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Examining The Relationship Between Radioactivity In Baby Teeth And Cancer Incidence And Mortality Near The Brookhaven National Laboratory

Radiation and Public Health Project, Inc.

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FINAL REPORT

EXAMINING THE RELATIONSHIP BETWEEN RADIOACTIVITY IN BABY TEETH AND CANCER INCIDENCE AND MORTALITY NEAR THE BROOKHAVEN NATIONAL LABORATORY

Submitted to
Citizens Monitoring and
Technical Assessment Fund

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EXECUTIVE SUMMARY

Objectives. The Radiation and Public Health Project (RPHP), a non-profit research and education group consisting of health professionals and scientists, has proposed to analyze information enabling it to:

1) compare trends of radiation in baby teeth with trends in cancer in eastern Long Island, near the Brookhaven National Laboratories (BNL)

2) evaluate if Long Island children with certain diseases such as cancer have elevated levels of radiation in their baby teeth

RPHPs work is supported by grant No. MTA-06-007 from the Citizens Monitoring and Technical Assessment Fund.

The analysis is of great importance to understanding radiation's health risks to humans. RPHPs unique data base of Strontium-90 measurements in hundreds of BNL-area baby teeth enables it to compare patterns of radiation exposure with patterns of disease. Sr-90 is a carcinogenic chemical produced only in nuclear weapons and reactors.

Data on Sr-90 in teeth were previously obtained through laboratory analysis (partially funded under Round 5 of the Resolve program). For this Round 6 effort, cancer incidence and mortality data were obtained from the New York State Department of Health and U.S. Centers for Disease Control and Prevention, respectively. Health status information for Long Island children who donated baby teeth were obtained through a mail survey administered by RPHP during Round 6.

Accomplishments. Major findings of the project are as follows (all data refer to Suffolk County residents):

A. Trends in average Sr-90 in baby teeth and cancer incidence matched with a four-year latency* for

- Incidence, all cancers combined, age 0-9 **(STRONGEST LINK WITH SR-90)**
- Incidence, all cancers combined, age 65 and over
- Incidence, female breast cancer age 25-54
- Incidence, female breast cancer age 65 and over

B. Trends in average Sr-90 in baby teeth were similar to trends in cancer mortality with a ten-year latency* for

- Mortality, all cancers combined, age 0-24 **(STRONGEST LINK WITH SR-90)**
- Mortality, leukemia, age 0-34 **(STRONGEST LINK WITH SR-90)**

* Cancer incidence from 1985-1987 corresponds with Sr-90 from 1981-1983, etc. Cancer mortality from 1991-1993 corresponds with Sr-90 from 1981-1983, etc.

C. Average Sr-90 levels in baby teeth were highest for children (tooth donors) who have cancer or whose mother has cancer.

The epidemiologic findings in this report document a statistical link between low-dose radiation exposure and risk of cancer, especially in children, supporting previous research studies. With 103 nuclear power reactors in the U.S. now operating, and with considerable radioactive waste stored in plants across the nation, it is critical that similar projects be conducted to validate this study and examine the extent of risk to human health.

Problems

No major problems were encountered during the project.

PURPOSE AND OBJECTIVES/KEY TASKS

On November 10, 2004, Joseph Mangano, National Coordinator of the Radiation and Public Health Project (RPHP), signed Grant No. MTA-06-007, which had been previously signed by Robert Fisher, General Counsel of the Citizens' Monitoring and Technical Assessment Fund. The grant, which extends from October 29, 2004 to December 29, 2005, is in the amount of $40,000.00.

The project follows RPHPs effort under Round 5 of the MTA program, in which trends in environmental radioactivity levels were compared to trends in in-body levels near Brookhaven National Laboratories (BNL). The Round 5 effort showed a link between radioactivity in baby teeth with many types of environmental radioactivity.

Two basic activities comprise the Round 6 project. First, RPHP will compare trends in cancer rates and in-body radiation near BNL. Results of this comparison will suggest whether radiation may be one factor affecting local cancer rates. Second, RPHP will calculate average levels of radioactive Strontium-90 in baby teeth of BNL-area children according to their health status, i.e. whether or not they have certain diseases. Thus, RPHP will assess whether high Strontium-90 in baby teeth is correlated with risk of childhood illness.

