NHANES 1999-2000 Second Public Data Release

Laboratory 22- Hair Mercury

Description

The objective of the NHANES Hair Mercury component is to document total mercury levels in human hair for a representative sample of U.S. children and women of reproductive age. Previous research has established that the mercury concentration in human scalp hair largely represents dietary methyl mercury exposure, methyl mercury being a known human neurotoxin. Summary data for 1999, the first year of this survey sample, was previously published in a CDC Morbidity & Mortality Weekly Report (MMWR 1999).

Eligible Sample

Males and females aged 1-5 years and females aged 16-49 years.

Exclusion Criteria

- Participants who lacked hair due to their hairstyle, *alopecia totalis*, or chemotherapy treatment
- Participants with religious or cultural beliefs against cutting hair
- Participants wearing wigs (unless the participant removed the wig)

Examination Protocol

The purpose of the hair sample collection is to obtain a suitable biological sample that can be used for the determination of total mercury levels in human hair. Prior to hair collection, subjects were asked whether their hair had been given a permanent, treated with hair dye or hair relaxer within the last month. Responses for this question were recorded in the variable HRQ010.

Hair samples were collected by a trained MEC Health Technologist in a dedicated room, with standardized protocols to avoid contamination. The samples collected represent approximately 100 strands of the 3 cm segment of hair closest to the occipital region (back portion) of the scalp. Actual lab analysis of hair mercury utilized the 1 cm segment closest to the scalp. The collection procedure was designed to provide 100 mg of hair for analysis (or at least a minimum 50 mg). This hair sample is used to characterize recent dietary exposure to methyl mercury over a relatively uniform time interval (approximately 2.5 months). Hair specimens were collected processed, packaged, and stored under appropriate ambient temperature conditions to avoid contamination. They were then grouped and then shipped to the laboratory for chemical analysis. Detailed specimen collection and processing instructions are discussed in the NHANES Specimen Collection Procedure Manual.

Staff
MEC Health Technologists collected the hair specimens.

Data Collection and Forms
Detailed specimen collection and processing instructions are discussed in the NHANES Specimen Collection Procedure Manual. The manual specifies the procedure to be used for preparation of the participant, specimen collection, labeling, processing, and preservation, and conditions for specimen transport that are appropriate for the method.

Laboratory Analytic Methodology
Total hair mercury was analyzed according to the method described in Pellizzari et al. (1999). This method involves the extraction of the analyte from hair samples using 30/70 sulfuric/nitric acid, and subsequent analysis by cold vapor atomic fluorescence spectrometry. The analyte is identified by the presence of fluorescence signal from a mercury-specific detector. Hair mercury (HRXHG) was typically analyzed in batches of 20 to 40 samples, and quantification of the analyte was carried out using batch specific standard calibration curves. Quality control (QC) procedures included performance testing of a known human hair reference standard, QC standard checks initially and following every 10^{th} sample, and replicate sampling (duplicate sample and duplicate extract repeats). Percent recovery of the mercury analyte was monitored by analyzing hair samples spiked with a known mercury reference standard prior to the extraction process.

Analytic Notes
Sample Detection Limits

Sample detection limit reported in this study is the Method Quantification Limit (MQL), the lowest value that could be reliably quantified, given instrument precision for a specific batch. The MQL is defined as 10 times the standard deviation of the reagent blanks in a specific batch run (EPA 1999). Overall, by this definition, some 12% of the total samples analyzed were below study detection limits.

Hair mercury detection limits varied by batch in this survey, a result of the laboratory's batch-specific standardization methodology. This data release follows the convention of Pellizzari et al. (1999). Whenever the values for HRXHG are below a batch detection limit, a fill value equal to the batch-specific MQL divided by the square root of two is entered. Analysts may wish to choose to use another convention or statistical model. Samples below the batch detection limit are identified by the variable HRDHGLC=1.

References
Blood and Hair Mercury Levels in Young Children and Women of Childbearing Age-United States, 1999. MMWR 2001 March 2;50(8):140-143.

Environmental Protection Agency, EPA. Appendix B to Part 136- Definition and Procedure for the Determination of the Method Detection Limit- Revision 1.11. 40 CFR 136, pp. 303-6, 1999.

Pellizzari ED, Fernando R, Cramer GM, Meaburn GM, Bangerter K. Analysis Of Mercury In Hair Of EPA Region V Population. Journal of Exposure Analysis & Environmental Epidemiology. 1999 Sep-Oct;9(5):393-401.