National Health and Nutrition Examination Survey 2003-2004

Documentation, Codebook, and Frequencies

Laboratory Component:
Environmental Phenols

Survey Years:
2003 to 2004

SAS Export File:
L24EPH_C.XPT

First Release: June 2007
Last Revised: N/A

NHANES 2003–2004 Data Documentation

Laboratory Assessment: Lab 24 Environmental Phenols (bisphenol A (BPA) and alkylphenols (APs))

Years of Coverage: 2003–2004 **First Published:** June 2007 **Last Revised:** N/A

Component Description

Biomonitoring of environmental phenols is used to determine their prevalence in humans and the relevance of human exposure in public health. The routes of human exposure to these phenolic compounds are industrial pollution, pesticide use, food consumption, or use of personal care products. Specifically, bisphenol A (BPA) is used in the manufacture of polycarbonate plastics and epoxy resins, which are used in baby bottles, as protective coatings on food containers, and as composites and sealants in dentistry[1, 2, 3]

Alkylphenols (APs), such as 4-tert-octylphenol, are used in the manufacture of nonionic surfactants used in detergents.4, 5, Chlorophenols have been used in the wood preservation industry, as intermediates in the production of pesticides, and as disinfectants or fungicides for industrial and indoor home use. The manufacture of other chlorinated aromatic compounds can produce chlorophenols as byproducts. Phenols are also used as sunscreen agents for skin protection, and as UV filters in cosmetic products and plastics to improve stability (e.g., benzophenone-3 [BP-3]), or used as bactericides (e.g., triclosan) in soap and other personal care products.

Eligible Sample

Participants aged 6 years and older who met the subsample requirements.

Description of Laboratory Methodology

Bisphenol A (BPA) and Alkylphenols (APs) have been previously measured in biological matrixes by using gas chromatography (GC) or high performance liquid chromatography (HPLC) coupled with different detection techniques. To achieve enhanced sensitivity and selectivity, the phenols have been derivatized to alkyl or acyl derivatives before GC-mass spectrometry (GC/MS) analysis.6-14 We have developed a sensitive method for measuring BPA, 4-tert-octylphenol (tOP), benzophenone-3 (BP-3), and one chlorophenols triclosan. The method uses solid phase extraction (SPE) coupled on-line to HPLC and tandem

mass spectrometry (MS/MS). With the use of isotopically labeled internal standards, the detection limits in 100 µL of urine are 0.1-2 nanograms per milliliter (ng/mL), sufficient for measuring urinary levels of phenols in non-occupationally exposed subjects.

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 analysis.

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 National Center for Environmental Health for testing.

Mobile Examination Centers (MECs)

Laboratory team performance is monitored using several techniques. NCHS and contract consultants use a structured quality assurance evaluation during unscheduled visits to evaluate both the quality of the laboratory work and the quality-control procedures. Each laboratory staff person is observed for equipment operation, specimen collection and preparation; testing procedures and constructive feedback are given to each staff. Formal retraining sessions are conducted annually to ensure that required skill levels were maintained.

The NHANES QA/QC protocols meet the 1988 Clinical Laboratory Improvement Act mandates. Detailed QA/QC instructions are discussed in the NHANES LPM.

Analytical Laboratories

NHANES uses several methods to monitor the quality of the analyses performed by the contract laboratories. In the MEC, these methods include performing blind split samples collected on “dry run” sessions. In addition, contract laboratories randomly perform repeat testing on 2.0% of all specimens.

NCHS developed and distributed a quality control protocol for all the contract laboratories which outlined the Westgard rules used when running NHANES specimens. Progress reports containing any problems encountered during shipping or receipt of specimens, summary statistics

for each control pool, QC graphs, instrument calibration, reagents, and any special considerations are submitted to NCHS and Westat quarterly. The reports are reviewed for trends or shifts in the data. The laboratories are required to explain any identified areas of concern.

All QC procedures recommended by the manufacturers were followed. Reported results for all assays meet the the Division of Environmental Health Laboratory Sciences's quality control and quality assurance performance criteria for accuracy and precision (similar to specifications outlined by Westgard (1981).

Analytic Notes

Subsample weights

Measures of urinary environmentals were measured in a one third subsample of persons 6 years and over. Special sample weights are required to analyze these data properly. Specific sample weights for this subsample are included in this data file and should be used when analyzing these data.

Variance estimation

The analysis of NHANES 2003-2004 laboratory data must be conducted with the key survey design and basic demographic variables. The NHANES 2003-2004 Demographic Data File contains demographic and sample design variables. The recommended procedure for variance estimation requires use of stratum and PSU variables (SDMVSTRA and SDMVPSU, respectively) in the demographic data file.

Links to NHANES Data Files

This laboratory data file can be linked to the other NHANES 2003-2004 data files using the unique survey participant identifier SEQN.

Detection Limits

The detection limits were constant for all of the analytes 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"". "0" means that the result was at or above the limit of detection. "1" indicates that the result was below the limit of detection.

The other variable named URX___ provides the analytic result for that analyte.

The lower limit of detection for the environmental phenols (bisphenol A (BPA) and alkylphenols (APs)) is

Analyte	Item ID	LLOD
Urinary Bisphenol A	URXBPH	0.36
Urinary 4-tert-octyl phenol	URX4TO	0.17
Urinary 2,4,4'-Trichloro-2'-hydroxyphenyl ether (Triclosan)	URXTRS	2.27
Urinary 2-Hydroxy-4-metoxybenzophenone (Benzophenone-3)	URXBP3	0.34

Please refer to the Analytic Guidelines for further details on the use of sample weights and other analytic issues.