Studies of Sr-90 in bones and teeth of humans have been conducted in many nations, especially during the period of large-scale atmospheric nuclear weapons testing (1945-1963). **However, RPHP is the first research organization to analyze the health risks of in-body Sr-90**. The key question of health effects of emissions from nuclear weapons and reactors that enter human bodies has existed for decades. An April 25, 1960 article in Newsweek magazine asks

"But what about the children who have done their growing while Strontium-90 levels were high – are they likely to develop cancer?"

This final report will be distributed to various community groups, elected officials, regulators, and the media. The project received endorsements from various local environmental groups, including Citizens Campaign for the Environment, Seeking Answers for Rhabdomyosarcoma, North Fork Environmental Council, and The Tooth Fairy cable television show.

BACKGROUND

A. Radiation and Public Health Project. The Radiation and Public Health Project (RPHP) is a private non-profit research and educational organization. Founded in the mid-1980s and designated as a 501 (c) (3) group in 1996, the RPHP mission is to obtain, analyze, and disseminate information on the health risks of radioactive emissions from nuclear weapons and reactors. Its core group consists of health and scientific professionals, including:

Joseph J. Mangano, MPH MBA, epidemiologist and RPHP National Coordinator
Ernest J. Sternglass, PhD, radiation physicist and RPHP Chief Scientist
Jay M. Gould, PhD, statistician and RPHP Director
Janette D. Sherman, MD, internist/toxicologist and RPHP Research Associate
William McDonnell, MA, data manager and RPHP Director
Agnes Reynolds RN, nurse and RPHP Research Associate

Since 1994, RPHP members have published 21 medical journal articles and 5 books on the health hazards of exposure to radiation from nuclear reactors.

B. RPHP and Long Island/BNL. RPHP has long held an interest in studying radiation health issues on Long Island. The Brookhaven National Laboratories (BNL) in Upton LI operated nuclear reactors continuously from 1950 to 1999. Throughout the past half-century, and particularly in the 1990s, accusations of radioactive contamination from BNL operations have been the subject of public discussion. Moreover, RPHP has documented elevated rates of cancer on Long Island, particularly (radiation-sensitive) breast cancer, thyroid cancer, and childhood cancer. More detailed information on BNL and cancer on Long Island is documented in RPHPs Round 5 final report.

In 1998, RPHP began its Tooth Fairy Project, which is the only study of in-body radiation levels near U.S. nuclear plants. The study measures the concentration of Strontium-90, a radioactive chemical found only in nuclear weapons and reactors, in baby teeth. RPHP has analyzed over 4,500 teeth (mostly near seven U.S. nuclear plants), with over 800 were contributed by families living on Long Island, the most of any region near a nuclear site.

In its Round 5 project, RPHP found that average levels of various radioactive chemicals near BNL had risen in the past 20 years. These included chemicals emitting beta particles in the air at Upton NY, all beta emitters in precipitation at Yaphank NY, Cesium-134 and Ruthenium-106 in fish in BNL ponds, and all alpha emitters in the Peconic River. Moreover, it documented that these rises corresponded to rises in average Sr-90 in baby teeth in eastern Suffolk County, downwind of the BNL plant. These discoveries led RPHP to pose the question of whether these rising levels of environmental and in-body radioactivity were linked with rising rates of cancer and other diseases.

METHODS USED

A. Cancer Rates. RPHP has calculated average Sr-90 concentrations in baby teeth by year of birth for over 600 persons born to Long Island residents. The methodology for collecting and testing teeth has been explained in the final Round 5 report. The REMS Inc. laboratory of Waterloo, Canada could not obtain an accurate result for about 5% of the baby teeth, and these are excluded from all analyses. Sr-90 concentration is expressed as picocuries per gram of calcium in the tooth at birth.

One way of assessing whether trends in Sr-90 are associated with disease risk is to compare Sr-90 trends with trends in cancer rates.

- Cancer mortality data by county is available from 1979-2002 on the web site of the U.S. Centers for Disease Control and Prevention (http://wonder.cdc.gov, underlying cause of death). The web site provides number of deaths, population, and death rates by age. The following types of cancer, with respective diagnosis codes, were analyzed:

Type of Cancer	ICD-9 Codes (1979-98)	ICD-10 Codes (1999-2002)
All Cancers Combined	140.0-239.9	C00-D48.9
Female Breast Cancer	174.0-174.9	C50-C50.9
Leukemia	204.0-208.9	C90.1-C95.9

- Cancer cases by age for Suffolk County for each year from 1979-1996 were obtained through a special request to the New York State Cancer Registry. In addition, the cancer registry maintains county-specific incidence rates for five-year periods from 1977-2002 on its web site (http://www.health.state.ny.us/nysdoh/cancer), providing.

