NHANES 2001–2002 Data Release

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Documentation for Laboratory Results

Laboratory 26PP – Urinary Priority Pesticides (Non-Persistent Pesticide Metabolites), and Urinary Organophosphate Pesticides

(1) Documentation File Date – July 2007

(2) Documentation File Name – Laboratory 26PP – Urinary Priority Pesticides (Non-Persistent Pesticide Metabolites), and Urinary Organophosphate Pesticides

(3) Survey Years Included in this File Release – 2001–2002

(4) Component Description

Priority Pesticides (Non-Persistent Pesticide Metabolites) and Urinary Organophosphate Pesticides

Pesticide residues and their metabolites in human tissues and fluids can be indicative of pesticide exposure and the total body burden of these pesticides. Little information is available concerning residential or household exposures to pesticides among the general population. Sufficient data do exist, however, from surveys or other focused research efforts to suggest that household exposure to certain common pesticides can be extensive and might be of significant public health concern. Pesticides of particular concern are: chlorpyrifos, 2,4-D, diazinon, permethrin, ortho-phenyl phenol, methyl parathion, and organophosphate pesticides.

(5) Sample Description

Eligible Sample

Subsample of participants aged 6 years and older.

(6) Description of the Laboratory Methodology

Priority Pesticides

Priority pesticides (non-persistent pesticide metabolites) were measured using two mass spectrometric methods.

Hydrolysis, extraction, derivatization, chromatography, mass spectrometry

This method measures human metabolites of the pesticides chlorpyrifos, chlorpyrifosmethyl, naphthalene, and carbaryl in urine. The procedure involves enzymatic hydrolysis of urine, extraction, derivatization, and column cleanup, followed by analysis of the concentrate using capillary gas chromatography combined with tandem mass spectrometry (GC-MS/MS). This procedure uses isotope dilution with ^{13}C-labeled internal standards for all analytes. During analysis, the analytes dissociate into charged fragments (ions) that are specific to each analyte. Two ions from each analyte and two ions from each ^{13}C-labeled internal standard are monitored and the abundances of each ion are measured. The ratios of these ions are used as criterion for evaluating the data. By evaluating these analytes in urine, a measurement of the body burden of each pesticide is obtained. For example, the amount of

1-naphthol observed in a person's urine indicates exposure to naphthalene, a common household pesticide used in moth repellents.

Organic Liquid Extraction, Liquid Chromatography, Tandem Mass Spectrometry
This method is used for determining concentrations of select pesticide metabolites in the human population. Urine samples are prepared by extracting with an organic solvent and concentration of the solute. The concentrate is analyzed using liquid chromatography combined with tandem mass spectrometric (LC/MS/MS) determination.

The metabolites (MS parent compound) are: atrazine mercapturate (ATZ), malathion dicarboxylic acid (MDA), 2-isopropyl-4-methyl-6-hydroxypyrimidine (IMPY), 3-phenoxybenzoic acid (3PBA), and 2,4-dichlorophenoxyacetic acid (2,4-D).

Urinary Organophosphate Pesticides
Urinary organophosphate pesticides uses azeotropic codistillation of urine, derivitization, gas chromatography-tandem mass spectrometric method (GC-MS/MS). This method can be used to quantify the six dialkylphosphate human metabolites of organophosphate pesticides in urine. The procedure involves an azeotropic distillation of urine, derivatization using chloroiodopropane, and analysis of the chloropropyl phosphate esters using GC-MS/MS. This procedure uses isotope dilution with deuterium or ^{13}C-labeled internal standards for all analytes. During analysis, the protonated analytes dissociate into charged fragments (ions) that are specific to each analyte. Two ions from each analyte and two ions from each labeled internal standard are monitored, and the abundances of each ion are measured. The ratios of these ions are used as criteria for evaluating the data. By evaluating these analytes in urine, a combined measurement of the body burden of common organophosphate pesticides (cumulative exposure) is obtained.

(7) Laboratory Quality Control and Monitoring

Urine specimens are processed, stored, and shipped to the Division of Environmental Health Laboratory Sciences, National Center for Environmental Health, Centers for Disease Control and Prevention for testing.

(8) Data Processing and Editing

Detailed specimen collection and processing instructions are discussed in the NHANES Laboratory/Medical Technologists Procedures Manual (LPM). Vials are stored under appropriate frozen (–20°C) conditions until they are shipped to the National Center for Environmental Health for testing.

(9) Data Access

All data are publicly available.

(10) Analytic Notes for Data Users

Analytic Notes

Measures of priority pesticides (non-persistent pesticide metabolites), and urinary organophosphate pesticides are assessed in a one-half subsample of participants ages 6-11 years and a one-third subsample of participants aged 12 years and older.

Use the special weights included in this data file when analyzing data. Read the "Special Sample Weights for this Dataset" instructions provided below before beginning analysis.

Detection Limits
For the six nonspecific organophosphate metabolites, URXOP1-URXOP6, the detection limit was constant. In cases, where the result was below the limit of detection, the value for that variable is the detection limit divided by the square root of two.

In most cases, the detection limit was variable for the other pesticide metabolites in the data set. Two variables are provided for each of these analytes. The variable named URD_LC indicates whether the result was below the limit of detection. There are two values: "0" and "1"; "1" indicates that the result was below the limit of detection. The other variable named URX_ provides the analytic result for that analyte. In cases, where the result was below the limit of detection, the value for that variable is the detection limit divided by the square root of two.

The analysis of NHANES 2001–2002 laboratory data must be conducted with the key survey design and basic demographic variables. The NHANES 2001–2002 Household Questionnaire Data Files contain demographic data, health indicators, and other related information collected during household interviews. The Household Questionnaire and other data files may be linked to the laboratory data file using the unique survey participant identifier SEQN.

(11) Special Sample Weights for this Dataset

Special sample weights are required to analyze these data properly.
Measures of this urinary multi-analyte profile are assessed in participants aged 6 years and over on a randomly selected subsample. Specific sample weights for this subsample are included in this data file and should be used when analyzing these data.

The dataset includes 2-year and 4-year subsample weights. The 4-year weights should be used if these 2001–2002 data are combined with 1999–2000 data. The 1999–2000 data files have been updated to include the subsample 4-year weights. The recommended procedure for variance estimation requires use of stratum and PSU variables (SDMVSTRA and SDMVPSU, respectively), which are included in the demographic data file for each data release. For further information, see the NHANES Analytic Guidelines.

(12) References

N/A