

# Report to Scientific Guidance Panel



**Jianwen She, Ph.D.**

**California Department of Public Health  
Environmental Health Laboratory**

Sacramento, CA  
November 6, 2014

# Overview

- Staff Changes
- Methods Updates
- Projects: Ongoing and Pending
- Future Work

# Staff Changes

## **CDC Grant positions**

- EHL analysts: reduced from 5 to 2
- Core lab staff: reduced from 3 to 0

## **State positions: Two vacancies**

- Replacing Dr. Simon Ip
- Limited-term (2-yr) position

## **Challenges in managing core tasks**

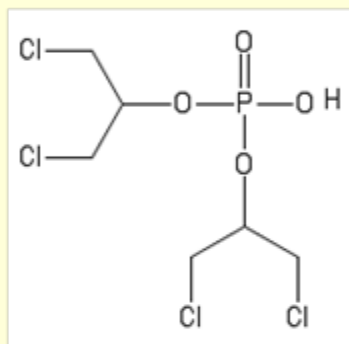
- Sample management
- LIMS
- QA/QC

# Methods Updates

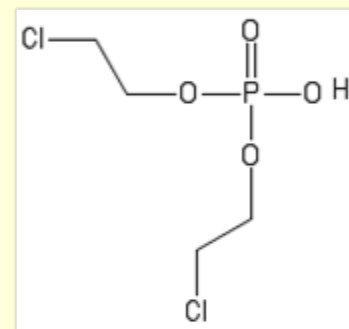
- **Organophosphate (OP) Flame Retardants**  
MS/MS detection method developed; HPLC separation method in progress
- **Bisphenol A Analogs**  
Method developed and under validation
- **“Unknown” Screening**  
Toxic Chemical Finder (TCF) database developed; application is being testing against known compounds

# OP Flame Retardants Method

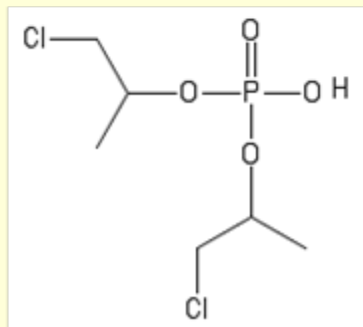
**Bis(1,3-dichloro-2-propyl) phosphate (BDCPP)**



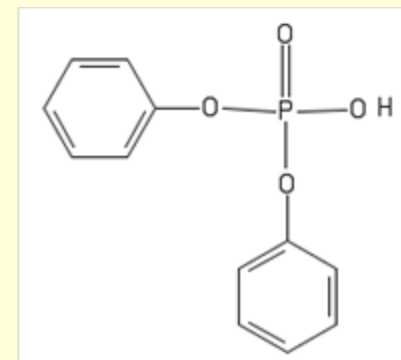
**Bis(2-chloroethyl) phosphate (BCEP)**



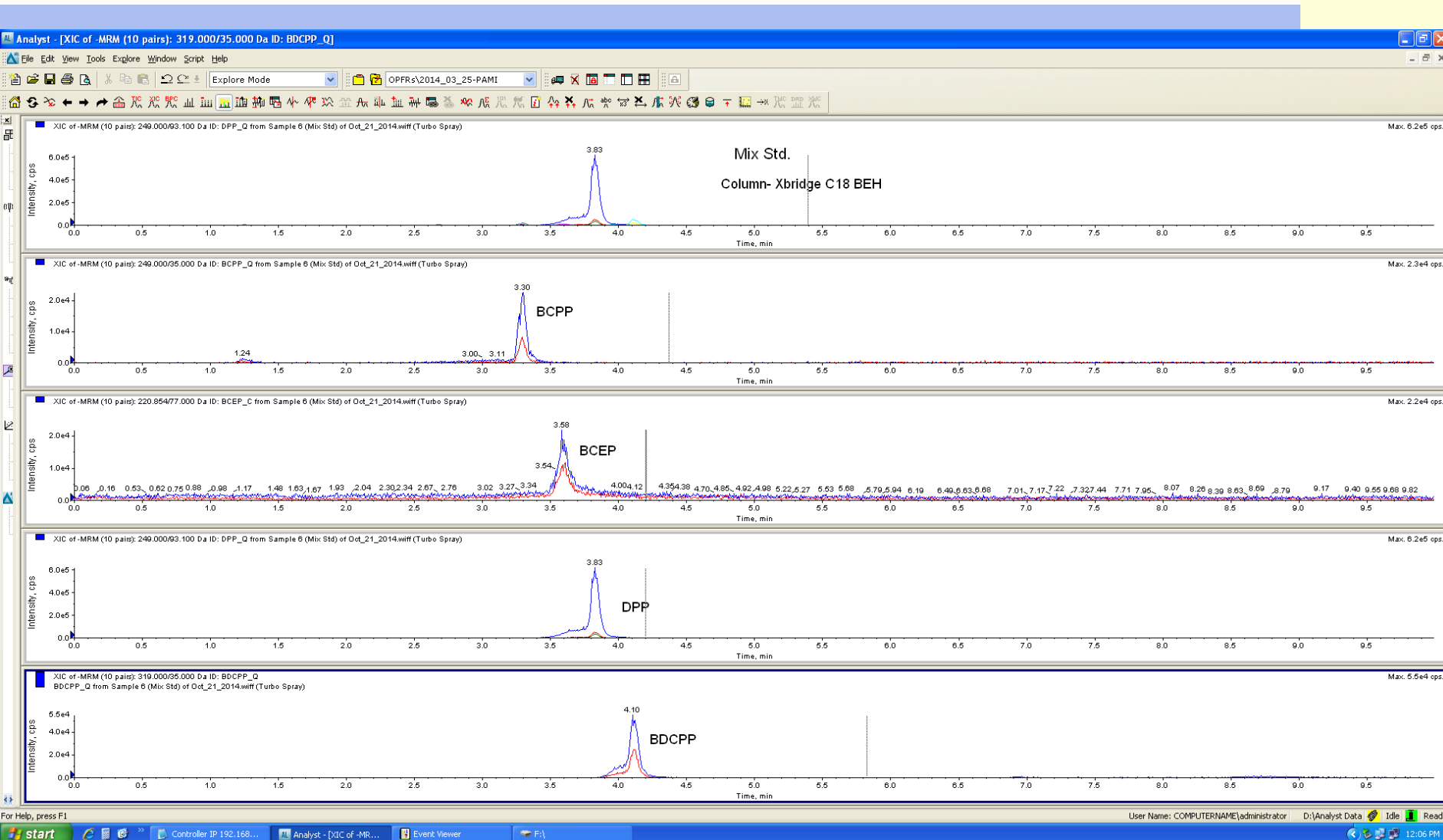
**Bis(2-chloroisopropyl) phosphate (BCPP)**