B. Health Status Data. Information on Suffolk County residents (mostly children) who donated a baby tooth to RPHP was obtained through an original RPHP survey, mailed to the parents of tooth donors. The following questions were included in the survey:

Child's name
Child's birth date
Current health status (excellent, good, fair, poor)
Current height (inches)
Current weight (pounds)
Other than birth, has the child ever been hospitalized overnight?
How many days of school did the child miss in the past school year?

Has the child ever been diagnosed with the following?

- Cancer
- Asthma
- Diabetes
- Birth defects
- Seizures
- Heart conditions
- Sinus problems
- Learning disabilities
- ADD/ADHD
- Autism
- Chronic ear infections
- Allergies (to foods)
- Allergies (to mold, pollen, etc).
- Chronic headaches
- Gastro-intestinal conditions
- Other

Is the child's father deceased?
Has the child's father ever been diagnosed with cancer?

Is the child's mother deceased?
Has the child's mother ever been diagnosed with cancer?

How many siblings has the child ever had?
Have any siblings been diagnosed with cancer?

Other comments.

Of the 805 surveys mailed, 88 (11%) were returned to RPHP because the address was incorrect. A total of 255, or 32%, of the surveys were completed and returned to RPHP, which reviewed the responses. A small number were returned to parents for corrections if any omissions or obvious errors were detected. The most common error was the case of a parent sending information for a sibling of the tooth donor, rather than the actual donor. Of the 255 surveys, 44 were not used in the analysis, since they had been tested using another scintillation counter with different standards, leaving 211 surveys as the basis for analysis.

Data for the survey was entered into an Excel spread sheet, and results tabulated. The main object for the survey was to calculate average Sr-90 levels in baby teeth for each category of tooth donor (e.g., children with asthma, children whose mother has been diagnosed with cancer), and compare them with "healthy" children (those reporting no conditions). RPHP did not check the accuracy of responses, but did pilot-test the survey with several parents. They reported that questions were easily understood and subject to little interpretation, and responses were likely to be highly accurate..

RESULTS

A. Fetal/Infant Health Since BNL Reactors Closed. In the Round 5 report, RPHP showed that Suffolk County cancer rates – both incidence and mortality – are generally above state and national norms. Rates of all cancers combined for both adults and children and female breast cancer (the subject of a multimillion dollar federal study that is still ongoing) are consistently high.

In the proposal for this Round 6 project, RPHP stated it would investigate whether reduced emissions from BNL after its final two reactors closed in 1996 and 1999 have resulted in improved local health. Radiation exposure, such as that from BNL, is most damaging to the fetus and infant because of their immature immune systems and rapid rate of cell division; thus, any improvements in health would likely affect the young first.

For non-Hispanic Suffolk County whites, the rate of babies born underweight (less than 2500 grams, or 5.5 pounds) rose 28% from 1995 to 2002. Multiple births, such as twins and triplets, are excluded. State and national rates showed virtually no change during this time, and the once-low Suffolk rate now equals that of the state (Figure 1).

Another measure of fetal and infant health is the rate of (singleton) babies born prematurely, i.e. with less than 37 weeks gestation. Figure 2 shows that from 1995 to 2002, the Suffolk rate for non-Hispanic whites rose 27%, much greater than increases for the state and nation. The once-low Suffolk rate now exceeds that of New York State.

A third measure of fetal/infant health is childhood cancer, since many experts believe that cancer that develops early in life is the result of a fetal abnormality. In Suffolk County, the cancer death rate to children under age 15 in the seven year period 1996-2002 rose 11.4% from the previous seven year period, compared to a 14.9% decline nationwide (Table 1). The rate in neighboring Nassau County also rose by 5.9% during this time.

Table 1
Change in Cancer Death Rate, Age 0-14
Suffolk County vs. U.S., 1989-1995 vs. 1996-2002

Area	Deaths	Population	Rate/100,000	% Change
Suffolk Co.				
1989-95	51	2,006,035	2.54	
1996-02	57	2,012,291	2.83	+11.4%
United States				
1989-95	13335	392619848	3.40	
1996-02	12102	419413759	2.89	- 14.9%

Source: U.S. Centers for Disease Control and Prevention (http://wonder.cdc.gov, underlying cause of death). Uses ICD-9 codes 140.0 – 239.9 (1989-98) and ICD-10 codes c00 – d48.9 (1999-02).

