GREENPEACE

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Greenpeace Cover Letter to the EQI Mercury Report

INTRODUCTION

An investigation of Factors Related to Levels of Mercury in Human Hair, produced by the Environmental Quality Institute (EQI) at the University of North Carolina at Asheville (UNCA), presents the current results for an ongoing survey of mercury levels in hair in volunteers from across the United States.

As of the release of this progress report, 6,583 hair samples have been analyzed for mercury content. Of those, 2,834 represent women of childbearing age (16-49 years of age). Within that group, 640 women – approximately 22.58 percent - had mercury levels that were at or above the reference level for mercury in hair, which correlates to the reference dose designated by the Environmental Protection Agency (EPA) for children, women of childbearing age and pregnant women. Given that the age structure of this sub-group in the current study might differ from that in the general population, this percentage may not hold for women of childbearing age across the U.S. population as a whole. In addition to the samples that were analyzed by the time this report was written, another 2402 samples have been analyzed since, with another 7,520 home sampling kits have been purchased.

PURPOSE

Greenpeace launched the Mercury Hair Sampling Project in order to draw attention to the global problem of mercury pollution, a major source of which is mercury emitted from coal-fired power plants, and to inform participants about clean energy alternatives that would reduce mercury emissions. Greenpeace recognizes that coal-fired power plants are not the only source of mercury pollution. Nevertheless, they are a substantial contributor to global pollution and represent one industry sector, namely power plants, that could contribute significantly to reducing mercury emissions by phasing out the burning of coal and introducing clean energy alternatives such as wind and solar power.[1]

The Centers for Disease Control and Prevention (CDC) National Health and Nutrition Examination Survey (NHANES) from 1999 and 2000 assessed hair mercury levels in 838 children 1 to 5 years of age, and 1,726 women 16 to 49 years of age.[2] Based on these results, similar findings of mercury blood levels, and the number of births in 2000, it has been estimated that between 300,000 and 630,000 newborns each year in the United States may be exposed in utero to concentrations of methyl mercury above the EPA limit that is considered to be without increased risk of adverse neurodevelopmental effects.[3] While the NHANES study selected a representative sample of the United States population, the Greenpeace project does not limit participation to selected individuals, and therefore the results of the two studies cannot yet be statistically compared. The Greenpeace project aims to test a larger study group of volunteers regardless of gender, age or ethnicity. This will ultimately provide new data about mercury levels in population sub-groups other than those studied by NHANES. In addition to providing new data, Greenpeace is also providing access to an analytical service at cost, which is not routinely available on demand through government sources.

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[1] Analysis of U.S. EPA's 1999 National Emissions Inventory for Hazardous Air Pollutants as cited in Northeast States for Coordinated Air Use Management (NESCAUM), Mercury Emissions from Coal-Fired Power Plants: The Case for Regulatory Action, October 2003.

[2] McDowell, Margaret A., et al. "Hair Mercury Levels in US Children and Women of Childbearing Age: Reference Range Data from NHANES 1999-2000." Environmental Health Perspectives 112(11) (August 2004): 1165-1171.

[3] Mahaffey, Kathryn R., Clickner, Robert P. and Bodurow, Catherine C. "Blood Organic Mercury and Dietary Mercury Intake: National Health and Nutrition Examination Survey, 1999 and 2000" Environmental Health Perspectives 112(5) (April 2004): 562-570.
Mahaffey, K. U.S. EPA. Methylmercury: Epidemiology Update, a presentation to the Fish Forum. San Diego 2004. http://www.epa.gov/waterscience/fish/forum/2004/presentations/monday/mahaffey.pdf

Additionally, Greenpeace is providing information to participants about the effects of mercury pollution and the potential long-term solutions.

COLLABORATION

Greenpeace has provided the Environmental Quality Institute at the University of North Carolina at Asheville with a grant to conduct a research study in order to assess mercury hair levels in volunteers from the United States.[4] Through this agreement, EQI is responsible for the design, execution, analysis, quality control and reporting of results. Therefore, all technical questions regarding the design and execution of sampling and analysis should be directed to EQI (http://www.unca.edu/eqi/). Through this agreement with EQI, Greenpeace has the right to use the project and its results to inform the public about mercury pollution and potential solutions. However, EQI owns the data collected and can use it for future research projects and publications not sanctioned by Greenpeace.

