

## Concentrations of Urinary Mono-Hydroxy PAHs in General U.S. Population: Results from the NHANES 2001-2001 Survey

Zheng Li<sup>1</sup>, Lovisa Romanoff<sup>2</sup>, Kisha Young, Nelson Blakely III<sup>2</sup>, Raymond Wei, Samuel P Caudill<sup>2</sup>, Larry L Needham<sup>2</sup>, Donald G Patterson<sup>2</sup>, Courtney D Sandau<sup>3</sup>

<sup>1</sup>Centers For Disease Control

<sup>2</sup>Centers for Disease Control and Prevention

<sup>3</sup>Jacques Whitford Limited

Urinary mono-hydroxy polycyclic aromatic hydrocarbons (OH-PAH), a class of PAH metabolites, have been used extensively as biomarkers for environmental PAH exposure. Hence, the measurement of these PAH metabolites are included in the National Health and Nutrition Examination Survey (NHANES) conducted by the Centers for Disease Control and Prevention (CDC) to establish reference range concentrations for environmental chemicals in the general U.S. population using human biomonitoring. We have developed a sensitive and robust method to measure 23 OH-PAHs in urine representing 8 parent PAHs, using automated solid phase extraction and isotope dilution gas chromatography/high resolution mass spectrometry (GC/HRMS). This method was used to measure the 23 PAH metabolites in urine specimens from over 2900 participants in NHANES for the years 2001 and 2002. Percentages of samples with detectable levels ranged from nearly 100% for metabolites of naphthalene, fluorene, phenanthrene and pyrene to less than 5% for metabolites from larger parent compounds such as chrysene, benzo[c]phenanthrene, and benz[a]anthracene. A reference range for 3-hydroxybenzo[a]pyrene (3-BAP) was established for the first time, and the 75th and 95th percentiles for the urinary concentration of 3-BAP were 33.0 ng/L urine (32.3 ng/g creatinine) and 179 ng/L urine (184 ng/g creatinine), respectively.

This is the second NHANES study that included OH-PAH measurement, following NHANES 1999-2000 in which 14 OH-PAHs of 7 parent compounds were measured. A statistical comparison of reported levels in these two NHANES studies was performed on the analytes that were detected in more than 50% of the samples in both surveys. Six compounds met this criterion, i.e., 2- and 3-hydroxyfluorene (2-FLUO, 3-FLUO), 1-, 2-, and 3-hydroxyphenanthrene (1-PHEN, 2-PHEN, 3-PHEN), and 1-hydroxypyrene (1-PYR). Both 2-PHEN and 1-PYR were found at lower levels in 2001-2002 as compared to 1999-2000. This trend was also true for the other four compounds, although the differences were not statistically significant. It is too early to draw any firm conclusions from these findings. PAH metabolites will be included in future NHANES surveys to determine the extent of exposure of the U.S. general population to PAHs over time.