RPHP has measured Sr-90 levels in over 500 baby teeth from Suffolk County residents. Virtually all of the Sr-90 in each tooth has been taken up during pregnancy (from the mother's bone stores and diet) and very early infancy (in breast or bottled milk). Thus, the declining trends in Suffolk County's infant health – observed in rising rates of childhood cancer, underweight births, and premature births – merit a more detailed look at whether there may be a cause-and-effect relationship between Sr-90 and health risk.

B. Trends in Sr-90 vs. Trends in Cancer Incidence. RPHP compared Suffolk County trends in Sr-90 (by year of the tooth donor's birth) with trends in cancer incidence.

The disease best known to be sensitive to radiation exposure is childhood cancer. Many As early as 1956, British researcher Alice Stewart documented a link between in utero pelvic X-rays and childhood cancer. Because most childhood cancers are not diagnosed until the child reaches age three, there is a lag period between any fetal insult and the diagnosis of cancer.

1. Total cancer incidence age 0-9. Figure 3 compares the Suffolk County trends in average Sr-90 concentration in baby teeth with cancer incidence diagnosed in children under age ten. There is a four-year latency period in this comparison. For example, Sr-90 for children born 1981-83 through 1990-92 is contrasted with childhood cancer incidence from 1985-87 to 1994-96. Thus, a total of 12 years, or 4 three-year periods, is given in the figure, covering hundreds of teeth and cancer cases.

The average Sr-90 level rises considerably from 1981-83 to 1984-86. It then declines in 1987-89, then increases again in 1990-92. Four years later, childhood cancer incidence follows the same pattern for each interval. The figure shows a close correlation between the two trends, suggesting a cause-and-effect link.

2. Total cancer incidence over age 65. Aside from children, the age cohort most susceptible to radiation exposure's harmful effects is the elderly. The susceptibility of this group, whose immune systems are declining, has been identified in a number of studies. For example, workers in nuclear plants suffer most greatly when exposures occur over age 55.

Figure 4 compares the same 12 years of Sr-90 data with cancer incidence over age 65 in Suffolk County. The pattern of increase-decrease-increase is also found in cancer incidence among the elderly. While this trend matches that of Sr-90 in teeth, the changes are not nearly as strong as they are in children.

3. Breast cancer incidence age 25-54. Beginning with studies of survivors of the Hiroshima and Nagasaki atomic bombs, elevated breast cancer risk has been documented after radiation exposures. Breast cancer is virtually non-existent in children, with virtually no cases diagnosed until women are in their 20s. Thus, Sr-90 averages were contrasted with breast cancer in the youngest affected Suffolk County females (age 25-54), using the same four year lag period.

The Sr-90 trend of increase-decrease-increase is matched for breast cancer incidence in younger women four years later. The fit between the two trends is stronger than that of cancer in the elderly, but not as strong as that of childhood cancer (Figure 5).

4. Breast cancer incidence over age 65. Breast cancer is most common in females over age 65. Figure 6 illustrates the trend in breast cancer incidence among elderly Suffolk County women compared to Sr-90 in baby teeth four years earlier. Again, the trends match; and like breast cancer in younger women, the link is not as strong as it is for childhood cancer.

5. Leukemia mortality age 0-34. In recent decades, advances in medical treatments have lowered the death rate for childhood cancer dramatically. In particular, many young people stricken with leukemia, which was often a death sentence two generations ago, can live well into adulthood. Still, some young cancer/leukemia victims succumb to the disease. Cancer remains the second most common reason for U.S. child deaths, behind accidents.

RPHP examined trends in leukemia mortality for children and young adults (age 0-34) in Suffolk County. It compared the average Sr-90 level in baby teeth with leukemia mortality ten years after. The reason why about a ten-year latency is expected between exposure and death (vs. four years for incidence) is that at least several years often elapses between diagnosis and death.

The link between average Sr-90 in baby teeth and leukemia mortality age 0-34 ten years later in Suffolk County is a strong one (Figure 7), as well correlated as the Sr-90/cancer incidence 0-9 link. The mortality analysis used five three-year periods, while the incidence analysis used only four.

6. Cancer mortality age 0-24. **Trends in cancer mortality age 0-24 in Suffolk County closely match trends in Sr-90 in baby teeth ten years earlier (Figure 8).**

C. Average Sr-90 in Suffolk Children with Particular Diseases. As mentioned, RPHP mailed health status surveys to Long Islanders who donated a baby tooth to be tested for Sr-90. A total of 211 surveys had been returned by September 5, 2005.

