more complicated. Biokinectic and dosimetric models developed by the International Commission on Radiological Protection (ICRP) are used to convert whole body burdens (from whole body counting or from *in vitro* bioassay tests such as urinalysis) into dose. In the case of a chronic exposure, organ and body burdens continue to build up over time until a steady state is reached where losses due to decay and excretion are balanced by intake and absorption. Cesium-137 has an effective half-life in an adult of about 110 days, and under chronic exposure conditions reaches a maximal dose contribution after about 2 years. By contrast, plutonium absorbed from the gastrointestinal or respiratory tract enters the blood stream and deposits in liver and bone with an effective half-life of 20 to 50 years. Only a small fraction of plutonium entering the blood stream is excreted in urine with the long-term excretion rate approaching 2×10^{-5} of the systemic body burden per day. Knowledge of excretion rates and time of exposure are important when interpreting urinalysis data. A more detailed discussion of the dose calculation methodology is given elsewhere (see under Daniels *et al.*, 2006).

Direct bioassay

The measurements of radioactive material in the human body utilizing instrumentation that detects radiation emitted from radioactive material in the body (synonymous with *in vivo* measurements).

Dose Assessment

The scientific process used to determine radiation dose and uncertainty in the dose.

Dose Equivalent

The dose equivalent is the adsorbed dose at a point in tissue multiplied by a biological effectiveness factor or quality factor for the particular types of radiation to cause biological damage. The conventional unit of dose equivalents used by federal and state agencies in the United States is the rem. A dose of 100 rem to an adult normally produces some clinical signs of radiation sickness and requires hospitalization. The international scientific unit for dose equivalent is the joule per kilogram ($J\ kg^{-1}$) and is called the sievert (Sv). One Sv is the same as 100 rem.

Effective Dose Equivalent

The effective dose equivalent for the whole body is the sum of dose-equivalents for various organs in the body weighted to account for different sensitivities of the organs to radiation. It includes the dose from radiation sources internal and/or external to the body. The effective dose equivalent is usually expressed in units of millirem (mrem). The international scientific unit for dose equivalent is the joule per kilogram ($J\ kg^{-1}$) and is called the sievert (Sv). One Sv is the same as 100 rem.

External Dose or Exposure

That portion of the dose equivalent received from radiation sources outside the human body.

Fission Track Analysis

During neutron irradiation heavy nuclei such as uranium and plutonium undergo nuclear fission with release of large fission fragments. This property has led to the development of a number of measurement techniques such as delayed neutron activation analysis and fission track analysis. Fission track analysis is a measurement technique commonly employed in plutonium urinalysis (bioassay) monitoring programs. Urine samples are chemically treated to remove plutonium. The plutonium is then mounted in contact with a special plastic or quartz slide known as solid-state nuclear track detector (SSNTD). The slide along with the sample is then irradiated in a reactor where neutron-induced fission of plutonium-239 (or uranium-235) causes emission of energetic fission fragments.

Some of the fragments penetrate into the SSNTD damaging the integrity of the material before coming to rest. The SSNTD is separated from the sample and chemically etched to expose the damaged areas (known as fission tracks) on the detector surface. The fission tracks are then counted under an optical microscope. The amount of plutonium (and/or uranium) present in the sample is a function of the total number of tracks and the neutron flux.

Gamma-rays

Gamma-rays are electromagnetic waves produced by spontaneous decay of radioactive elements during de-excitation of an atomic nucleus. Sunlight also consists of electromagnetic waves but gamma-rays have a shorter wavelength and much higher energy. High-energy gamma-rays such as those produced by decay of cesium-137 may penetrate deeply into the body and affect cells. Gamma-rays from a cobalt-60 source are often used for cancer radiotherapy.

High-End Health Risk

High-end health risk is used here under the context that it refers to the maximally exposed individuals in a population.

In Vito

In vitro measurements are synonymous with indirect bioassay techniques, such as plutonium urinalysis.

In Vivo

In vivo measurements are synonymous with bioassay techniques, such as whole body counting.

Indirect bioassay

In direct bioassay are measurements used to determine the presence of and/or the amount of a radioactive material in the excreta, urine or in other biological materials removed from the body (synonymous with *in vitro* measurements).

Individual

An individual is any human being.

Internal Dose or Exposure

The internal dose is that portion of the dose equivalent received from radiation sources inside the human body.

Isotope

Atoms with the same number of protons but different numbers of neutrons are called isotopes of that element. We identify different isotopes by appending the total number of nucleons (the total number of proton plus neutrons in the nucleus of an atom) to the name of the element, e.g., cesium-137. Isotopes are usually written in an abbreviated form using the chemical symbol of the element. Two examples include ^{137}Cs for cesium-137 and ^{239}Pu for plutonium-239.

Minimum Detectable Amount (MDA)

The minimum detectable amount (MDA) is the smallest activity or mass of an analyte in a sample or person that can be detected with an acceptable level of uncertainty.

Quality Assurance

All those planned and systematic actions necessary to provide adequate confidence that an analysis, measurement or surveillance program will perform satisfactorily.

Quality Control

Quality Control is defined as those actions taken to control the attributes of a analytical process, system or facility according to predetermined quality requirements.

Radiation Dose (or mrem)

A generic term to describe the amount of radiation a person receives. Dose is measured in units of thousands of a roentegen equivalent man (rem) (called the millirem). The conventional unit used by federal and state agencies in the United States is the millirem (mrem). Dose is a general term used to assist in the management of exposure to radiation. The common international scientific (SI) unit for dose is the millisievert (mSv). One mSv is the same as 100 mrem.

Radioactivity

A natural and spontaneous process by which unstable atoms of an element emit energy and/or particles from their nuclei and, thus change (or decay) to atoms of a different element or a different state of the same element.

Radiological Monitoring

Radiological monitoring is the process of measuring radiation levels or individual doses, and the use of the results to assess radiological hazards or potential and actual doses resulting from exposures to ionizing radiation.

Remediation

Remediation is the actions taken to reduce risks to human health or the environment posed by the presence of radioactive or hazardous materials.

Risk

The probability of harm from the presence of radionuclides or hazardous materials taking into account (1) the probability of occurrences or events that could lead to an exposure, (2) probability that individual or populations would be exposed to radioactive or hazardous materials and the magnitude of such exposures, and (3) the probability that an exposure would produce a response.

Validation

Validation refers to the process of defining the method capability and determining whether it can be properly applied as intended.

Whole Body

For the purposes of external exposure includes the head, trunk, the arms above and including the elbow, and legs above and including the knee.

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Appendix I

Individual Radiological Surveillance Monitoring Data Based on Whole Body Counting and Plutonium Urinalysis (2002-2004)

ENEWETAK ATOLL AGRICULTURAL WORKERS &

ISLAND RESIDENTS

Table 1. Whole body count data for agricultural workers and Enewetak Island residents (2002-2004).

Personal ID #	Age Type	Gender	Collection Date	^{137}Cs (kBq) Value	MDA
EN00002	Adult	Male	2002-02-08	0.28 ± 0.02	0.10
EN00002	Adult	Male	2002-06-03	0.38 ± 0.02	0.10
EN00002	Adult	Male	2003-09-04	0.30 ± 0.02	0.18
EN00003	Adult	Male	2002-04-02	0.20 ± 0.02	0.10
EN00003	Adult	Male	2003-07-19	0.36 ± 0.02	0.18
EN00003	Adult	Male	2004-03-02	0.40 ± 0.03	0.15
EN00003	Adult	Male	2004-07-15	0.34 ± 0.07	0.31
EN00003	Adult	Male	2004-08-26	0.11 ± 0.04	0.19
EN00004	Adult	Male	2002-02-11	0.06 ± 0.01	0.08
EN00004	Adult	Male	2002-05-23	0.00 ± 0.00	0.06
EN00004	Adult	Male	2002-06-24	0.00 ± 0.00	0.06
EN00004	Adult	Male	2002-10-03	0.11 ± 0.01	0.08
EN00004	Adult	Male	2004-01-12	0.00 ± 0.00	0.07
EN00004	Adult	Male	2004-02-10	0.00 ± 0.00	0.07
EN00004	Adult	Male	2004-07-22	0.04 ± 0.02	0.09
EN00004	Adult	Male	2004-09-30	0.04 ± 0.02	0.08
EN00004	Adult	Male	2004-12-02	0.00 ± 0.00	0.06
EN00005	Adult	Male	2002-02-11	0.21 ± 0.02	0.09
EN00005	Adult	Male	2002-03-14	0.20 ± 0.02	0.09
EN00005	Adult	Male	2002-05-24	0.25 ± 0.02	0.10
EN00005	Adult	Male	2002-06-24	0.30 ± 0.02	0.10
EN00005	Adult	Male	2002-12-04	0.33 ± 0.02	0.11
EN00005	Adult	Male	2004-01-12	0.08 ± 0.02	0.18
EN00005	Adult	Male	2004-02-11	0.06 ± 0.01	0.17
EN00005	Adult	Male	2004-07-26	0.18 ± 0.03	0.13
EN00006	Adult	Male	2002-02-13	0.24 ± 0.02	0.08
EN00006	Adult	Male	2002-03-15	0.15 ± 0.01	0.09
EN00006	Adult	Male	2002-05-23	0.36 ± 0.02	0.10
EN00006	Adult	Male	2002-06-24	0.39 ± 0.02	0.10
EN00006	Adult	Male	2002-10-03	0.38 ± 0.02	0.11
EN00006	Adult	Male	2002-11-27	0.27 ± 0.02	0.11
EN00006	Adult	Male	2003-01-08	0.26 ± 0.02	0.10
EN00006	Adult	Male	2003-11-19	0.00 ± 0.00	0.08
EN00006	Adult	Male	2004-01-12	0.07 ± 0.02	0.19
EN00006	Adult	Male	2004-06-21	0.44 ± 0.04	0.17
EN00006	Adult	Male	2004-07-28	0.35 ± 0.03	0.14
EN00006	Adult	Male	2004-09-30	0.29 ± 0.03	0.14
EN00007	Adult	Male	2002-02-11	0.64 ± 0.04	0.11
EN00007	Adult	Male	2002-03-14	0.51 ± 0.03	0.11
EN00007	Adult	Male	2002-05-23	0.50 ± 0.03	0.11
EN00007	Adult	Male	2002-06-25	0.46 ± 0.03	0.10
EN00007	Adult	Male	2002-10-08	0.36 ± 0.02	0.11
EN00007	Adult	Male	2002-11-27	0.27 ± 0.02	0.10

Table 1. Continued.

Personal ID #	Age Type	Gender	Collection Date	^{137}Cs (kBq) Value	MDA
EN00007	Adult	Male	2003-12-02	0.16 ± 0.02	0.31
EN00007	Adult	Male	2004-01-12	0.00 ± 0.00	0.08
EN00007	Adult	Male	2004-02-10	0.00 ± 0.00	0.08
EN00007	Adult	Male	2004-06-21	0.14 ± 0.03	0.13
EN00007	Adult	Male	2004-07-21	0.24 ± 0.04	0.16
EN00007	Adult	Male	2004-12-02	0.00 ± 0.00	0.06
EN00008	Adult	Male	2002-02-11	0.16 ± 0.01	0.10
EN00008	Adult	Male	2002-03-14	0.13 ± 0.01	0.09
EN00009	Adult	Male	2002-02-18	0.08 ± 0.01	0.09
EN00009	Adult	Male	2002-03-19	0.07 ± 0.01	0.09
EN00009	Adult	Male	2002-05-23	0.14 ± 0.01	0.09
EN00009	Adult	Male	2002-06-25	0.08 ± 0.01	0.09
EN00009	Adult	Male	2002-10-04	0.16 ± 0.01	0.08
EN00009	Adult	Male	2002-11-25	0.09 ± 0.01	0.10
EN00009	Adult	Male	2003-01-07	0.10 ± 0.01	0.08
EN00009	Adult	Male	2003-11-19	0.00 ± 0.00	0.07
EN00009	Adult	Male	2004-01-09	0.13 ± 0.01	0.26
EN00009	Adult	Male	2004-02-10	0.09 ± 0.02	0.13
EN00009	Adult	Male	2004-06-21	0.06 ± 0.02	0.09
EN00009	Adult	Male	2004-07-22	0.08 ± 0.02	0.09
EN00009	Adult	Male	2004-09-30	0.04 ± 0.02	0.07
EN00010	Adult	Male	2002-02-13	0.18 ± 0.02	0.10
EN00010	Adult	Male	2002-03-22	0.13 ± 0.01	0.10
EN00010	Adult	Male	2002-05-23	0.23 ± 0.02	0.09
EN00010	Adult	Male	2002-06-24	0.24 ± 0.02	0.10
EN00010	Adult	Male	2002-10-03	0.34 ± 0.02	0.11
EN00010	Adult	Male	2003-01-07	0.21 ± 0.02	0.11
EN00010	Adult	Male	2003-12-01	0.16 ± 0.02	0.16
EN00010	Adult	Male	2004-01-12	0.09 ± 0.02	0.19
EN00010	Adult	Male	2004-02-10	0.11 ± 0.02	0.17
EN00010	Adult	Male	2004-06-21	0.40 ± 0.02	0.19
EN00010	Adult	Male	2004-07-22	0.35 ± 0.03	0.14
EN00011	Adult	Male	2002-02-11	0.24 ± 0.02	0.08
EN00011	Adult	Male	2002-05-24	0.26 ± 0.02	0.10
EN00011	Adult	Male	2002-06-24	0.24 ± 0.02	0.10
EN00011	Adult	Male	2002-10-03	0.26 ± 0.02	0.10
EN00011	Adult	Male	2002-11-25	0.26 ± 0.02	0.10
EN00011	Adult	Male	2003-01-06	0.22 ± 0.02	0.11
EN00011	Adult	Male	2003-11-26	0.11 ± 0.02	0.16
EN00011	Adult	Male	2004-01-12	0.31 ± 0.02	0.19
EN00011	Adult	Male	2004-02-10	0.37 ± 0.02	0.17
EN00011	Adult	Male	2004-07-22	0.49 ± 0.04	0.18
EN00012	Adult	Male	2002-02-11	0.06 ± 0.01	0.08
EN00012	Adult	Male	2002-03-15	0.07 ± 0.01	0.10

Table 1. Continued.