PARTICIPANTS

The participants in this ongoing study are volunteers who have chosen to be involved either by providing a hair sample at a Greenpeace event, at a participating hair salon, to a partnering organization such as the Sierra Club, Aveda Salons, National Waterkeepers Alliance, or by ordering the test by mail for a nominal fee (which covers sample analysis and essential associated costs only). Because the majority of participants paid a fee to be involved, Greenpeace and EQI did not limit participation in the project to people of a specific age, gender, ethnicity or rate of fish consumption and accepted all samples that appeared to have been properly collected and had all paperwork completed. Further information about participant self-selection and potential bias is addressed in the EQI report.

EPA AND FDA REFERENCE DOSE

The reference dose (RfD) is a numerical estimate of a daily oral exposure to the human population, including sensitive subgroups such as children, which is not likely to cause harmful effects during a lifetime. RfDs are generally used for health effects that are thought to have a threshold or low dose limit for producing effects. The EPA and Food and Drug Administration (FDA) have jointly determined a reference dose for methyl mercury of 0.1 µg/kg body weight/day, which corresponds to a hair mercury level of one µg/g (one microgram of mercury per gram of hair) for women of childbearing age, pregnant women, nursing women and young children.[5] Because this reference dose was not set for the general population, it cannot be applied to people who do not fit into these specific categories. There are no current health guidelines or government reference doses for men or elderly women. Health care professionals and scientists are concerned that chronic exposure to methyl mercury may also produce cardiovascular effects that would adversely affect any member of the population, however studies have not yet determined a reference dose for these effects.[6]

SOURCES OF MERCURY

Emissions from coal-fired power plants account for the largest single source of industrial mercury emissions in the United States – approximately 41 percent.[7] However, mercury is a global problem with

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[4] http://www.unca.edu/eqi/

[5] U.S. EPA. Reference Dose for Mercury. External Review Draft. U.S. Environmental Protection Agency, National Center for Environmental Assessment NCEA-S-0930 (2000).

[6] Guallar E., et al. "Mercury, fish oils, and the risk of myocardial infarction." New England Journal of Medicine (2002) 347(22): 1747-1754.
Rissanen T., et al. "Fish oil-derived fatty acids, docosahexaenoic acid and docosapentaenoic acid, and the risk of acute coronary events." Circulation (2000)102:2677-2679.
Salonen J.T., et al. "Mercury accumulation and accelerated progression of carotid atherosclerosis: a population-based prospective 4-year follow-up study in men in eastern Finland." Atherosclerosis (2000) 148:265-273.

[7] Analysis of U.S. EPA's 1999 National Emissions Inventory for Hazardous Air Pollutants as cited in Northeast States for Coordinated Air Use Management (NESCAUM), Mercury Emissions from Coal-Fired Power Plants: The Case for Regulatory Action, October 2003.

sources of pollution all over the world. Coal is also burned heavily in Europe and Asia as a fuel for power plants. The U.S. consumption of coal is approximately 20 percent of the global total.[8] Mercury is also released from a wide range of other sources, including waste incinerators and certain chemical industries, such as the production of chlorine.[9] In addition, there are natural sources of mercury from volcanic eruptions and erosion of rocks and soils.

The major source of mercury exposure for people is consumption of fish that contain mercury. Under certain conditions, elemental mercury is converted to a more biologically toxic form, methyl mercury, by bacteria in soils and water. Fish concentrate this methyl mercury contamination as it is carried up the food chain from bacteria to small organisms and on to smaller fish. Large predatory fish consequently carry the heaviest mercury contamination, though recent government tests also show that a percentage of fish, such as canned light tuna, considered lower in mercury content are also testing at levels considered high.[10] At the same time, many fresh water fish in the United States are also contaminated with mercury. It is difficult to identify the specific source of mercury contamination in any individual person or fish. It has been shown, however, that reduction of point source mercury emissions limits not only the global environmental impact of mercury pollution but can also reduce the potential impact of elevated localized levels of mercury ("hot spots") near the point source.[11] It is therefore possible to begin to tackle major ongoing mercury emissions at the source, including reducing mercury emissions from power plants by switching from coal to clean energy alternatives.

HEALTH IMPLICATIONS

Organic compounds of mercury such as methyl mercury are considered the most toxic forms of the element. Exposures to very small amounts of these compounds over time can result in accumulation in body tissues and health effects including neurological damage. For fetuses, infants and children the primary health effects of mercury are on neurological development. Even the levels of mercury exposure which result from a mother's consumption of methyl mercury from dietary sources can adversely affect the brain and nervous system of a developing fetus. Impacts on memory, attention, language and other skills have been found in children exposed to moderate levels in the womb.[12]

HAIR SAMPLING

Hair sampling is one effective method of monitoring mercury in one's body. However, hair provides only a snapshot of mercury consumption and contamination in the recent past. As one's hair grows out, it carries some of the mercury in the bloodstream acting like an indicator strip of ongoing blood levels. Blood analysis is a more direct method to determine mercury levels in the body, though hair analysis - when conducted to strict protocols - is widely accepted for large-scale studies and as a valuable indicator of exposure over time. However, hair mercury levels cannot be used to determine if a person has chronic mercury poisoning. Further testing and medical analysis is needed for such assessment.