An average Sr-90 level was calculated for all responses, plus each category of children whose parents reported they suffered from a disease. These results are given in Table 2. Only those categories with at least 5 children are presented, as others would have little significance.

Table 2
Average Strontium-90 Concentration in Baby Teeth
By Category of Health Status, Suffolk County

Category	Responses	Average Sr-90*	% plus/minus Oth Responses
All Responses	211	1.27	-
Mother Deceased	0	-	-
Father Deceased	6	1.40	+11
Mother has Cancer	**22**	**1.78**	**+46**
Father has Cancer	11	1.15	- 10
Hospitalized overnight (other than birth)	37	1.03	- 22
Tooth Donor has			
- Cancer	**5**	**1.86**	**+48**
- ADD/ADHD	20	1.61	+30
- Gastrointestinal conditions	10	1.59	+27
- Environmental Allergies	59	1.52	+30
- Food allergies	13	1.45	+15
- Asthma	31	1.39	+11
- Sinus problems	22	1.38	+10
- Learning disabilities	19	1.35	+ 7
- Chronic Headaches	8	1.18	- 7
- Chronic ear infections	18	1.12	- 14
- Two or more stated conditions	30	1.55	+27
- No stated conditions	72	1.30	+ 4

Notes: * Average picocuries of Strontium-90 per gram of calcium at birth. Excludes teeth for which lab cannot achieve accurate results. Excludes are categories with fewer than five responses (diabetes, birth defects, seizures, heart conditions, autism)

The two categories with clearly the highest average Sr-90 concentrations are children with cancer and children whose mothers have already been diagnosed with cancer. Their average Sr-90 levels were 1.86 and 1.78, respectively, or 48% and 46% greater than the average for other donors. Only 5 children with cancer responded to the survey – which suggests that the higher average Sr-90 may or may not be significant - but 22 whose mothers who have cancer.

Aside from cancer, the tooth donors with the highest average Sr-90 are those with Attention Deficit Hyperactivity Disorder (ADHD), gastrointestinal conditions, and environmental allergies such as pollen, ragweed, dust, etc. These results suggest that radiation exposure may raise the risk of developing these conditions in childhood.

Children with most diseases have a higher average Sr-90 than those with no stated conditions – who are presumably the "healthy" children. Moreover, the 30 children who reported at least two conditions had a considerably higher Sr-90 average (1.55) than those with no stated conditions (1.30), suggesting that radiation exposure may make children prone to multiple disorders.

DISCUSSION

The question of whether radioactive emissions from Brookhaven National Laboratories (BNL) into the local environment have harmed the health of local residents is a legitimate one. Since the early 1950s, BNL has discharged a considerable amount of contaminants into the local air, water, and soil. In addition, Suffolk County, Long Island has experienced high and rising rates of cancer, including those cancer types most sensitive to radiation exposure. Despite these dual trends, no study of BNLs role in the current cancer epidemic has been made. (A multimillion dollar federal study of breast cancer in Long Island begun in 1993 completely ignores radioactivity from the laboratory's nuclear reactors as one causal factor).

The Radiation and Public Health Project (RPHP), a professional research group based in New York City, has extensive experience with the analysis of health risks from radiation exposure. It is undertaking the first study of in-body radioactivity near U.S. nuclear power plants through the "Tooth Fairy Project", which measures radioactive Strontium-90 concentrations in baby teeth (over 4500 to date). Under Round 5 of the Resolve program, RPHP documented a link between environmental radioactivity trends near BNL and trends of Sr-90 in baby teeth in Suffolk County – suggesting that BNL emissions routinely enter the human body.

This Round 6 project takes the environmental/in-body link one step further. Specifically, it examines whether there is a link between in-body radioactivity and cancer in Suffolk County.

There are two major findings in the study. The first is that the trend in average Sr-90 closely matches the trend in childhood cancer incidence and mortality in Suffolk County. The link assumes a latency of four years for incidence and ten years for mortality. Cancer incidence (all types combined and female breast cancer) among older adults, also have similar trends to average Sr-90, but childhood cancer is much more closely matched.

This finding establishes a statistical link between exposure to radioactive emissions and childhood cancer, similar to that found in other cause and effect relationships (e.g., smoking prevalence and lung cancer incidence).