Personal ID #	Age Type	Gender	Collection Date	^{137}Cs (kBq) Value	MDA
EN00012	Adult	Male	2002-05-23	0.09 ± 0.01	0.09
EN00012	Adult	Male	2002-06-24	0.07 ± 0.01	0.08
EN00012	Adult	Male	2002-10-04	0.09 ± 0.01	0.09
EN00012	Adult	Male	2002-11-27	0.16 ± 0.01	0.08
EN00012	Adult	Male	2003-01-07	0.15 ± 0.01	0.08
EN00012	Adult	Male	2003-12-01	0.22 ± 0.02	0.16
EN00012	Adult	Male	2004-01-12	0.14 ± 0.02	0.18
EN00012	Adult	Male	2004-02-10	0.12 ± 0.02	0.16
EN00012	Adult	Male	2004-06-21	0.23 ± 0.04	0.19
EN00012	Adult	Male	2004-07-29	0.18 ± 0.04	0.18
EN00013	Adult	Male	2002-02-18	0.06 ± 0.01	0.07
EN00013	Adult	Male	2002-03-18	0.00 ± 0.00	0.06
EN00013	Adult	Male	2002-05-23	0.00 ± 0.00	0.06
EN00013	Adult	Male	2002-06-24	0.08 ± 0.01	0.07
EN00013	Adult	Male	2003-01-07	0.00 ± 0.00	0.07
EN00013	Adult	Male	2003-12-01	0.06 ± 0.01	0.13
EN00013	Adult	Male	2004-01-12	0.00 ± 0.00	0.07
EN00013	Adult	Male	2004-02-10	0.00 ± 0.00	0.07
EN00015	Adult	Male	2002-02-11	0.10 ± 0.01	0.08
EN00015	Adult	Male	2002-03-18	0.09 ± 0.01	0.09
EN00015	Adult	Male	2002-05-23	0.15 ± 0.01	0.09
EN00015	Adult	Male	2002-06-24	0.15 ± 0.01	0.10
EN00015	Adult	Male	2002-10-04	0.16 ± 0.01	0.10
EN00015	Adult	Male	2003-01-06	0.13 ± 0.01	0.08
EN00015	Adult	Male	2003-12-01	0.09 ± 0.01	0.15
EN00015	Adult	Male	2004-01-09	0.07 ± 0.01	0.15
EN00015	Adult	Male	2004-02-10	0.00 ± 0.00	0.08
EN00015	Adult	Male	2004-06-21	0.14 ± 0.02	0.11
EN00015	Adult	Male	2004-07-23	0.10 ± 0.02	0.11
EN00016	Adult	Male	2003-11-19	0.00 ± 0.00	0.08
EN00018	Adult	Male	2002-02-13	0.12 ± 0.01	0.09
EN00018	Adult	Male	2002-03-18	0.15 ± 0.01	0.09
EN00018	Adult	Male	2002-05-24	0.24 ± 0.02	0.11
EN00018	Adult	Male	2002-06-24	0.26 ± 0.02	0.10
EN00018	Adult	Male	2002-10-04	0.39 ± 0.02	0.11
EN00018	Adult	Male	2002-11-27	0.27 ± 0.02	0.11
EN00018	Adult	Male	2003-01-06	0.22 ± 0.02	0.11
EN00018	Adult	Male	2003-12-02	0.00 ± 0.00	0.08
EN00018	Adult	Male	2004-01-12	0.09 ± 0.02	0.17
EN00018	Adult	Male	2004-02-11	0.08 ± 0.01	0.17
EN00018	Adult	Male	2004-06-21	0.21 ± 0.04	0.16
EN00018	Adult	Male	2004-07-22	0.26 ± 0.03	0.13
EN00019	Adult	Male	2002-02-11	0.22 ± 0.02	0.11
EN00019	Adult	Male	2002-03-18	0.11 ± 0.01	0.08

Table 1. Continued.

Personal ID #	Age Type	Gender	Collection Date	^{137}Cs (kBq) Value	MDA
EN00019	Adult	Male	2002-05-23	0.25 ± 0.02	0.10
EN00019	Adult	Male	2002-06-24	0.25 ± 0.02	0.10
EN00019	Adult	Male	2002-10-04	0.36 ± 0.02	0.11
EN00020	Adult	Male	2002-02-13	0.24 ± 0.02	0.10
EN00020	Adult	Male	2002-05-23	0.40 ± 0.02	0.10
EN00020	Adult	Male	2003-12-01	0.14 ± 0.02	0.16
EN00020	Adult	Male	2004-01-12	0.15 ± 0.02	0.19
EN00020	Adult	Male	2004-02-10	0.20 ± 0.02	0.16
EN00020	Adult	Male	2004-06-24	0.23 ± 0.04	0.17
EN00020	Adult	Male	2004-07-22	0.18 ± 0.04	0.16
EN00021	Adult	Male	2002-02-13	0.16 ± 0.01	0.08
EN00021	Adult	Male	2002-03-15	0.08 ± 0.01	0.09
EN00021	Adult	Male	2002-05-24	0.25 ± 0.02	0.10
EN00021	Adult	Male	2002-06-25	0.24 ± 0.02	0.09
EN00021	Adult	Male	2002-12-04	0.58 ± 0.03	0.11
EN00021	Adult	Male	2003-01-07	0.50 ± 0.03	0.12
EN00021	Adult	Male	2003-11-27	0.29 ± 0.02	0.17
EN00021	Adult	Male	2004-01-12	0.32 ± 0.02	0.18
EN00021	Adult	Male	2004-02-10	0.26 ± 0.02	0.17
EN00021	Adult	Male	2004-06-21	0.58 ± 0.04	0.17
EN00021	Adult	Male	2004-07-28	0.42 ± 0.07	0.32
EN00022	Adult	Male	2002-02-19	0.10 ± 0.01	0.09
EN00022	Adult	Male	2002-03-15	0.12 ± 0.01	0.08
EN00022	Adult	Male	2002-06-25	0.06 ± 0.01	0.08
EN00022	Adult	Male	2002-12-04	0.16 ± 0.01	0.10
EN00022	Adult	Male	2003-01-14	0.20 ± 0.01	0.08
EN00022	Adult	Male	2003-11-19	0.07 ± 0.01	0.15
EN00022	Adult	Male	2004-01-13	0.05 ± 0.01	0.12
EN00022	Adult	Male	2004-02-10	0.10 ± 0.02	0.16
EN00022	Adult	Male	2004-06-23	0.21 ± 0.03	0.12
EN00022	Adult	Male	2004-07-26	0.22 ± 0.03	0.12
EN00023	Adult	Male	2002-02-19	0.15 ± 0.01	0.09
EN00023	Adult	Male	2002-06-03	0.23 ± 0.02	0.10
EN00023	Adult	Male	2002-10-08	0.33 ± 0.02	0.11
EN00023	Adult	Male	2002-11-27	0.23 ± 0.02	0.11
EN00023	Adult	Male	2003-01-06	0.17 ± 0.01	0.11
EN00023	Adult	Male	2004-01-14	0.14 ± 0.02	0.18
EN00023	Adult	Male	2004-02-10	0.15 ± 0.02	0.16
EN00023	Adult	Male	2004-06-23	0.13 ± 0.03	0.13
EN00023	Adult	Male	2004-07-22	0.15 ± 0.03	0.12
EN00024	Adult	Male	2002-03-18	0.55 ± 0.03	0.11
EN00024	Adult	Male	2002-05-24	0.60 ± 0.03	0.11
EN00024	Adult	Male	2002-06-25	0.54 ± 0.03	0.11
EN00024	Adult	Male	2002-10-08	0.60 ± 0.03	0.12

Table 1. Continued.

Personal ID #	Age Type	Gender	Collection Date	^{137}Cs (kBq) Value	MDA
EN00024	Adult	Male	2002-12-02	0.47 ± 0.02	0.11
EN00024	Adult	Male	2003-01-08	0.47 ± 0.02	0.11
EN00024	Adult	Male	2003-11-26	0.30 ± 0.02	0.16
EN00024	Adult	Male	2004-01-12	0.28 ± 0.02	0.19
EN00024	Adult	Male	2004-02-10	0.28 ± 0.02	0.17
EN00024	Adult	Male	2004-06-23	0.47 ± 0.04	0.15
EN00024	Adult	Male	2004-07-23	0.49 ± 0.07	0.33
EN00024	Adult	Male	2004-07-23	0.66 ± 0.08	0.36
EN00025	Adult	Male	2002-02-18	0.13 ± 0.01	0.09
EN00025	Adult	Male	2002-03-22	0.13 ± 0.01	0.09
EN00025	Adult	Male	2002-05-27	0.25 ± 0.02	0.09
EN00025	Adult	Male	2002-06-25	0.32 ± 0.02	0.10
EN00025	Adult	Male	2002-10-08	0.26 ± 0.02	0.11
EN00025	Adult	Male	2002-11-25	0.23 ± 0.02	0.09
EN00025	Adult	Male	2003-01-08	0.17 ± 0.01	0.10
EN00025	Adult	Male	2003-12-01	0.14 ± 0.02	0.16
EN00025	Adult	Male	2004-01-14	0.09 ± 0.02	0.16
EN00025	Adult	Male	2004-06-21	0.44 ± 0.04	0.16
EN00025	Adult	Male	2004-07-23	0.00 ± 0.00	0.13
EN00027	Adult	Male	2002-02-18	0.06 ± 0.01	0.10
EN00027	Adult	Male	2002-03-15	0.08 ± 0.01	0.08
EN00027	Adult	Male	2002-05-27	0.08 ± 0.01	0.09
EN00027	Adult	Male	2002-06-25	0.11 ± 0.01	0.07
EN00027	Adult	Male	2002-10-08	0.33 ± 0.02	0.11
EN00027	Adult	Male	2002-11-27	0.23 ± 0.02	0.11
EN00027	Adult	Male	2003-01-07	0.21 ± 0.02	0.11
EN00027	Adult	Male	2003-12-01	0.14 ± 0.02	0.28
EN00027	Adult	Male	2004-01-13	0.08 ± 0.02	0.16
EN00027	Adult	Male	2004-02-10	0.00 ± 0.00	0.07
EN00027	Adult	Male	2004-06-24	0.08 ± 0.02	0.10
EN00027	Adult	Male	2004-07-22	0.00 ± 0.00	0.06
EN00028	Adult	Male	2002-02-19	0.12 ± 0.01	0.10
EN00028	Adult	Male	2002-03-20	0.11 ± 0.01	0.08
EN00028	Adult	Male	2002-05-29	0.14 ± 0.01	0.10
EN00028	Adult	Male	2002-06-25	0.19 ± 0.02	0.10
EN00028	Adult	Male	2002-12-04	0.16 ± 0.01	0.09
EN00029	Adult	Male	2002-02-19	0.12 ± 0.01	0.09
EN00029	Adult	Male	2002-03-19	0.11 ± 0.01	0.10
EN00029	Adult	Male	2002-05-27	0.19 ± 0.02	0.10
EN00029	Adult	Male	2002-06-26	0.21 ± 0.02	0.09
EN00029	Adult	Male	2002-10-08	0.25 ± 0.02	0.11
EN00029	Adult	Male	2002-11-25	0.17 ± 0.01	0.09
EN00029	Adult	Male	2003-11-19	0.00 ± 0.00	0.08
EN00029	Adult	Male	2003-11-26	0.00 ± 0.00	0.08

Table 1. Continued.