References

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Locator Fields

Title: Lab 24 Environmental Phenols (bisphenol A (BPA) and alkylphenols (APs))

Contact Number: 1-866-441-NCHS

Years of Content: 2003–2004

First Published: June 2007

Revised: N/A

Access Constraints: None

Use Constraints: None

Geographic Coverage: National

Subject: Environmental Phenols (bisphenol A (BPA) and alkylphenols (APs))

Record Source: NHANES 2003–2004

Survey Methodology: NHANES 2003–2004 is a stratified multistage probability sample of the civilian non-institutionalized population of the U.S.

Medium: NHANES Web site; SAS transport files

National Health and Nutrition Examination Survey
Codebook for Data Production (2003-2004)

Environmental Phenols (L24EPH_C)
Person Level Data

First Published: June 2007
Last Revised: N/A

SEQN	Target
	B(6 Yrs. to 150 Yrs.)
Hard Edits	**SAS Label**
	Respondent sequence number
English Text: Respondent sequence number.	
English Instructions:	

WTSC2YR	Target
	B(6 Yrs. to 150 Yrs.)
Hard Edits	**SAS Label**
	Two-year MEC weights of subsample C
English Text: Two-year MEC weights of subsample C	
English Instructions:	

Code or Value	Description	Count	Cumulative	Skip to Item
0 to 456851.11941	Range of Values	2612	2612	
.	Missing	0	2612	

URXUCR	Target
	B(6 Yrs. to 150 Yrs.)
Hard Edits	**SAS Label**
	Creatinine, urine (mg/dL)
English Text: Urinary creatinine	
English Instructions:	

Code or Value	Description	Count	Cumulative	Skip to Item
7 to 648	Range of Values	2530	2530	
.	Missing	82	2612	

URXBPH	Target
	B(6 Yrs. to 150 Yrs.)
Hard Edits	**SAS Label**
	Urinary Bisphenol A (ng/mL)
English Text: Urinary Bisphenol A	
English Instructions:	

Code or Value	Description	Count	Cumulative	Skip to Item
0.3 to 149	Range of Values	2517	2517	
.	Missing	95	2612	

URDBPHLC	Target
	B(6 Yrs. to 150 Yrs.)
Hard Edits	**SAS Label**
	Urinary Bisphenol A comment
English Text: Urinary Bisphenol A comment code	
English Instructions:	

Code or Value	Description	Count	Cumulative	Skip to Item
0	At or above the detection limit	2353	2353	
1	Below lower detection limit	164	2517	
.	Missing	95	2612	

URXBP3	Target
	B(6 Yrs. to 150 Yrs.)
Hard Edits	**SAS Label**
	Urinary Benzophenone-3 (ng/mL)
English Text: Urinary 2-Hydroxy-4-metoxybenzophenone (Benzophenone-3)	
English Instructions:	

Code or Value	Description	Count	Cumulative	Skip to Item
0.2 to 21700	Range of Values	2517	2517	
.	Missing	95	2612	

URDBP3LC	Target
	B(6 Yrs. to 150 Yrs.)
Hard Edits	**SAS Label**
	Urinary Benzophenone-3 comment
English Text: Urinary 2-Hydroxy-4-metoxybenzophenone (Benzophenone-3) comment code	
English Instructions:	

Code or Value	Description	Count	Cumulative	Skip to Item
0	At or above the detection limit	2444	2444	
1	Below lower detection limit	73	2517	
.	Missing	95	2612	

URX4TO	Target
	B(6 Yrs. to 150 Yrs.)
Hard Edits	**SAS Label**
	Urinary 4-tert-octyl phenol (ng/mL)
English Text: Urinary 4-tert-Octyl phenol	
English Instructions:	

Code or Value	Description	Count	Cumulative	Skip to Item
0.1 to 20.6	Range of Values	2517	2517	
.	Missing	95	2612	

URD4TOLC	Target
	B(6 Yrs. to 150 Yrs.)
Hard Edits	**SAS Label**
	Urinary 4-tert-octyl phenol comment
English Text: Urinary 4-tert-octyl phenol comment code	
English Instructions:	

Code or Value	Description	Count	Cumulative	Skip to Item
0	At or above the detection limit	1384	1384	
1	Below lower detection limit	1133	2517	
.	Missing	95	2612	

URDTRS	Target
	B(6 Yrs. to 150 Yrs.)
Hard Edits	**SAS Label**
	Urinary Triclosan (ng/mL)
English Text: Urinary 2,4,4'-Trichloro-2'-hydroxyphenyl ether (Triclosan)	
English Instructions:	

Code or Value	Description	Count	Cumulative	Skip to Item
1.6 to 3790	Range of Values	2517	2517	
.	Missing	95	2612	

URDTRSLC	Target
	B(6 Yrs. to 150 Yrs.)
Hard Edits	**SAS Label**
	Urinary Triclosan comment
English Text: Urinary 2,4,4'-Trichloro-2'-hydroxyphenyl ether (Triclosan) comment code	
English Instructions:	

Code or Value	Description	Count	Cumulative	Skip to Item
0	At or above the detection limit	1864	1864	
1	Below lower detection limit	653	2517	
.	Missing	95	2612	