**Diphenyl phosphate (DPP)**

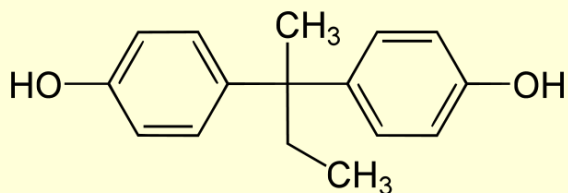


# OP Flame Retardants Method (2)

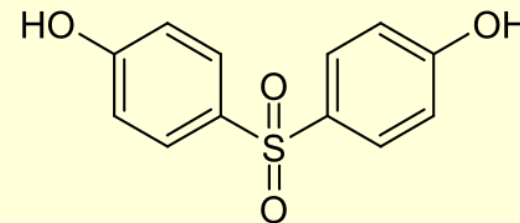


# BPA Analogs\*

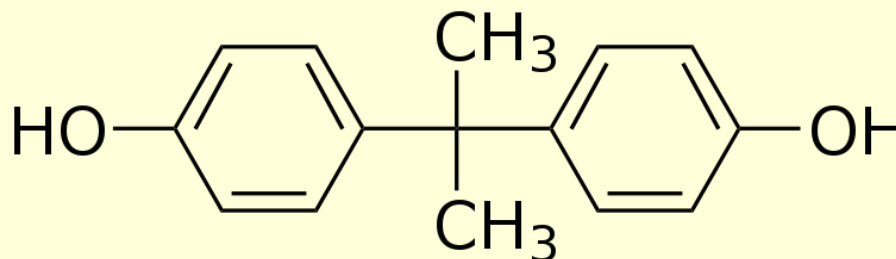
**BPB**



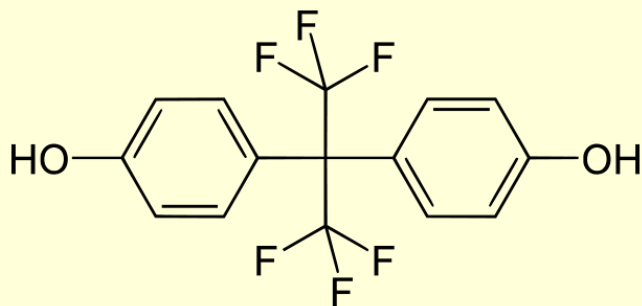
**BPS**



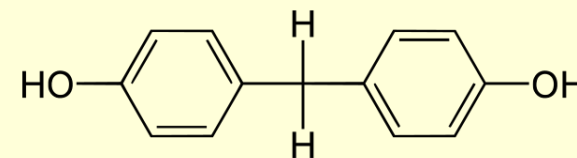
**BPA**



**BPAF**



**BPF**



\*p,p'-Bisphenols

# Method Validation

		<u>QC-Low-level</u> 0.5 ppb (n=9)		<u>QC-High-level</u> 5 ppb (n=9)	
	<u>Linear range</u> (ppb)	<u>Precision</u> (RSD)	<u>Accuracy</u> (Recovery)	<u>Precision</u> (RSD)	<u>Accuracy</u> (Recovery)
<b>BPS</b>	0.1-50 (R <sup>2</sup> =0.967)	6%	86%	13%	103%
<b>BPB</b>	0.1-100 (R <sup>2</sup> =0.982)	11%	94%	13%	106%
<b>BPAF</b>	0.1-8 (R <sup>2</sup> =0.996)	12%	86%	15%	106%
<b>BPF</b>	0.1-100 (R <sup>2</sup> =0.999)	6%	108%	9%	113%