Personal ID #	Age Type	Gender	Collection Date	^{137}Cs (kBq) Value	MDA
EN00029	Adult	Male	2004-01-14	0.07 ± 0.02	0.18
EN00029	Adult	Male	2004-02-11	0.08 ± 0.01	0.17
EN00029	Adult	Male	2004-06-23	0.41 ± 0.04	0.19
EN00029	Adult	Male	2004-07-26	0.24 ± 0.03	0.16
EN00030	Adult	Male	2002-07-02	0.15 ± 0.01	0.10
EN00032	Adult	Male	2002-02-13	0.14 ± 0.01	0.09
EN00032	Adult	Male	2002-03-22	0.12 ± 0.01	0.09
EN00032	Adult	Male	2002-06-26	0.13 ± 0.01	0.09
EN00032	Adult	Male	2002-10-08	0.19 ± 0.02	0.10
EN00032	Adult	Male	2002-11-25	0.16 ± 0.01	0.09
EN00032	Adult	Male	2003-01-07	0.13 ± 0.01	0.10
EN00032	Adult	Male	2003-11-19	0.19 ± 0.02	0.16
EN00032	Adult	Male	2004-01-13	0.25 ± 0.02	0.18
EN00032	Adult	Male	2004-02-10	0.19 ± 0.02	0.17
EN00032	Adult	Male	2004-07-26	0.13 ± 0.03	0.13
EN00032	Adult	Male	2004-12-02	0.08 ± 0.03	0.15
EN00033	Adult	Male	2002-02-19	0.16 ± 0.01	0.08
EN00033	Adult	Male	2002-03-14	0.10 ± 0.01	0.09
EN00033	Adult	Male	2002-05-27	0.19 ± 0.02	0.09
EN00033	Adult	Male	2002-06-26	0.22 ± 0.02	0.10
EN00033	Adult	Male	2002-10-09	0.22 ± 0.02	0.10
EN00033	Adult	Male	2002-12-04	0.15 ± 0.01	0.09
EN00033	Adult	Male	2003-01-09	0.12 ± 0.01	0.09
EN00033	Adult	Male	2004-01-09	0.08 ± 0.02	0.16
EN00033	Adult	Male	2004-02-10	0.08 ± 0.01	0.17
EN00033	Adult	Male	2004-06-23	0.15 ± 0.03	0.12
EN00033	Adult	Male	2004-07-22	0.16 ± 0.03	0.14
EN00033	Adult	Male	2004-09-30	0.10 ± 0.03	0.13
EN00034	Adult	Male	2002-02-11	0.23 ± 0.02	0.10
EN00034	Adult	Male	2002-03-18	0.18 ± 0.02	0.10
EN00034	Adult	Male	2002-05-27	0.35 ± 0.02	0.10
EN00034	Adult	Male	2002-06-26	0.37 ± 0.02	0.10
EN00034	Adult	Male	2003-01-08	0.22 ± 0.02	0.10
EN00034	Adult	Male	2003-12-01	0.15 ± 0.02	0.16
EN00034	Adult	Male	2004-01-14	0.16 ± 0.02	0.17
EN00034	Adult	Male	2004-02-10	0.19 ± 0.02	0.17
EN00034	Adult	Male	2004-06-24	0.28 ± 0.04	0.17
EN00034	Adult	Male	2004-07-22	0.34 ± 0.03	0.15
EN00034	Adult	Male	2004-09-30	0.17 ± 0.03	0.15
EN00035	Adult	Male	2002-02-18	0.09 ± 0.01	0.10
EN00035	Adult	Male	2002-03-15	0.15 ± 0.01	0.07
EN00035	Adult	Male	2002-05-29	0.12 ± 0.01	0.08
EN00035	Adult	Male	2002-06-26	0.11 ± 0.01	0.08
EN00035	Adult	Male	2002-10-09	0.18 ± 0.01	0.10
EN00035	Adult	Male	2002-12-04	0.22 ± 0.02	0.10

Table 1. Continued.

Personal ID #	Age Type	Gender	Collection Date	^{137}Cs (kBq) Value	MDA
EN00035	Adult	Male	2003-01-14	0.15 ± 0.01	0.09
EN00035	Adult	Male	2004-01-15	0.26 ± 0.02	0.18
EN00035	Adult	Male	2004-02-11	0.21 ± 0.02	0.17
EN00035	Adult	Male	2004-07-22	0.19 ± 0.03	0.12
EN00036	Adult	Male	2003-12-02	0.14 ± 0.02	0.16
EN00036	Adult	Male	2004-06-01	0.19 ± 0.03	0.13
EN00037	Adult	Male	2002-07-02	0.19 ± 0.02	0.10
EN00038	Adult	Male	2002-02-18	0.16 ± 0.01	0.09
EN00038	Adult	Male	2002-05-27	0.22 ± 0.02	0.09
EN00038	Adult	Male	2002-06-25	0.25 ± 0.02	0.09
EN00038	Adult	Male	2002-12-04	0.32 ± 0.02	0.11
EN00038	Adult	Male	2003-01-09	0.31 ± 0.02	0.11
EN00038	Adult	Male	2003-11-26	0.32 ± 0.02	0.16
EN00038	Adult	Male	2004-01-13	0.34 ± 0.02	0.18
EN00038	Adult	Male	2004-02-10	0.25 ± 0.02	0.16
EN00038	Adult	Male	2004-07-21	0.79 ± 0.05	0.19
EN00039	Adult	Male	2002-02-18	0.20 ± 0.02	0.09
EN00039	Adult	Male	2002-03-18	0.21 ± 0.02	0.10
EN00039	Adult	Male	2002-05-27	0.21 ± 0.02	0.10
EN00039	Adult	Male	2002-06-26	0.20 ± 0.02	0.10
EN00039	Adult	Male	2002-10-09	0.23 ± 0.02	0.11
EN00039	Adult	Male	2002-12-04	0.16 ± 0.01	0.09
EN00039	Adult	Male	2003-01-08	0.25 ± 0.02	0.11
EN00039	Adult	Male	2003-12-01	0.16 ± 0.02	0.17
EN00039	Adult	Male	2004-01-14	0.17 ± 0.02	0.18
EN00039	Adult	Male	2004-02-11	0.22 ± 0.02	0.18
EN00040	Adult	Male	2002-07-02	0.12 ± 0.01	0.07
EN00040	Adult	Male	2003-11-28	0.00 ± 0.00	0.08
EN00040	Adult	Male	2004-03-24	0.26 ± 0.04	0.18
EN00040	Adult	Male	2004-05-31	0.25 ± 0.04	0.17
EN00041	Adult	Male	2003-12-02	0.13 ± 0.01	0.16
EN00041	Adult	Male	2004-08-26	0.43 ± 0.07	0.29
EN00042	Adult	Male	2002-02-18	0.19 ± 0.02	0.10
EN00042	Adult	Male	2002-03-15	0.18 ± 0.02	0.09
EN00042	Adult	Male	2002-06-03	0.55 ± 0.03	0.09
EN00042	Adult	Male	2002-06-27	0.43 ± 0.03	0.08
EN00042	Adult	Male	2003-01-08	0.38 ± 0.02	0.11
EN00042	Adult	Male	2003-12-01	0.23 ± 0.02	0.16
EN00042	Adult	Male	2004-01-09	0.28 ± 0.02	0.17
EN00042	Adult	Male	2004-02-10	0.37 ± 0.02	0.17
EN00042	Adult	Male	2004-06-24	0.41 ± 0.04	0.19
EN00043	Adult	Male	2002-02-11	0.26 ± 0.02	0.10
EN00043	Adult	Male	2002-03-20	0.18 ± 0.02	0.09
EN00043	Adult	Male	2002-05-28	0.17 ± 0.02	0.09
EN00043	Adult	Male	2002-06-26	0.15 ± 0.01	0.09

Table 1. Continued.

Personal ID #	Age Type	Gender	Collection Date	^{137}Cs (kBq) Value	MDA
EN00043	Adult	Male	2002-10-14	0.18 ± 0.01	0.10
EN00043	Adult	Male	2003-01-09	0.16 ± 0.01	0.10
EN00043	Adult	Male	2003-12-01	0.10 ± 0.01	0.15
EN00043	Adult	Male	2004-01-09	0.00 ± 0.00	0.08
EN00043	Adult	Male	2004-02-10	0.16 ± 0.02	0.17
EN00043	Adult	Male	2004-06-23	0.22 ± 0.04	0.16
EN00043	Adult	Male	2004-07-26	0.23 ± 0.04	0.19
EN00044	Adult	Male	2003-12-16	0.16 ± 0.02	0.17
EN00044	Adult	Male	2004-07-15	0.00 ± 0.00	0.12
EN00044	Adult	Male	2004-12-15	0.07 ± 0.02	0.10
EN00045	Adult	Male	2002-07-17	0.54 ± 0.03	0.11
EN00046	Adult	Male	2002-07-02	0.19 ± 0.02	0.10
EN00046	Adult	Male	2003-11-28	0.00 ± 0.00	0.08
EN00046	Adult	Male	2004-12-15	0.56 ± 0.04	0.15
EN00047	Adult	Male	2002-05-28	0.30 ± 0.02	0.10
EN00047	Adult	Male	2002-06-26	0.28 ± 0.02	0.10
EN00047	Adult	Male	2003-12-01	0.19 ± 0.02	0.16
EN00047	Adult	Male	2004-06-23	0.38 ± 0.04	0.18
EN00047	Adult	Male	2004-07-22	0.18 ± 0.03	0.14
EN00047	Adult	Male	2004-12-02	0.00 ± 0.00	0.07
EN00048	Adult	Male	2002-07-02	0.09 ± 0.01	0.08
EN00048	Adult	Male	2003-11-26	0.00 ± 0.00	0.08
EN00049	Adult	Male	2002-07-15	0.07 ± 0.01	0.09
EN00050	Adult	Male	2004-07-22	0.00 ± 0.00	0.11
EN00051	Adult	Male	2004-07-05	0.25 ± 0.06	0.25
EN00051	Adult	Male	2004-12-15	0.15 ± 0.03	0.13
EN00052	Adult	Male	2002-07-15	0.10 ± 0.01	0.08
EN00052	Adult	Male	2003-12-09	0.00 ± 0.00	0.07
EN00053	Adult	Male	2002-07-15	0.18 ± 0.02	0.10
EN00053	Adult	Male	2003-12-09	0.10 ± 0.02	0.17
EN00054	Adult	Male	2002-07-15	0.23 ± 0.02	0.10
EN00054	Adult	Male	2004-08-26	0.42 ± 0.08	0.35
EN00057	Adult	Male	2003-11-27	0.11 ± 0.02	0.15
EN00059	Adult	Male	2002-07-12	0.14 ± 0.01	0.09
EN00059	Adult	Male	2003-12-03	0.00 ± 0.00	0.08
EN00059	Adult	Male	2004-07-28	0.17 ± 0.04	0.19
EN00061	Adult	Female	2004-08-05	0.00 ± 0.00	0.06
EN00064	Adult	Male	2002-07-16	0.09 ± 0.01	0.09
EN00064	Adult	Male	2003-11-28	0.00 ± 0.00	0.08
EN00065	Adult	Male	2002-07-17	0.22 ± 0.02	0.10
EN00065	Adult	Male	2003-12-09	0.00 ± 0.00	0.08
EN00065	Adult	Male	2004-06-07	0.48 ± 0.05	0.20
EN00065	Adult	Male	2004-07-15	0.39 ± 0.04	0.16
EN00068	Adult	Male	2002-07-15	0.28 ± 0.02	0.10
EN00068	Adult	Male	2003-12-16	0.52 ± 0.03	0.17

Table 1. Continued.

Personal ID #	Age Type	Gender	Collection Date	^{137}Cs (kBq) Value	MDA
EN00069	Adult	Male	2002-07-17	0.15 ± 0.01	0.08
EN00069	Adult	Male	2004-07-30	0.10 ± 0.03	0.14
EN00070	Adult	Male	2002-07-16	0.32 ± 0.02	0.10
EN00070	Adult	Male	2004-08-04	0.09 ± 0.03	0.12
EN00071	Adult	Male	2003-12-04	0.00 ± 0.00	0.08
EN00074	Adult	Female	2004-05-22	0.16 ± 0.03	0.12
EN00076	Teenager	Male	2002-07-15	0.15 ± 0.01	0.10
EN00076	Adult	Male	2004-08-06	0.05 ± 0.03	0.13
EN00078	Adult	Female	2002-07-15	0.09 ± 0.01	0.09
EN00080	Adult	Male	2002-07-12	0.17 ± 0.01	0.09
EN00080	Adult	Male	2003-12-16	0.11 ± 0.02	0.17
EN00081	Adult	Male	2002-07-17	0.17 ± 0.02	0.10
EN00081	Adult	Male	2004-07-29	0.00 ± 0.00	0.11
EN00082	Teenager	Male	2002-07-12	0.21 ± 0.02	0.09
EN00082	Adult	Male	2003-12-12	0.14 ± 0.02	0.17
EN00082	Adult	Male	2004-09-17	0.00 ± 0.00	0.12
EN00084	Adult	Male	2002-02-19	0.20 ± 0.02	0.10
EN00084	Adult	Male	2002-03-15	0.23 ± 0.02	0.10
EN00084	Adult	Male	2002-05-27	0.12 ± 0.01	0.10
EN00084	Adult	Male	2002-06-27	0.19 ± 0.02	0.10
EN00084	Adult	Male	2002-12-02	0.22 ± 0.02	0.11
EN00084	Adult	Male	2003-01-09	0.17 ± 0.01	0.10
EN00084	Adult	Male	2003-12-01	0.15 ± 0.02	0.16
EN00084	Adult	Male	2004-01-13	0.13 ± 0.02	0.19
EN00084	Adult	Male	2004-02-11	0.10 ± 0.02	0.17
EN00084	Adult	Male	2004-06-24	0.17 ± 0.03	0.13
EN00084	Adult	Male	2004-07-23	0.15 ± 0.03	0.13
EN00086	Adult	Male	2004-07-20	0.00 ± 0.00	0.12
EN00088	Adult	Male	2002-07-12	0.07 ± 0.01	0.08
EN00091	Adult	Male	2003-12-04	0.00 ± 0.00	0.08
EN00092	Adult	Male	2002-07-15	0.14 ± 0.01	0.09
EN00093	Adult	Male	2004-07-05	0.20 ± 0.03	0.13
EN00094	Adult	Male	2002-07-15	0.22 ± 0.02	0.09
EN00095	Adult	Male	2002-07-02	0.18 ± 0.02	0.09
EN00097	Adult	Male	2002-07-12	0.09 ± 0.01	0.08
EN00098	Adult	Male	2002-07-17	0.13 ± 0.01	0.08
EN00100	Adult	Male	2003-01-20	0.35 ± 0.02	0.11
EN00100	Adult	Male	2003-12-15	0.30 ± 0.02	0.17
EN00101	Adult	Male	2003-12-03	0.00 ± 0.00	0.07
EN00102	Adult	Male	2003-01-20	0.07 ± 0.01	0.10
EN00104	Adult	Male	2003-01-20	0.07 ± 0.01	0.10
EN00105	Adult	Male	2003-01-20	0.18 ± 0.01	0.10
EN00105	Adult	Male	2003-12-15	0.13 ± 0.02	0.09
EN00107	Adult	Male	2003-01-22	0.16 ± 0.01	0.09
EN00108	Adult	Male	2003-12-12	0.20 ± 0.02	0.17

Table 1. Continued.