Hair sampling was chosen for this project because of the ease and relatively low cost of sampling many people, and to be as consistent as possible with the analytical methods used by the Center for Disease Control in the NHANES study detailed above.

BREAST-FEEDING

Although methyl mercury can pass from mother to child when breast-feeding, Greenpeace believes that the benefits of breast-feeding outweigh the risks of general population exposure to mercury. If you have reason to believe that you have been exposed to unusually high levels of mercury, please consult a doctor. Recent studies have shown that mercury contamination in umbilical cord blood is even higher than the

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[8] International Energy Annual, Key World Energy Statistics, 2004
[9] United Nations Environment Programme. Global Mercury Assessment (December 2002).
[10] http://www.cfsan.fda.gov/~frf/seamehg2.html
[11] http://www.dep.state.fl.us/secretary/news/2003/nov/pdf/mercury_report.pdf
[12] http://www.epa.gov/mercury/health.htm

mother's general blood system suggesting higher risk to unborn children than may previously have been estimated.[13]

FISH CONSUMPTION

Fish is a food source that supplies the body with Omega-3 fatty acids, which have been shown to reduce risks of cardiovascular disease and other heart problems. There are other sources of these fatty acids such as dark green vegetables like broccoli, spinach, lettuce and kale, and walnuts, flax seed, beans (mung, navy, pinto and kidney), peas, citrus, melons and cherries. The EPA and FDA issued a joint fish advisory for small children, pregnant women, women who may become pregnant and nursing mothers.[14] A number of scientists have expressed concern about this advisory.[15] The EPA and FDA considered multiple advisory scenarios and opted to recommend fish consumption advice that may allow up to 5.9% of women of childbearing age, pregnant and nursing women, and small children to have mercury levels over the reference limit.[16] Greenpeace makes the following fish consumption recommendations based on fish tissue analyses done by the FDA, and advisories from the EPA and analysis from the Natural Resources Defense Council, and the Mercury Policy Project.

1. **Do not eat** grouper, marlin, orange roughy, shark, swordfish, king mackerel, or tilefish because they contain high levels of mercury.

2. **Avoid** (eat less than three 6 oz. servings a month) bluefish, croaker, halibut, lobster (American/Maine), rockfish, sea bass, sea trout (weakfish), canned albacore tuna, and tuna steaks.

3. **Eat sparingly** (less than six 6 oz. servings a month) carp, cod, dungeness crab, blue crab, snow crab, mahi mahi, monkfish, freshwater perch, skate, snapper, and chunk light canned tuna.

4. **Eat in moderation** farmed abalone, anchovies, butterfish, calamari (squid), catfish, farmed caviar, clams, king crab, crawfish/crayfish, flounder, haddock, hake, herring, lobster (spiny/rock), Atlantic mackerel, farmed mussels, oysters, ocean perch, pollock, wild salmon, sardines, scallops, shad, shrimp, sole, farmed sturgeon, tilapia, trout, and whitefish.

5. **Check local advisories** about the safety of fish caught by family and friends in your local lakes, rivers and coastal areas. If no advice is available, eat up to six ounces (one average meal) per week of fish you catch from local waters, but do not consume any other fish during that week.

6. Fishing and farming practices of selected species have raised environmental concerns. Refer to the Ocean Friendly Seafood Guide to learn more at www.blueocean.org

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[13] Stern AH, Smith AE. 2003. An assessment of the cord blood/maternal blood methylmercury ratio: implications for risk assessment. Environmental Health Perspectives 111:1465–1470
Mahaffey, K. U.S. EPA. Methylmercury: Epidemiology Update, a presentation to the Fish Forum. San Diego 2004. http://www.epa.gov/waterscience/fish/forum/2004/presentations/monday/mahaffey.pdf
[14] http://www.epa.gov/waterscience/fishadvice/advice.html
[15] http://www.mercurypolicy.org/new/fdaletter022404.html
[16] "How We Got There: The Process FDA and EPA Used in Developing the Advisory" presented by EPA scientist Denise Keehner, PhD, at the Mercury: Medical and Public Health Issues Conference in Tampa, FL April 2004