The second major finding is that Suffolk children who have cancer or who have mothers with cancer have average Sr-90 averages in their baby teeth nearly 50% higher than those who do not have cancer. This discovery extends the linkage between Sr-90 levels and cancer risk.

Children with conditions such as allergies, asthma, and Attention Deficit and Hyperactivity Disorder also have elevated average Sr-90 levels, suggesting a potential cause-and-effect link. However, children with cancer or who have mothers with cancer have the highest Sr-90 levels, suggesting the strongest risk from Sr-90 is cancer.

The connection between Sr-90 in baby teeth and elevated risk for cancer in children is a logical one. A baby tooth takes up most of its Sr-90 during pregnancy and very early infancy. Cancer in children is commonly believed to originate with an abnormality in the fetus. Research showing that pelvic X-rays raise the risk of childhood cancer demonstrates that radiation exposure can lead to such an abnormality. The elevated Sr-90 level in children whose mothers have cancer is also logical, since some of the Sr-90 is transmitted to the fetus through the mother's bone stores. A mother with higher Sr-90 levels is more likely to transmit higher levels to the child, and is also more likely to develop cancer.

But while Sr-90 is only one of over 100 radioisotopes created only in nuclear weapons and reactors, the findings can be extended to other chemicals. Sr-90, because of its long half life of 28.7 years, is a proxy measure for all long-lasting radioisotopes in the body, including Cesium-137 (half life of 30 years) and plutonium-239 (24,000 years).

A final result of the project is that since the closing of the final two BNL reactors in 1996 and 1999, there has been no apparent improvement in infant and child health. Since the mid-1990s, rates of premature infants, underweight births, and childhood cancer deaths have risen more rapidly than state or national rates. While closing the BNL reactors reduces environmental radioactivity, and should improve local health (most quickly in the very young), any improvements have yet to be detected by 2002.

These results only begin to explore the connection between BNL radiation and cancer in Suffolk County. Further research can also examine:

- Sr-90 in more teeth from children with cancer can be measured to insure significance.

- Other radioactive elements can be measured in the body, and compared with cancer risk.

- Specific types of childhood cancers (leukemia and brain cancer are the most common) can be analyzed for sensitivity to Sr-90 and other chemicals.

- Similar studies should be conducted near other DOE nuclear sites along with civilian nuclear power plants to validate whether BNL emissions truly pose a risk for cancer to children.

DISSEMINATION OF RESULTS

The importance of the results of this project is not to be taken lightly. Because little research has been done on the topic of health effects of in-body radioactivity from nuclear plants, there is much to be learned. In particular, the project can

- Help isolate one reason for the high cancer rates on Long Island

- Indicate that an aggressive, immediate decontamination of the BNL site be undertaken, to limit any future exposures and cancer risk

- Serve as a template for similar projects near other DOE sites, and near civilian nuclear power plants

- Be shared with elected officials, members of the media, and the public at large in order to inform them of risks and hence play a role in future policy decisions regarding nuclear policy (and overall energy policy)

Prior to the grant award for this project, several environmental groups on Long Island were contacted and expressed interest in supporting the project. These are:

- Adrienne Esposito, Citizens Campaign for the Environment, Farmingdale NY
- Randy Snell, Seeking Answers for Rhabdomyosarcoma Children, Coram NY
- Sandra Senzon, dental hygienist and host of the cable TV show The Tooth Fairy
- Debra O'Kane, North Fork Environmental Council, Mattituck NY

These individuals, and perhaps others, will receive copies of the report. Each will be encouraged to present information publicly.

At least two public officials from Long Island, New York State Assembly members Ginny Fields and Fred Thiele, have long supported RPHP research. Each will receive a copy of this report, and RPHP will follow up on how to use it. Suffolk County legislator Jay Schneiderman will also receive a copy.

Members of Congress are important to this process, since the DOE cleanup of sites like BNL is being performed with federal regulators and dollars, giving Congress oversight over the process. Congressman Tim Bishop of Long Island, whose district includes BNL, will receive a copy of the report. Senators Hillary Clinton and Charles Schumer will also be provided copies. Alice Williams of the DOE will receive a copy, as required under the Grant Agreement.

RPHP members feel strongly that results of this study be published in a peer-reviewed medical journal. With the completion of this report, efforts will be made to prepare an article and submit it to an appropriate journal. It is hoped that publication of such an article will spur researchers (and supporters such as the Fund) to back similar types of research.