Personal ID #	Age Type	Gender	Collection Date	^{137}Cs (kBq) Value	MDA
EN00109	Adult	Male	2003-12-10	0.24 ± 0.02	0.17
EN00110	Adult	Male	2002-05-28	0.19 ± 0.02	0.09
EN00110	Adult	Male	2003-01-22	0.27 ± 0.02	0.10
EN00111	Adult	Male	2003-11-27	0.00 ± 0.00	0.08
EN00114	Adult	Male	2003-01-22	0.47 ± 0.02	0.11
EN00114	Adult	Male	2003-11-26	0.28 ± 0.02	0.16
EN00116	Adult	Male	2003-12-03	0.42 ± 0.02	0.16
EN00116	Adult	Male	2004-01-19	0.44 ± 0.03	0.18
EN00117	Adult	Male	2004-07-21	0.00 ± 0.00	0.11
EN00119	Teenager	Male	2002-07-10	0.07 ± 0.01	0.10
EN00120	Adult	Male	2003-12-15	0.00 ± 0.00	0.07
EN00120	Adult	Male	2004-06-02	0.07 ± 0.02	0.10
EN00122	Adult	Male	2004-07-15	0.62 ± 0.04	0.18
EN00125	Adult	Male	2004-12-01	0.45 ± 0.03	0.14
EN00126	Adult	Male	2003-01-28	0.81 ± 0.04	0.12
EN00127	Adult	Male	2003-01-22	0.59 ± 0.03	0.11
EN00128	Adult	Male	2003-01-24	0.08 ± 0.01	0.09
EN00128	Adult	Male	2003-12-03	0.21 ± 0.02	0.28
EN00130	Adult	Male	2003-01-28	0.13 ± 0.01	0.07
EN00130	Adult	Male	2003-12-03	0.00 ± 0.00	0.07
EN00131	Adult	Male	2003-01-22	0.09 ± 0.01	0.10
EN00132	Adult	Male	2003-11-28	0.00 ± 0.00	0.08
EN00132	Adult	Male	2004-09-02	0.00 ± 0.00	0.11
EN00133	Adult	Male	2003-12-03	0.00 ± 0.00	0.07
EN00135	Adult	Male	2003-12-03	0.03 ± 0.01	0.08
EN00136	Adult	Male	2003-01-24	0.24 ± 0.02	0.10
EN00139	Adult	Male	2002-11-27	0.45 ± 0.02	0.11
EN00139	Adult	Male	2003-01-28	0.29 ± 0.02	0.11
EN00140	Adult	Male	2003-01-28	0.21 ± 0.02	0.11
EN00142	Adult	Male	2003-01-28	0.30 ± 0.02	0.11
EN00142	Adult	Male	2004-06-14	0.46 ± 0.04	0.17
EN00143	Adult	Male	2003-01-28	0.21 ± 0.02	0.10
EN00146	Adult	Male	2004-01-16	0.12 ± 0.02	0.18
EN00150	Adult	Male	2002-07-12	0.17 ± 0.01	0.09
EN00150	Adult	Male	2004-06-14	0.75 ± 0.04	0.17
EN00150	Adult	Male	2004-07-08	0.57 ± 0.05	0.20
EN00151	Adult	Male	2002-02-22	0.40 ± 0.02	0.10
EN00151	Adult	Male	2002-07-15	0.93 ± 0.05	0.11
EN00151	Adult	Male	2002-10-08	0.84 ± 0.04	0.12
EN00151	Adult	Male	2003-01-15	0.62 ± 0.03	0.11
EN00151	Adult	Male	2003-12-17	0.33 ± 0.02	0.17
EN00151	Adult	Male	2004-07-27	0.00 ± 0.00	0.12
EN00156	Adult	Male	2004-07-26	0.00 ± 0.00	0.11
EN00159	Adult	Male	2003-12-02	0.19 ± 0.02	0.16
EN00161	Adult	Male	2003-11-26	0.00 ± 0.00	0.07

Table 1. Continued.

Personal ID #	Age Type	Gender	Collection Date	^{137}Cs (kBq) Value	MDA
EN00163	Adult	Male	2004-02-04	0.00 ± 0.00	0.08
EN00163	Adult	Male	2004-06-07	0.20 ± 0.03	0.15
EN00165	Adult	Male	2004-07-05	0.25 ± 0.04	0.17
EN00166	Teenager	Male	2003-12-02	0.00 ± 0.00	0.07
EN00166	Adult	Male	2004-09-29	0.00 ± 0.00	0.06
EN00168	Adult	Male	2004-06-25	0.04 ± 0.02	0.08
EN00171	Adult	Male	2004-07-21	0.00 ± 0.00	0.11
EN00172	Adult	Male	2002-07-12	0.26 ± 0.02	0.10
EN00173	Adult	Male	2003-11-27	0.09 ± 0.02	0.17
EN00178	Adult	Male	2004-08-05	0.00 ± 0.00	0.12
EN00180	Teenager	Male	2004-03-22	0.00 ± 0.00	0.06
EN00181	Teenager	Male	2002-07-10	0.08 ± 0.01	0.09
EN00181	Teenager	Male	2003-07-23	0.00 ± 0.00	0.11
EN00182	Teenager	Male	2003-02-04	0.00 ± 0.00	0.07
EN00182	Teenager	Male	2003-11-29	0.00 ± 0.00	0.07
EN00185	Adult	Male	2003-12-03	0.66 ± 0.03	0.17
EN00185	Adult	Male	2004-06-08	1.42 ± 0.06	0.20
EN00185	Adult	Male	2004-07-08	1.18 ± 0.06	0.24
EN00193	Adult	Female	2003-12-04	0.07 ± 0.01	0.12
EN00193	Adult	Female	2004-03-24	0.12 ± 0.02	0.10
EN00196	Adult	Female	2003-12-16	0.00 ± 0.00	0.07
EN00197	Adult	Female	2003-12-10	0.00 ± 0.00	0.07
EN00200	Adult	Male	2003-07-24	0.00 ± 0.00	0.11
EN00201	Adult	Female	2004-05-24	0.09 ± 0.03	0.12
EN00202	Adult	Female	2003-12-10	0.00 ± 0.00	0.07
EN00204	Adult	Female	2004-06-16	0.18 ± 0.04	0.18
EN00204	Adult	Female	2004-06-16	0.18 ± 0.04	0.19
EN00207	Adult	Female	2003-11-25	0.00 ± 0.00	0.08
EN00208	Adult	Female	2004-08-02	0.13 ± 0.03	0.13
EN00216	Teenager	Female	2003-02-03	0.00 ± 0.00	0.07
EN00217	Pre-Teen	Female	2003-02-05	0.15 ± 0.01	0.08
EN00220	Adult	Female	2003-11-24	0.00 ± 0.00	0.07
EN00221	Adult	Female	2004-07-20	0.00 ± 0.00	0.12
EN00223	Teenager	Male	2004-07-21	0.16 ± 0.03	0.11
EN00226	Adult	Male	2003-12-16	0.00 ± 0.00	0.07
EN00226	Adult	Male	2004-07-15	0.00 ± 0.00	0.06
EN00228	Adult	Male	2004-01-15	0.18 ± 0.02	0.18
EN00228	Adult	Male	2004-02-10	0.21 ± 0.02	0.16
EN00228	Adult	Male	2004-06-23	0.24 ± 0.03	0.15
EN00228	Adult	Male	2004-07-21	0.20 ± 0.03	0.14
EN00228	Adult	Male	2004-10-01	0.23 ± 0.04	0.19
EN00230	Adult	Male	2004-01-13	0.12 ± 0.02	0.17
EN00230	Adult	Male	2004-02-10	0.00 ± 0.00	0.08
EN00230	Adult	Male	2004-06-23	0.30 ± 0.04	0.17
EN00230	Adult	Male	2004-07-22	0.20 ± 0.03	0.13

Table 1. Continued.

Personal ID #	Age Type	Gender	Collection Date	^{137}Cs (kBq) Value	MDA
EN00230	Adult	Male	2004-10-01	0.18 ± 0.03	0.12
EN00231	Pre-Teen	Female	2003-02-12	0.00 ± 0.00	0.07
EN00231	Pre-Teen	Female	2003-11-22	0.00 ± 0.00	0.07
EN00232	Pre-Teen	Female	2003-11-22	0.00 ± 0.00	0.07
EN00233	Pre-Teen	Female	2003-02-04	0.00 ± 0.00	0.07
EN00233	Teenager	Female	2003-11-22	0.00 ± 0.00	0.07
EN00233	Teenager	Female	2004-08-13	0.00 ± 0.00	0.11
EN00234	Pre-Teen	Female	2004-03-30	0.04 ± 0.02	0.09
EN00237	Adult	Female	2003-12-02	0.08 ± 0.01	0.11
EN00240	Adult	Female	2003-11-25	0.00 ± 0.00	0.07
EN00241	Adult	Female	2003-11-19	0.00 ± 0.00	0.07
EN00242	Adult	Female	2003-11-19	0.00 ± 0.00	0.07
EN00244	Adult	Male	2004-06-08	0.60 ± 0.04	0.17
EN00244	Adult	Male	2004-07-14	0.53 ± 0.05	0.21
EN00249	Adult	Female	2003-12-02	0.17 ± 0.02	0.14
EN00252	Adult	Female	2003-01-15	0.34 ± 0.02	0.11
EN00253	Adult	Female	2004-06-16	0.05 ± 0.02	0.11
EN00260	Adult	Female	2003-07-29	0.00 ± 0.00	0.10
EN00262	Adult	Female	2003-11-25	0.00 ± 0.00	0.08
EN00265	Adult	Female	2004-08-02	0.00 ± 0.00	0.06
EN00267	Adult	Female	2003-12-10	0.10 ± 0.02	0.16
EN00268	Adult	Female	2004-06-16	0.10 ± 0.02	0.11
EN00274	Adult	Female	2004-06-14	0.83 ± 0.04	0.17
EN00274	Adult	Female	2004-07-08	0.67 ± 0.04	0.18
EN00280	Adult	Female	2004-05-22	0.15 ± 0.03	0.12
EN00287	Adult	Female	2002-07-01	0.05 ± 0.01	0.08
EN00288	Adult	Female	2004-08-02	0.01 ± 0.02	0.09
EN00290	Adult	Female	2004-07-20	0.00 ± 0.00	0.11
EN00291	Adult	Female	2004-10-20	0.00 ± 0.00	0.11
EN00293	Adult	Female	2004-05-22	0.16 ± 0.03	0.11
EN00296	Adult	Female	2004-05-21	0.28 ± 0.04	0.18
EN00298	Adult	Female	2004-05-21	0.07 ± 0.03	0.12
EN00299	Adult	Female	2003-12-09	0.00 ± 0.00	0.07
EN00302	Adult	Female	2003-12-17	0.08 ± 0.01	0.12
EN00304	Teenager	Female	2004-07-30	0.00 ± 0.00	0.06
EN00305	Adult	Female	2004-06-07	0.33 ± 0.03	0.14
EN00306	Adult	Female	2004-05-22	0.23 ± 0.03	0.15
EN00307	Adult	Female	2003-11-24	0.00 ± 0.00	0.07
EN00315	Adult	Female	2003-12-10	0.00 ± 0.00	0.07
EN00316	Adult	Female	2003-11-24	0.00 ± 0.00	2.02
EN00317	Adult	Female	2003-12-10	0.00 ± 0.00	0.07
EN00317	Adult	Female	2004-07-06	0.13 ± 0.03	0.12
EN00321	Adult	Male	2002-06-13	0.10 ± 0.01	0.08
EN00321	Adult	Male	2003-12-10	0.06 ± 0.02	0.16
EN00328	Adult	Male	2004-08-06	0.00 ± 0.00	0.12

Table 1. Continued.

Personal ID #	Age Type	Gender	Collection Date	^{137}Cs (kBq) Value	MDA
EN00331	Adult	Female	2003-11-24	0.11 ± 0.02	0.16
EN00337	Adult	Female	2003-11-24	0.00 ± 0.00	0.07
EN00339	Adult	Female	2004-06-07	0.07 ± 0.02	0.08
EN00345	Adult	Female	2003-12-02	0.00 ± 0.00	0.07
EN00347	Adult	Female	2004-05-22	0.04 ± 0.02	0.10
EN00348	Adult	Female	2003-12-10	0.05 ± 0.01	0.14
EN00353	Adult	Male	2004-12-09	0.05 ± 0.02	0.09
EN00354	Adult	Male	2003-12-08	0.08 ± 0.01	0.13
EN00354	Adult	Male	2004-07-28	0.15 ± 0.02	0.11
EN00355	Adult	Male	2003-12-08	0.05 ± 0.01	0.12
EN00362	Adult	Female	2003-12-04	0.00 ± 0.00	0.08
EN00362	Adult	Female	2004-07-06	0.19 ± 0.03	0.12
EN00364	Adult	Male	2003-12-02	0.10 ± 0.01	0.16
EN00364	Adult	Male	2004-09-17	0.00 ± 0.00	0.12
EN00375	Adult	Male	2002-03-20	0.14 ± 0.01	0.09
EN00375	Adult	Male	2002-05-28	0.26 ± 0.02	0.10
EN00375	Adult	Male	2002-06-26	0.18 ± 0.02	0.09
EN00375	Adult	Male	2002-11-27	0.16 ± 0.02	0.10
EN00375	Adult	Male	2004-01-13	0.10 ± 0.02	0.18
EN00375	Adult	Male	2004-02-10	0.09 ± 0.02	0.17
EN00375	Adult	Male	2004-06-24	0.12 ± 0.02	0.11
EN00375	Adult	Male	2004-07-28	0.10 ± 0.03	0.13
EN00376	Adult	Male	2004-07-21	0.49 ± 0.04	0.17
EN00378	Adult	Male	2004-12-15	0.11 ± 0.03	0.15
EN00379	Adult	Male	2003-12-02	0.11 ± 0.01	0.14
EN00379	Adult	Male	2004-07-15	0.09 ± 0.03	0.13
EN00380	Adult	Male	2004-07-14	0.15 ± 0.03	0.13
EN00382	Adult	Male	2003-11-28	0.00 ± 0.00	0.07
EN00383	Adult	Male	2003-11-27	0.00 ± 0.00	1.96
EN00383	Adult	Male	2004-12-10	0.00 ± 0.00	0.06
EN00387	Adult	Female	2004-05-21	0.46 ± 0.04	0.15
EN00388	Teenager	Male	2004-09-29	0.43 ± 0.04	0.17
EN00394	Adult	Male	2003-11-19	0.00 ± 0.00	0.07
EN00394	Adult	Male	2004-05-31	0.04 ± 0.02	0.09
EN00398	Adult	Male	2002-07-11	0.18 ± 0.02	0.09
EN00399	Adult	Female	2003-07-24	0.00 ± 0.00	0.10
EN00400	Adult	Female	2003-11-25	0.00 ± 0.00	0.07
EN00400	Adult	Female	2004-06-14	0.08 ± 0.02	0.11
EN00403	Adult	Male	2004-03-19	0.26 ± 0.04	0.19
EN00403	Adult	Male	2004-08-05	0.21 ± 0.03	0.15
EN00405	Adult	Female	2003-12-15	0.08 ± 0.01	0.15
EN00412	Adult	Male	2004-07-19	0.46 ± 0.04	0.19
EN00412	Adult	Male	2004-07-29	0.38 ± 0.04	0.17
EN00415	Teenager	Male	2004-08-05	0.04 ± 0.02	0.08
EN00420	Adult	Male	2004-01-19	0.24 ± 0.02	0.17

Table 1. Continued.

Personal ID #	Age Type	Gender	Collection Date	^{137}Cs (kBq) Value	MDA
EN00421	Adult	Female	2002-02-13	0.07 ± 0.01	0.09
EN00422	Adult	Male	2002-02-19	0.00 ± 0.00	0.06
EN00422	Adult	Male	2003-11-27	0.00 ± 0.00	0.07
EN00423	Teenager	Male	2002-02-19	0.00 ± 0.00	0.06
EN00424	Adult	Male	2002-02-20	0.12 ± 0.01	0.09
EN00425	Adult	Male	2002-02-20	0.08 ± 0.01	0.08
EN00426	Adult	Male	2002-02-27	0.10 ± 0.01	0.07
EN00426	Adult	Male	2003-12-16	0.08 ± 0.01	0.16
EN00427	Adult	Female	2002-02-27	0.06 ± 0.01	0.08
EN00428	Adult	Male	2002-02-27	0.10 ± 0.01	0.09
EN00428	Adult	Male	2003-12-02	0.08 ± 0.01	0.09
EN00429	Adult	Male	2002-02-27	0.00 ± 0.00	0.06
EN00430	Adult	Female	2002-03-04	0.35 ± 0.02	0.10
EN00430	Adult	Female	2003-11-24	0.00 ± 0.00	0.08
EN00431	Adult	Female	2002-03-04	0.06 ± 0.01	0.08
EN00432	Teenager	Female	2002-03-04	0.00 ± 0.00	0.06
EN00432	Adult	Female	2004-07-30	0.00 ± 0.00	0.06
EN00433	Adult	Female	2002-03-04	0.00 ± 0.00	0.06
EN00434	Adult	Male	2002-03-05	0.11 ± 0.01	0.09
EN00434	Adult	Male	2003-12-02	0.00 ± 0.00	0.08
EN00434	Adult	Male	2004-06-24	0.12 ± 0.03	0.13
EN00434	Adult	Male	2004-09-13	0.36 ± 0.07	0.32
EN00435	Adult	Male	2002-03-05	0.24 ± 0.02	0.11
EN00435	Adult	Male	2004-01-23	0.07 ± 0.02	0.18
EN00435	Adult	Male	2004-07-28	0.00 ± 0.00	0.12
EN00436	Adult	Female	2002-03-06	0.19 ± 0.02	0.07
EN00437	Adult	Male	2004-07-29	0.24 ± 0.03	0.12
EN00438	Adult	Female	2002-04-02	0.00 ± 0.00	0.06
EN00439	Adult	Female	2002-04-02	0.00 ± 0.00	0.06
EN00440	Adult	Female	2002-04-03	0.14 ± 0.01	0.10
EN00441	Adult	Male	2002-05-23	0.11 ± 0.01	0.08
EN00442	Adult	Female	2002-06-05	0.00 ± 0.00	0.06
EN00443	Adult	Female	2002-06-05	0.06 ± 0.01	0.09
EN00444	Adult	Male	2002-06-05	0.00 ± 0.00	0.06
EN00445	Adult	Female	2002-06-06	0.09 ± 0.01	0.07
EN00446	Adult	Male	2002-06-06	0.04 ± 0.01	0.09
EN00447	Adult	Male	2002-06-06	0.00 ± 0.00	0.06
EN00448	Teenager	Male	2002-06-07	0.00 ± 0.00	0.06
EN00449	Teenager	Female	2002-06-07	0.22 ± 0.02	0.10
EN00450	Teenager	Male	2002-06-07	0.00 ± 0.00	0.06
EN00450	Adult	Male	2004-07-14	0.08 ± 0.02	0.11
EN00451	Teenager	Female	2002-06-07	0.13 ± 0.01	0.08
EN00452	Teenager	Female	2002-06-07	0.16 ± 0.01	0.08
EN00453	Teenager	Female	2002-06-07	0.05 ± 0.01	0.08
EN00454	Teenager	Male	2002-06-11	0.26 ± 0.02	0.10

Table 1. Continued.

Personal ID #	Age Type	Gender	Collection Date	^{137}Cs (kBq) Value	MDA
EN00454	Adult	Male	2004-06-08	0.13 ± 0.03	0.14
EN00455	Teenager	Female	2002-06-19	0.00 ± 0.00	0.06
EN00456	Adult	Male	2002-06-19	0.10 ± 0.01	0.07
EN00457	Adult	Male	2002-06-25	0.45 ± 0.03	0.10
EN00457	Adult	Male	2003-12-02	0.25 ± 0.02	0.15
EN00457	Adult	Male	2004-07-15	0.18 ± 0.03	0.12
EN00458	Adult	Male	2002-06-27	0.06 ± 0.01	0.09
EN00459	Adult	Female	2002-06-27	0.00 ± 0.00	0.06
EN00460	Adult	Male	2002-07-01	0.00 ± 0.00	0.06
EN00462	Adult	Male	2002-07-01	0.30 ± 0.02	0.10
EN00463	Pre-Teen	Female	2002-07-10	0.08 ± 0.01	0.10
EN00463	Teenager	Male	2003-02-04	0.00 ± 0.00	0.07
EN00463	Teenager	Male	2003-11-29	0.00 ± 0.00	0.07
EN00464	Teenager	Male	2002-07-10	0.35 ± 0.02	0.10
EN00464	Teenager	Male	2003-02-10	0.15 ± 0.01	0.09
EN00465	Pre-Teen	Male	2002-07-10	0.52 ± 0.03	0.10
EN00465	Pre-Teen	Male	2003-02-12	0.29 ± 0.02	0.10
EN00465	Teenager	Male	2004-03-22	0.42 ± 0.04	0.19
EN00466	Adult	Female	2002-10-08	0.00 ± 0.00	0.07
EN00467	Adult	Male	2002-10-08	0.00 ± 0.00	0.07
EN00468	Adult	Male	2002-10-08	0.00 ± 0.00	0.08
EN00469	Adult	Female	2002-10-08	0.00 ± 0.00	0.07
EN00470	Adult	Male	2002-11-12	0.05 ± 0.01	0.07
EN00471	Adult	Female	2002-11-12	0.00 ± 0.00	0.07
EN00472	Adult	Male	2002-11-12	0.00 ± 0.00	0.07
EN00473	Adult	Female	2002-11-12	0.00 ± 0.00	0.07
EN00474	Teenager	Female	2002-11-13	0.00 ± 0.00	0.07
EN00474	Adult	Female	2003-12-10	0.00 ± 0.00	0.07
EN00475	Adult	Male	2002-11-13	0.00 ± 0.00	0.07
EN00476	Adult	Female	2002-11-13	0.00 ± 0.00	0.07
EN00477	Adult	Female	2002-11-13	0.09 ± 0.01	0.09
EN00479	Teenager	Female	2002-11-14	0.18 ± 0.01	0.08
EN00479	Teenager	Female	2003-12-16	0.06 ± 0.01	0.15
EN00480	Adult	Female	2002-11-14	0.07 ± 0.01	0.11
EN00482	Adult	Male	2004-07-05	0.26 ± 0.03	0.13
EN00483	Adult	Male	2003-01-02	0.00 ± 0.00	0.07
EN00485	Adult	Female	2003-01-13	0.09 ± 0.01	0.08
EN00486	Adult	Male	2003-01-13	0.09 ± 0.01	0.08
EN00486	Adult	Male	2004-07-08	0.55 ± 0.05	0.22
EN00487	Adult	Female	2003-01-13	0.12 ± 0.01	0.10
EN00487	Adult	Female	2004-09-08	0.00 ± 0.00	3.35
EN00488	Adult	Male	2003-01-13	0.20 ± 0.02	0.10
EN00488	Adult	Male	2004-09-08	0.23 ± 0.05	0.21
EN00489	Adult	Female	2003-01-14	0.00 ± 0.00	0.07
EN00490	Adult	Female	2003-01-14	0.00 ± 0.00	0.07

Table 1. Continued.

Personal ID #	Age Type	Gender	Collection Date	^{137}Cs (kBq) Value	MDA
EN00491	Adult	Female	2003-01-15	0.08 ± 0.01	0.10
EN00491	Adult	Female	2003-11-25	0.00 ± 0.00	0.08
EN00492	Adult	Male	2003-01-20	0.12 ± 0.01	0.09
EN00493	Teenager	Male	2003-01-31	0.00 ± 0.00	0.07
EN00494	Teenager	Male	2003-01-31	0.10 ± 0.01	0.07
EN00495	Teenager	Male	2003-01-31	0.00 ± 0.00	0.07
EN00496	Teenager	Female	2003-01-31	0.04 ± 0.01	0.09
EN00497	Teenager	Female	2003-01-31	0.00 ± 0.00	0.07
EN00498	Teenager	Female	2003-01-31	0.06 ± 0.01	0.07
EN00499	Teenager	Female	2003-01-31	0.00 ± 0.00	0.07
EN00500	Teenager	Male	2003-01-31	0.04 ± 0.01	0.09
EN00501	Teenager	Male	2003-01-31	0.00 ± 0.00	0.07
EN00502	Teenager	Male	2003-01-31	0.00 ± 0.00	0.07
EN00503	Teenager	Male	2003-02-03	0.13 ± 0.01	0.08
EN00503	Teenager	Male	2004-07-05	0.03 ± 0.02	0.07
EN00504	Teenager	Male	2003-02-03	0.14 ± 0.01	0.09
EN00505	Teenager	Male	2003-02-03	0.09 ± 0.01	0.10
EN00505	Teenager	Male	2004-07-26	0.00 ± 0.00	0.11
EN00506	Teenager	Female	2003-02-04	0.11 ± 0.01	0.08
EN00506	Teenager	Female	2003-11-22	0.00 ± 0.00	0.07
EN00507	Pre-Teen	Female	2003-02-04	0.05 ± 0.01	0.08
EN00507	Teenager	Female	2003-11-22	0.00 ± 0.00	0.07
EN00508	Teenager	Male	2003-02-04	0.10 ± 0.01	0.09
EN00509	Teenager	Female	2003-02-04	0.00 ± 0.00	0.07
EN00509	Teenager	Female	2003-11-22	0.00 ± 0.00	0.07
EN00510	Pre-Teen	Female	2003-02-04	0.00 ± 0.00	0.07
EN00511	Pre-Teen	Male	2003-02-04	0.12 ± 0.01	0.10
EN00511	Teenager	Male	2003-11-29	0.00 ± 0.00	0.08
EN00512	Teenager	Male	2003-02-04	0.15 ± 0.01	0.09
EN00512	Teenager	Male	2003-11-29	0.00 ± 0.00	0.08
EN00513	Teenager	Male	2003-02-05	0.12 ± 0.01	0.09
EN00513	Teenager	Male	2003-11-29	0.06 ± 0.01	0.16
EN00514	Teenager	Male	2003-02-05	0.10 ± 0.01	0.08
EN00515	Teenager	Female	2003-02-05	0.08 ± 0.01	0.07
EN00516	Teenager	Female	2003-02-05	0.00 ± 0.00	0.07
EN00517	Adult	Male	2003-02-10	0.15 ± 0.01	0.08
EN00517	Adult	Male	2004-08-06	0.13 ± 0.03	0.15
EN00518	Teenager	Male	2003-02-10	0.13 ± 0.01	0.07
EN00518	Teenager	Male	2003-11-29	0.00 ± 0.00	0.08
EN00519	Teenager	Male	2003-02-10	0.09 ± 0.01	0.08
EN00519	Teenager	Male	2003-11-28	0.00 ± 0.00	0.07
EN00520	Teenager	Male	2003-02-10	0.04 ± 0.01	0.10
EN00521	Teenager	Male	2003-02-10	0.19 ± 0.01	0.08
EN00522	Teenager	Male	2003-02-10	0.00 ± 0.00	0.07
EN00523	Teenager	Female	2003-02-10	0.00 ± 0.00	0.07

Table 1. Continued.

Personal ID #	Age Type	Gender	Collection Date	^{137}Cs (kBq) Value	MDA
EN00523	Teenager	Female	2003-11-22	0.00 ± 0.00	0.07
EN00524	Teenager	Male	2003-02-10	0.14 ± 0.01	0.09
EN00525	Pre-Teen	Female	2003-02-12	0.00 ± 0.00	0.07
EN00525	Pre-Teen	Female	2004-03-25	0.00 ± 0.00	0.06
EN00526	Pre-Teen	Male	2003-02-12	0.11 ± 0.01	0.08
EN00526	Teenager	Male	2004-03-25	0.13 ± 0.03	0.15
EN00527	Teenager	Male	2003-02-12	0.11 ± 0.01	0.08
EN00528	Pre-Teen	Male	2003-02-12	0.00 ± 0.00	0.07
EN00529	Pre-Teen	Male	2003-02-12	0.07 ± 0.01	0.07
EN00530	Teenager	Male	2003-02-12	0.17 ± 0.01	0.09
EN00530	Teenager	Male	2004-03-25	0.27 ± 0.04	0.18
EN00531	Pre-Teen	Male	2003-02-12	0.10 ± 0.01	0.09
EN00532	Teenager	Male	2003-02-12	0.14 ± 0.01	0.07
EN00533	Adult	Male	2002-01-10	0.00 ± 0.00	0.06
EN00533	Adult	Male	2003-12-15	0.00 ± 0.00	0.07
EN00534	Adult	Male	2002-03-28	0.00 ± 0.00	0.06
EN00536	Pre-Teen	Male	2003-11-19	0.00 ± 0.00	0.07
EN00536	Pre-Teen	Male	2004-04-06	0.07 ± 0.02	0.10
EN00537	Adult	Male	2003-11-19	0.00 ± 0.00	0.07
EN00538	Adult	Female	2003-11-19	0.05 ± 0.01	0.13
EN00539	Adult	Female	2003-11-19	0.00 ± 0.00	0.07
EN00540	Adult	Male	2003-11-19	0.06 ± 0.01	0.15
EN00541	Adult	Male	2003-11-27	0.00 ± 0.00	0.08
EN00542	Teenager	Male	2003-12-02	0.09 ± 0.02	0.12
EN00543	Teenager	Male	2003-12-08	0.00 ± 0.00	0.07
EN00543	Teenager	Male	2004-08-06	0.05 ± 0.02	0.09
EN00544	Teenager	Male	2003-12-09	0.00 ± 0.00	0.07
EN00545	Adult	Male	2003-12-09	0.09 ± 0.01	0.16
EN00546	Adult	Female	2003-12-09	0.00 ± 0.00	0.07
EN00547	Adult	Female	2003-12-10	0.00 ± 0.00	0.07
EN00548	Teenager	Female	2003-12-15	0.09 ± 0.01	0.14
EN00549	Adult	Female	2003-12-15	0.00 ± 0.00	0.07
EN00550	Adult	Female	2003-12-16	0.00 ± 0.00	0.07
EN00551	Adult	Female	2003-12-16	0.00 ± 0.00	0.07
EN00553	Adult	Male	2004-01-26	0.06 ± 0.01	0.14
EN00554	Adult	Female	2004-01-26	0.00 ± 0.00	0.07
EN00555	Adult	Male	2004-02-04	0.00 ± 0.00	0.07
EN00556	Adult	Male	2004-03-17	0.00 ± 0.00	0.06
EN00556	Adult	Male	2004-07-15	0.00 ± 0.00	0.11
EN00557	Adult	Female	2004-03-19	0.37 ± 0.05	0.20
EN00558	Teenager	Female	2004-03-22	0.00 ± 0.00	0.06
EN00559	Teenager	Male	2004-03-22	0.00 ± 0.00	0.06
EN00560	Pre-Teen	Female	2004-03-22	0.11 ± 0.02	0.10
EN00561	Pre-Teen	Male	2004-03-22	0.00 ± 0.00	0.06
EN00562	Adult	Male	2004-03-24	0.24 ± 0.03	0.13

Table 1. Continued.

Personal ID #	Age Type	Gender	Collection Date	^{137}Cs (kBq) Value	MDA
EN00563	Adult	Female	2004-03-24	0.08 ± 0.02	0.09
EN00564	Adult	Male	2004-03-24	0.00 ± 0.00	0.06
EN00565	Adult	Female	2004-03-24	0.07 ± 0.02	0.07
EN00566	Adult	Unknown	2004-03-24	0.11 ± 0.03	0.13
EN00567	Adult	Male	2004-03-24	0.00 ± 0.00	0.07
EN00568	Adult	Male	2004-03-24	0.44 ± 0.04	0.15
EN00568	Adult	Male	2004-03-24	0.52 ± 0.05	0.20
EN00569	Teenager	Male	2004-03-25	0.07 ± 0.03	0.12
EN00570	Pre-Teen	Male	2004-03-25	0.10 ± 0.02	0.11
EN00571	Teenager	Male	2004-03-25	0.00 ± 0.00	0.06
EN00572	Pre-Teen	Male	2004-03-25	0.09 ± 0.02	0.10
EN00573	Teenager	Male	2004-03-25	0.00 ± 0.00	0.06
EN00573	Teenager	Male	2004-06-08	0.67 ± 0.04	0.18
EN00574	Pre-Teen	Female	2004-03-25	0.00 ± 0.00	0.06
EN00575	Pre-Teen	Female	2004-03-25	0.10 ± 0.02	0.10
EN00576	Pre-Teen	Female	2004-03-26	0.00 ± 0.00	0.06
EN00577	Pre-Teen	Male	2004-03-26	0.00 ± 0.00	0.06
EN00578	Pre-Teen	Male	2004-03-26	0.19 ± 0.04	0.16
EN00579	Pre-Teen	Male	2004-03-29	0.00 ± 0.00	0.06
EN00580	Pre-Teen	Male	2004-03-29	0.00 ± 0.00	0.06
EN00581	Pre-Teen	Male	2004-03-29	0.06 ± 0.02	0.09
EN00582	Pre-Teen	Female	2004-03-29	0.00 ± 0.00	0.06
EN00583	Pre-Teen	Female	2004-03-29	0.00 ± 0.00	0.06
EN00584	Pre-Teen	Female	2004-03-29	0.00 ± 0.00	0.06
EN00585	Teenager	Female	2004-03-29	0.06 ± 0.02	0.10
EN00586	Pre-Teen	Female	2004-03-29	0.00 ± 0.00	0.06
EN00587	Pre-Teen	Male	2004-03-29	0.00 ± 0.00	0.06
EN00587	Pre-Teen	Male	2004-06-07	1.62 ± 0.07	0.22
EN00587	Pre-Teen	Male	2004-07-12	1.11 ± 0.05	0.18
EN00588	Pre-Teen	Male	2004-03-29	0.04 ± 0.03	0.12
EN00589	Pre-Teen	Male	2004-03-29	0.05 ± 0.02	0.08
EN00590	Teenager	Female	2004-03-30	0.11 ± 0.02	0.10
EN00591	Teenager	Female	2004-03-30	0.00 ± 0.00	0.06
EN00592	Teenager	Female	2004-03-30	0.05 ± 0.02	0.09
EN00593	Pre-Teen	Female	2004-03-30	0.00 ± 0.00	0.06
EN00594	Pre-Teen	Male	2004-03-30	0.00 ± 0.00	0.06
EN00595	Pre-Teen	Male	2004-03-30	0.00 ± 0.00	0.06
EN00596	Teenager	Male	2004-03-30	0.00 ± 0.00	0.06
EN00597	Adult	Female	2004-03-30	0.00 ± 0.00	0.06
EN00598	Pre-Teen	Male	2004-03-30	0.05 ± 0.02	0.09
EN00599	Pre-Teen	Male	2004-03-30	0.08 ± 0.03	0.12
EN00600	Pre-Teen	Female	2004-03-30	0.00 ± 0.00	0.06
EN00601	Pre-Teen	Female	2004-03-30	0.00 ± 0.00	0.06
EN00602	Pre-Teen	Male	2004-03-30	0.00 ± 0.00	0.06
EN00603	Pre-Teen	Male	2004-03-31	0.14 ± 0.03	0.13

Table 1. Continued.

Personal ID #	Age Type	Gender	Collection Date	^{137}Cs (kBq) Value	MDA
EN00604	Pre-Teen	Male	2004-03-31	0.03 ± 0.02	0.08
EN00604	Pre-Teen	Male	2004-06-07	0.99 ± 0.05	0.18
EN00604	Pre-Teen	Male	2004-07-08	0.66 ± 0.04	0.16
EN00605	Pre-Teen	Male	2004-03-31	0.05 ± 0.02	0.07
EN00607	Pre-Teen	Female	2004-03-31	0.04 ± 0.02	0.10
EN00608	Pre-Teen	Female	2004-03-31	0.00 ± 0.00	0.06
EN00609	Pre-Teen	Female	2004-03-31	0.06 ± 0.02	0.09
EN00610	Pre-Teen	Female	2004-03-31	0.00 ± 0.00	0.06
EN00611	Pre-Teen	Female	2004-03-31	0.00 ± 0.00	0.06
EN00612	Pre-Teen	Male	2004-03-31	0.05 ± 0.02	0.10
EN00613	Pre-Teen	Male	2004-03-31	0.00 ± 0.00	0.06
EN00614	Pre-Teen	Male	2004-03-31	0.06 ± 0.02	0.08
EN00615	Pre-Teen	Male	2004-04-05	0.28 ± 0.03	0.14
EN00616	Pre-Teen	Male	2004-04-05	0.06 ± 0.02	0.10
EN00616	Pre-Teen	Male	2004-07-08	0.20 ± 0.04	0.17
EN00617	Pre-Teen	Male	2004-04-05	0.00 ± 0.00	0.06
EN00618	Pre-Teen	Male	2004-04-05	0.04 ± 0.02	0.08
EN00618	Pre-Teen	Male	2004-07-08	0.12 ± 0.02	0.11
EN00619	Pre-Teen	Male	2004-04-05	0.25 ± 0.03	0.15
EN00620	Pre-Teen	Female	2004-04-05	0.00 ± 0.00	0.06
EN00621	Pre-Teen	Male	2004-04-05	0.00 ± 0.00	0.06
EN00622	Pre-Teen	Male	2004-04-05	0.04 ± 0.02	0.08
EN00623	Pre-Teen	Female	2004-04-05	0.00 ± 0.02	0.06
EN00624	Pre-Teen	Female	2004-04-05	0.04 ± 0.02	0.08
EN00625	Pre-Teen	Male	2004-04-05	0.00 ± 0.00	0.06
EN00626	Pre-Teen	Male	2004-04-05	0.00 ± 0.00	0.06
EN00626	Pre-Teen	Male	2004-06-07	0.68 ± 0.04	0.16
EN00626	Pre-Teen	Male	2004-07-08	0.51 ± 0.05	0.21
EN00627	Pre-Teen	Female	2004-04-05	0.21 ± 0.03	0.15
EN00628	Pre-Teen	Female	2004-04-05	0.00 ± 0.00	0.06
EN00629	Pre-Teen	Female	2004-04-06	0.10 ± 0.03	0.13
EN00630	Pre-Teen	Female	2004-04-06	0.04 ± 0.02	0.09
EN00631	Pre-Teen	Female	2004-04-06	0.00 ± 0.00	0.06
EN00632	Pre-Teen	Female	2004-04-06	0.00 ± 0.00	0.06
EN00633	Pre-Teen	Female	2004-04-06	0.06 ± 0.02	0.09
EN00634	Pre-Teen	Male	2004-04-06	0.15 ± 0.04	0.16
EN00635	Pre-Teen	Male	2004-04-06	0.00 ± 0.00	0.06
EN00636	Pre-Teen	Male	2004-04-06	0.05 ± 0.02	0.09
EN00637	Pre-Teen	Female	2004-04-06	0.00 ± 0.00	0.06
EN00638	Pre-Teen	Female	2004-04-06	0.00 ± 0.00	0.06
EN00639	Pre-Teen	Female	2004-04-06	0.00 ± 0.00	0.06
EN00640	Pre-Teen	Female	2004-04-06	0.00 ± 0.00	0.06
EN00641	Pre-Teen	Female	2004-04-06	0.00 ± 0.00	0.06
EN00642	Pre-Teen	Female	2004-04-07	0.03 ± 0.02	0.08
EN00643	Pre-Teen	Female	2004-04-07	0.06 ± 0.02	0.09

Table 1. Continued.

Personal ID #	Age Type	Gender	Collection Date	^{137}Cs (kBq) Value	MDA
EN00644	Pre-Teen	Female	2004-04-07	0.00 ± 0.00	0.06
EN00645	Pre-Teen	Male	2004-04-07	0.05 ± 0.02	0.07
EN00646	Pre-Teen	Male	2004-04-07	0.03 ± 0.02	0.07
EN00647	Pre-Teen	Male	2004-04-07	0.03 ± 0.02	0.08
EN00648	Pre-Teen	Female	2004-04-07	0.00 ± 0.00	0.06
EN00649	Pre-Teen	Female	2004-04-07	0.05 ± 0.02	0.08
EN00649	Pre-Teen	Female	2004-06-14	0.17 ± 0.03	0.13
EN00650	Pre-Teen	Female	2004-04-07	0.00 ± 0.00	0.06
EN00651	Pre-Teen	Female	2004-04-07	0.00 ± 0.00	0.06
EN00652	Pre-Teen	Male	2004-04-19	0.05 ± 0.02	0.09
EN00653	Child	Male	2004-04-19	0.00 ± 0.00	0.06
EN00654	Child	Male	2004-04-19	0.00 ± 0.00	0.06
EN00655	Pre-Teen	Male	2004-04-19	0.00 ± 0.00	0.06
EN00656	Child	Male	2004-04-19	0.00 ± 0.00	0.06
EN00657	Child	Female	2004-04-19	0.00 ± 0.00	0.06
EN00658	Child	Female	2004-04-19	0.06 ± 0.02	0.07
EN00659	Pre-Teen	Female	2004-04-19	0.04 ± 0.02	0.11
EN00660	Pre-Teen	Female	2004-04-19	0.00 ± 0.00	0.06
EN00661	Child	Female	2004-04-19	0.00 ± 0.00	0.06
EN00662	Child	Female	2004-04-19	0.00 ± 0.00	0.06
EN00663	Child	Female	2004-04-19	0.00 ± 0.00	0.06
EN00664	Pre-Teen	Female	2004-04-19	0.00 ± 0.00	0.06
EN00665	Child	Male	2004-04-20	0.09 ± 0.04	0.18
EN00666	Pre-Teen	Female	2004-04-20	0.00 ± 0.00	0.06
EN00667	Pre-Teen	Female	2004-04-20	0.00 ± 0.00	0.06
EN00668	Pre-Teen	Female	2004-04-20	0.00 ± 0.00	0.06
EN00669	Child	Female	2004-04-20	0.00 ± 0.00	0.06
EN00670	Child	Female	2004-04-20	0.00 ± 0.00	0.06
EN00671	Child	Male	2004-04-20	0.00 ± 0.00	0.06
EN00672	Child	Female	2004-04-20	0.00 ± 0.00	0.06
EN00673	Child	Male	2004-04-20	0.00 ± 0.00	0.06
EN00674	Child	Female	2004-04-20	0.00 ± 0.00	0.06
EN00675	Child	Male	2004-04-20	0.00 ± 0.00	0.06
EN00676	Child	Female	2004-04-21	0.00 ± 0.00	0.06
EN00677	Child	Male	2004-04-21	0.00 ± 0.00	0.06
EN00678	Child	Female	2004-04-21	0.00 ± 0.00	0.06
EN00679	Child	Male	2004-04-21	0.00 ± 0.00	0.06
EN00680	Child	Female	2004-04-21	0.00 ± 0.00	0.06
EN00681	Pre-Teen	Male	2004-04-21	0.00 ± 0.00	0.06
EN00682	Adult	Male	2004-05-03	0.08 ± 0.03	0.11
EN00683	Child	Male	2004-05-04	0.00 ± 0.00	0.06
EN00684	Child	Male	2004-05-04	0.00 ± 0.00	0.06
EN00685	Child	Male	2004-05-04	0.00 ± 0.00	0.06
EN00686	Child	Male	2004-05-04	0.00 ± 0.00	0.06
EN00687	Child	Male	2004-05-04	0.00 ± 0.00	0.06

Table 1. Continued.

Personal ID #	Age Type	Gender	Collection Date	^{137}Cs (kBq) Value	MDA
EN00688	Child	Male	2004-05-10	0.00 ± 0.00	0.06
EN00689	Child	Male	2004-05-10	0.00 ± 0.00	0.06
EN00689	Child	Male	2004-07-08	0.31 ± 0.04	0.17
EN00690	Child	Male	2004-05-10	0.00 ± 0.00	0.06
EN00691	Child	Male	2004-05-10	0.00 ± 0.00	0.06
EN00692	Child	Male	2004-05-10	0.00 ± 0.00	0.06
EN00693	Adult	Female	2004-05-10	0.00 ± 0.00	0.06
EN00694	Child	Female	2004-05-12	0.00 ± 0.00	0.06
EN00695	Child	Female	2004-05-12	0.00 ± 0.00	0.06
EN00696	Child	Female	2004-05-12	0.00 ± 0.00	0.06
EN00697	Child	Female	2004-05-12	0.00 ± 0.00	0.06
EN00698	Child	Female	2004-05-12	0.00 ± 0.00	0.06
EN00699	Child	Male	2004-05-13	0.00 ± 0.00	0.06
EN00700	Child	Male	2004-05-13	0.00 ± 0.00	0.06
EN00701	Child	Male	2004-05-13	0.00 ± 0.00	0.06
EN00702	Child	Female	2004-05-13	0.00 ± 0.00	0.06
EN00703	Child	Female	2004-05-14	0.00 ± 0.00	0.06
EN00704	Child	Female	2004-05-14	0.00 ± 0.00	0.06
EN00705	Child	Male	2004-05-17	0.00 ± 0.00	0.06
EN00706	Child	Male	2004-05-17	0.00 ± 0.00	0.06
EN00708	Adult	Male	2004-05-21	0.40 ± 0.05	0.20
EN00709	Adult	Female	2004-05-22	0.24 ± 0.04	0.19
EN00710	Adult	Male	2004-05-25	0.33 ± 0.04	0.16
EN00710	Adult	Male	2004-07-08	0.37 ± 0.04	0.19
EN00711	Adult	Female	2004-05-25	0.14 ± 0.03	0.12
EN00712	Adult	Male	2004-05-25	0.07 ± 0.02	0.10
EN00713	Adult	Male	2004-05-25	0.00 ± 0.00	0.06
EN00713	Adult	Male	2004-05-25	0.08 ± 0.02	0.10
EN00714	Adult	Male	2004-05-27	0.06 ± 0.02	0.08
EN00715	Adult	Male	2004-06-01	0.00 ± 0.00	0.06
EN00716	Adult	Male	2004-06-01	0.00 ± 0.00	0.06
EN00717	Child	Male	2004-06-07	0.58 ± 0.04	0.17
EN00718	Child	Male	2004-06-07	0.47 ± 0.04	0.18
EN00719	Adult	Female	2004-06-08	0.05 ± 0.02	0.08
EN00720	Adult	Male	2004-06-09	0.29 ± 0.05	0.23
EN00721	Adult	Female	2004-06-09	0.18 ± 0.03	0.13
EN00722	Adult	Male	2004-06-09	0.33 ± 0.04	0.16
EN00723	Teenager	Female	2004-06-14	0.26 ± 0.04	0.17
EN00724	Adult	Female	2004-06-14	0.13 ± 0.03	0.14
EN00725	Adult	Female	2004-06-16	0.15 ± 0.02	0.12
EN00726	Adult	Female	2004-06-16	0.12 ± 0.04	0.17
EN00728	Teenager	Male	2004-07-05	0.07 ± 0.02	0.09
EN00729	Adult	Male	2004-07-05	0.00 ± 0.00	0.06
EN00730	Teenager	Male	2004-07-12	0.29 ± 0.04	0.17
EN00731	Adult	Female	2004-07-19	0.00 ± 0.00	0.06

Table 1. Continued.

Personal ID #	Age Type	Gender	Collection Date	^{137}Cs (kBq) Value	MDA
EN00732	Adult	Female	2004-07-19	0.07 ± 0.02	0.10
EN00733	Adult	Male	2004-07-21	0.31 ± 0.03	0.15
EN00734	Adult	Male	2004-07-21	0.53 ± 0.04	0.18
EN00735	Adult	Male	2004-07-22	0.00 ± 0.00	0.06
EN00736	Adult	Female	2004-07-28	0.00 ± 0.00	0.06
EN00737	Adult	Female	2004-07-30	0.11 ± 0.02	0.10
EN00738	Adult	Male	2004-08-02	0.12 ± 0.02	0.11
EN00739	Adult	Male	2004-08-02	0.05 ± 0.02	0.08
EN00740	Adult	Male	2004-08-05	0.44 ± 0.05	0.20
EN00741	Teenager	Male	2004-09-29	0.33 ± 0.04	0.16
EN00742	Adult	Male	2004-10-01	0.00 ± 0.00	0.06
EN00743	Adult	Male	2004-12-07	0.04 ± 0.02	0.11
EN00744	Child	Male	2004-12-09	0.00 ± 0.00	0.06
EN00745	Adult	Male	2004-12-09	0.00 ± 0.00	0.06
EN00746	Adult	Male	2004-12-15	0.27 ± 0.04	0.18

Table 2. Plutonium urinalysis data for agricultural workers and Enewetak Island residents (CAMS/LLNL, 2002-2004).

Personal ID #	Age Type	Gender	Collection Date	^{239}Pu (µBq) (µBq/24 h void)		^{240}Pu (µBq) (µBq/24 h void)	
				Value	MDA	Value	MDA
EN00002	Adult	Male	2002-04-15	1.83 ± 0.60	0.70	0.73 ± 0.87	2.62
EN00002	Adult	Male	2002-04-19	0.66 ± 0.38	0.70	0.52 ± 0.72	2.62
EN00003	Adult	Male	2002-04-12	0.32 ± 0.29	0.70	-0.02 ± 0.59	2.62
EN00009	Adult	Male	2002-04-17	0.28 ± 0.40	0.70	-0.02 ± 1.22	2.62
EN00011	Adult	Male	2003-08-12	0.26 ± 0.20	0.16	-0.13 ± 0.47	1.42
EN00012	Adult	Male	2002-04-18	0.21 ± 0.27	0.70	-0.02 ± 0.60	2.62
EN00013	Adult	Male	2002-04-17	0.57 ± 0.49	0.70	-0.02 ± 1.27	2.62
EN00014	Adult	Male	2003-08-11	0.18 ± 0.19	0.16	0.79 ± 0.69	1.42
EN00019	Adult	Male	2003-08-07	0.20 ± 0.38	0.66	-0.13 ± 1.38	1.77
EN00021	Adult	Male	2003-11-27	0.18 ± 0.26	0.49	1.65 ± 1.29	2.61
EN00024	Adult	Male	2002-04-15	0.12 ± 0.26	0.70	-0.02 ± 0.87	2.62
EN00024	Adult	Male	2002-04-19	0.50 ± 0.34	0.70	-0.02 ± 0.60	2.62
EN00024	Adult	Male	2003-08-07	0.62 ± 0.41	0.66	-0.13 ± 0.78	1.77
EN00027	Adult	Male	2002-04-18	0.42 ± 0.34	0.70	-0.02 ± 0.70	2.62
EN00028	Adult	Male	2002-04-18	0.13 ± 0.27	0.70	0.76 ± 1.39	2.62
EN00029	Adult	Male	2002-04-18	-0.07 ± 0.31	0.70	-0.02 ± 0.99	2.62
EN00029	Adult	Male	2003-08-11	-0.07 ± 0.13	0.16	-0.13 ± 0.49	1.42
EN00030	Adult	Male	2002-04-12	0.28 ± 0.31	0.70	-0.02 ± 0.70	2.62
EN00032	Adult	Male	2003-08-07	0.49 ± 0.35	0.66	-0.13 ± 0.69	1.77
EN00033	Adult	Male	2002-04-17	-0.07 ± 0.29	0.70	-0.02 ± 0.70	2.62
EN00036	Adult	Male	2003-08-13	0.07 ± 0.15	0.16	-0.13 ± 0.58	1.42
EN00037	Adult	Male	2002-04-15	0.16 ± 0.30	0.70	-0.02 ± 0.77	2.62
EN00038	Adult	Male	2002-04-17	0.14 ± 0.28	0.70	0.78 ± 1.42	2.62
EN00038	Adult	Male	2003-08-07	-0.04 ± 0.17	0.66	0.82 ± 0.74	1.77
EN00039	Adult	Male	2002-04-17	0.21 ± 0.27	0.70	-0.02 ± 0.62	2.62
EN00042	Adult	Male	2003-08-12	0.10 ± 0.19	0.16	-0.13 ± 0.71	1.42
EN00044	Adult	Male	2003-08-08	0.51 ± 0.36	0.66	-0.13 ± 0.72	1.77
EN00057	Adult	Male	2003-11-27	-0.05 ± 0.22	0.49	0.59 ± 0.78	2.61
EN00057	Adult	Male	2003-11-29	0.92 ± 0.50	0.49	2.51 ± 1.55	2.61
EN00059	Adult	Male	2003-08-08	-0.17 ± 0.25	0.66	-0.13 ± 0.91	1.77
EN00064	Adult	Male	2003-11-28	-0.05 ± 0.38	0.49	1.21 ± 1.35	2.61
EN00070	Adult	Male	2002-04-12	0.12 ± 0.26	0.70	-0.02 ± 0.83	2.62
EN00084	Adult	Male	2003-08-12	0.50 ± 0.30	0.16	0.40 ± 0.58	1.42
EN00086	Adult	Male	2002-04-15	0.10 ± 0.25	0.70	-0.02 ± 0.68	2.62
EN00092	Adult	Male	2002-04-15	0.72 ± 0.43	0.70	-0.02 ± 0.94	2.62
EN00100	Adult	Male	2002-04-12	0.37 ± 0.36	0.70	-0.02 ± 0.93	2.62
EN00102	Adult	Male	2003-08-09	0.16 ± 0.25	0.16	-0.13 ± 0.91	1.42
EN00102	Adult	Male	2003-08-13	0.59 ± 0.34	0.16	-0.13 ± 0.65	1.42
EN00104	Adult	Male	2003-08-09	0.77 ± 0.43	0.16	2.29 ± 1.42	1.42
EN00104	Adult	Male	2003-08-13	0.14 ± 0.22	0.16	-0.13 ± 0.80	1.42
EN00107	Adult	Male	2002-04-15	-0.07 ± 0.33	0.70	-0.02 ± 1.17	2.62
EN00108	Adult	Male	2003-08-07	0.89 ± 0.54	0.66	-0.13 ± 1.05	1.77
EN00108	Adult	Male	2003-08-09	0.32 ± 0.24	0.16	-0.13 ± 0.54	1.42
EN00110	Adult	Male	2003-08-13	-0.07 ± 0.15	0.16	0.86 ± 0.74	1.42
EN00111	Adult	Male	2003-11-27	-0.80 ± 0.51	0.49	-0.08 ± 1.12	2.61
EN00114	Adult	Male	2002-04-19	0.23 ± 0.28	0.70	-0.02 ± 0.69	2.62
EN00116	Adult	Male	2003-08-09	-0.07 ± 0.17	0.16	-0.13 ± 0.63	1.42
EN00122	Adult	Male	2003-08-11	0.05 ± 0.14	0.16	-0.13 ± 0.51	1.42
EN00124	Adult	Male	2003-08-11	0.17 ± 0.18	0.16	-0.13 ± 0.51	1.42
EN00125	Adult	Male	2002-04-19	0.28 ± 0.31	0.70	0.61 ± 0.95	2.62
EN00125	Adult	Male	2003-08-07	0.80 ± 0.40	0.66	-0.13 ± 0.64	1.77
EN00139	Adult	Male	2003-08-12	0.05 ± 0.14	0.16	0.33 ± 0.51	1.42
EN00141	Adult	Male	2002-04-19	0.13 ± 0.27	0.70	-0.02 ± 0.75	2.62

Table 2. Continued.

Personal ID #	Age Type	Gender	Collection Date	^{239}Pu (µBq) (µBq/24 h void)		^{240}Pu (µBq) (µBq/24 h void)	
				Value	MDA	Value	MDA
EN00145	Adult	Male	2002-04-12	0.69 ± 0.48	0.70	-0.02 ± 1.00	2.62
EN00147	Adult	Male	2003-08-12	-0.07 ± 0.13	0.16	-0.13 ± 0.48	1.42
EN00151	Adult	Male	2003-08-08	0.53 ± 0.51	0.66	6.65 ± 3.05	1.77
EN00160	Adult	Male	2002-04-17	0.66 ± 0.46	0.70	0.85 ± 1.17	2.62
EN00160	Adult	Male	2002-04-18	0.35 ± 0.35	0.70	2.18 ± 2.57	2.62
EN00161	Teenager	Male	2002-04-19	0.33 ± 0.34	0.70	-0.02 ± 0.73	2.62
EN00174	Adult	Male	2003-08-09	0.42 ± 0.29	0.16	1.14 ± 0.93	1.42
EN00182	Teenager	Male	2003-11-29	-0.05 ± 0.41	0.49	-0.08 ± 1.32	2.61
EN00184	Adult	Male	2003-08-08	0.14 ± 0.22	0.16	0.67 ± 0.83	1.42
EN00189	Adult	Male	2003-08-13	-0.07 ± 0.19	0.16	-0.13 ± 0.70	1.42
EN00197	Adult	Female	2002-04-08	0.04 ± 0.22	0.70	0.38 ± 0.77	2.62
EN00198	Adult	Female	2002-04-08	0.23 ± 0.35	0.70	-0.02 ± 1.02	2.62
EN00201	Adult	Female	2003-08-05	0.51 ± 0.41	0.66	-0.13 ± 0.91	1.77
EN00204	Adult	Female	2002-04-10	0.09 ± 0.24	0.70	0.49 ± 0.94	2.62
EN00204	Adult	Female	2003-08-05	-0.17 ± 0.31	0.66	-0.13 ± 1.07	1.77
EN00207	Adult	Female	2003-11-25	0.23 ± 0.31	0.49	-0.08 ± 1.14	2.61
EN00221	Adult	Female	2002-04-09	0.08 ± 0.24	0.70	-0.02 ± 0.67	2.62
EN00242	Adult	Female	2002-04-08	-0.07 ± 0.22	0.70	-0.02 ± 0.49	2.62
EN00244	Adult	Male	2003-08-11	0.17 ± 0.18	0.16	-0.13 ± 0.51	1.42
EN00246	Adult	Female	2003-08-04	-0.17 ± 0.17	0.66	-0.13 ± 0.59	1.77
EN00246	Adult	Female	2003-08-06	0.00 ± 0.20	0.66	-0.13 ± 0.73	1.77
EN00251	Adult	Female	2002-04-09	0.36 ± 0.31	0.70	-0.02 ± 0.68	2.62
EN00251	Adult	Female	2003-08-05	0.01 ± 0.17	0.66	0.93 ± 0.69	1.77
EN00252	Adult	Female	2002-04-11	0.17 ± 0.30	0.70	-0.02 ± 0.91	2.62
EN00262	Adult	Female	2003-11-25	-0.05 ± 0.37	0.49	2.30 ± 1.73	2.61
EN00264	Adult	Female	2002-04-10	-0.07 ± 0.23	0.70	-0.02 ± 0.56	2.62
EN00267	Adult	Female	2003-08-06	0.00 ± 0.21	0.66	-0.13 ± 0.73	1.77
EN00268	Adult	Female	2002-04-09	-0.07 ± 0.23	0.70	-0.02 ± 0.61	2.62
EN00269	Adult	Female	2002-04-09	0.64 ± 0.45	0.70	-0.02 ± 0.81	2.62
EN00272	Teenager	Female	2003-08-04	-0.17 ± 0.22	0.66	-0.13 ± 0.83	1.77
EN00272	Teenager	Female	2003-08-06	-0.17 ± 0.16	0.66	-0.13 ± 0.54	1.77
EN00273	Adult	Female	2002-04-10	0.20 ± 0.32	0.70	-0.02 ± 1.01	2.62
EN00278	Adult	Female	2003-08-05	0.35 ± 0.28	0.70	-0.13 ± 0.59	1.77
EN00288	Adult	Female	2002-04-08	-0.07 ± 0.22	0.70	-0.02 ± 0.48	2.62
EN00290	Adult	Female	2002-04-08	0.44 ± 0.32	0.70	0.45 ± 0.66	2.62
EN00290	Adult	Female	2002-04-11	-0.07 ± 0.23	0.70	-0.02 ± 0.73	2.62
EN00291	Adult	Female	2002-04-09	0.20 ± 0.27	0.70	-0.02 ± 0.59	2.62
EN00293	Adult	Female	2002-04-11	-0.07 ± 0.30	0.70	-0.02 ± 0.93	2.62
EN00294	Adult	Female	2002-04-10	0.21 ± 0.27	0.70	-0.02 ± 0.64	2.62
EN00296	Adult	Female	2002-04-10	-0.07 ± 0.22	0.70	-0.02 ± 0.52	2.62
EN00304	Teenager	Female	2002-04-08	0.17 ± 0.25	0.70	0.47 ± 0.76	2.62
EN00304	Teenager	Female	2002-04-11	0.10 ± 0.25	0.70	1.29 ± 2.09	2.62
EN00329	Adult	Female	2003-08-05	0.31 ± 0.24	0.66	0.24 ± 0.48	1.77
EN00334	Adult	Female	2003-08-06	0.10 ± 0.22	0.66	-0.13 ± 0.60	1.77
EN00337	Adult	Female	2003-11-24	-0.05 ± 0.32	0.49	-0.08 ± 1.15	2.61
EN00339	Adult	Female	2003-08-05	0.36 ± 0.33	0.66	-0.13 ± 0.71	1.77
EN00346	Adult	Female	2002-04-09	0.26 ± 0.27	0.70	-0.02 ± 0.55	2.62
EN00359	Adult	Male	2003-08-12	0.06 ± 0.15	0.16	-0.13 ± 0.61	1.42
EN00364	Adult	Male	2003-08-11	0.65 ± 0.30	0.16	-0.13 ± 0.49	1.42
EN00375	Adult	Male	2002-04-18	0.61 ± 0.43	0.70	-0.02 ± 0.81	2.62
EN00376	Adult	Male	2003-08-13	-0.07 ± 0.11	0.16	-0.13 ± 0.42	1.42
EN00382	Adult	Male	2003-11-28	0.62 ± 0.40	0.49	0.69 ± 0.87	2.61
EN00383	Adult	Male	2003-11-28	0.11 ± 0.20	0.49	1.66 ± 1.08	2.61
EN00391	Adult	Male	2003-08-08	-0.17 ± 0.16	0.66	-0.13 ± 0.53	1.77

Table 2. Continued.

Personal ID #	Age Type	Gender	Collection Date	^{239}Pu (µBq) (µBq/24 h void)		^{240}Pu (µBq) (µBq/24 h void)	
				Value	MDA	Value	MDA
EN00400	Adult	Female	2003-11-25	0.26 ± 0.25	0.49	0.46 ± 0.68	2.61
EN00403	Adult	Male	2003-08-09	0.04 ± 0.13	0.16	-0.13 ± 0.48	1.42
EN00407	Adult	Female	2002-04-10	0.30 ± 0.28	0.70	-0.02 ± 0.55	2.62
EN00421	Adult	Female	2003-08-06	-0.17 ± 0.27	0.66	0.90 ± 1.07	1.77
EN00422	Adult	Male	2003-11-27	7.76 ± 1.18	0.49	-0.08 ± 0.76	2.61
EN00430	Adult	Female	2003-11-24	0.32 ± 0.29	0.49	-0.08 ± 0.78	2.61
EN00430	Adult	Female	2003-11-25	0.59 ± 0.39	0.49	0.70 ± 0.88	2.61
EN00431	Adult	Female	2003-08-06	0.45 ± 0.33	0.66	-0.13 ± 0.64	1.77
EN00461	Adult	Female	2003-08-04	0.11 ± 0.30	0.66	-0.13 ± 1.11	1.77
EN00463	Teenager	Male	2003-11-29	0.17 ± 0.25	0.49	-0.08 ± 0.92	2.61
EN00467	Adult	Male	2003-08-08	0.71 ± 0.36	0.16	-0.13 ± 0.64	1.42
EN00474	Teenager	Female	2003-08-04	0.31 ± 0.30	0.66	-0.13 ± 0.69	1.77
EN00509	Teenager	Female	2003-11-24	-0.05 ± 0.37	0.49	1.26 ± 1.40	2.61
EN00511	Teenager	Male	2003-11-29	0.32 ± 0.39	0.49	-0.08 ± 1.37	2.61
EN00512	Teenager	Male	2003-11-29	-0.05 ± 0.25	0.49	-0.08 ± 0.87	2.61
EN00519	Teenager	Male	2003-11-29	0.28 ± 0.26	0.49	-0.08 ± 0.72	2.61
EN00539	Adult	Female	2003-11-25	-0.05 ± 0.25	0.49	0.70 ± 0.88	2.61