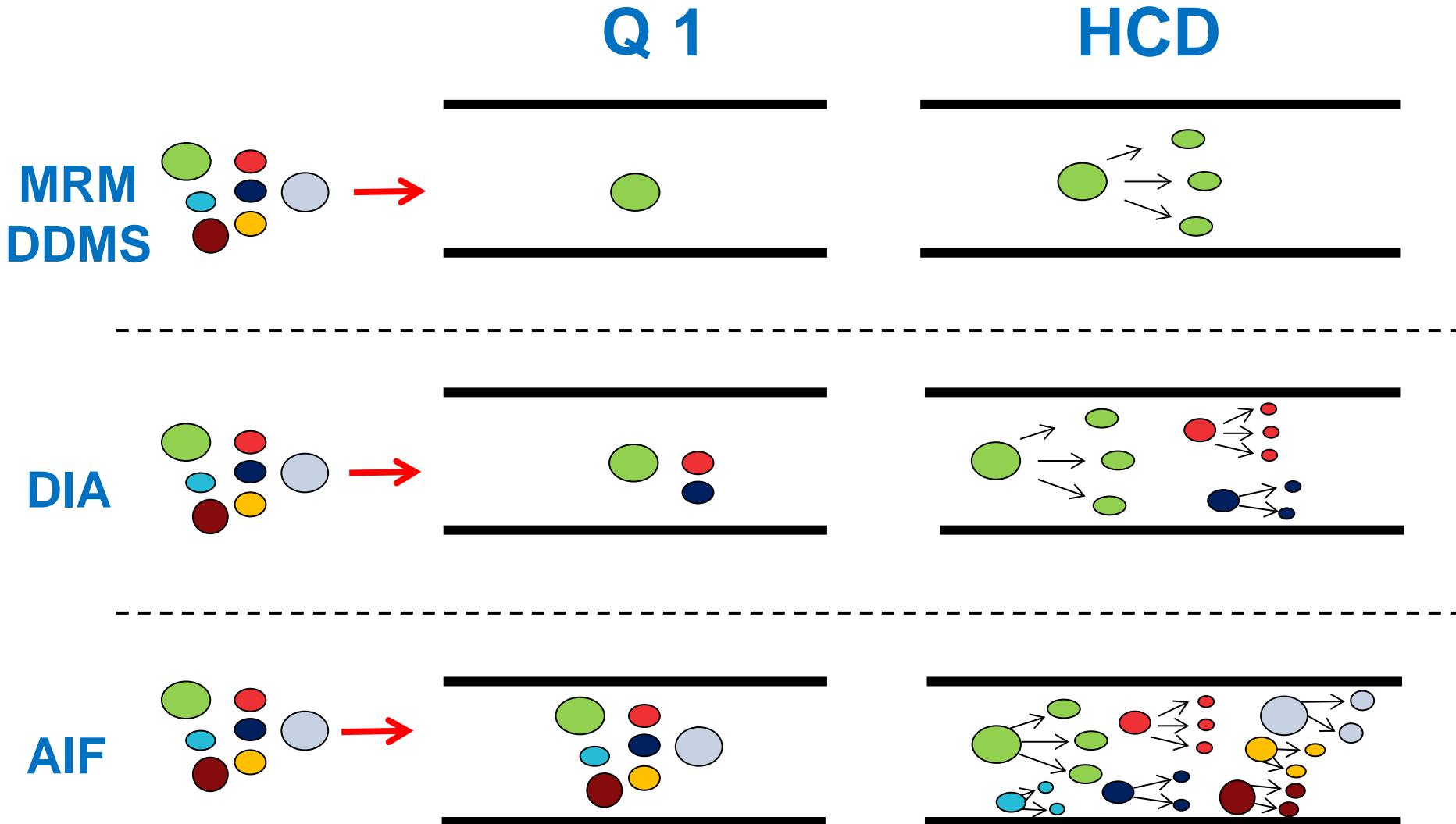


# “Unknown” Screening

Recently approved \$250K upgrade of our ***Exactive Plus*** to ***Q-Exactive Plus***

- Installation pending

# Q-Exactive plus



# Metabolomics: Detect the Unexpected !



---

**Metabolic fingerprinting**  
classifying samples

# Environmental Chemicals Screening Strategy



**Targeted  
(Known compounds)**

**Non-targeted  
(Targeted unknowns)**

**Non-targeted Unknown  
(Unknown unknowns)**

**Sample preparation, LC-HR-MS Measurement and input Spectrum**

1. Chemical structures known
2. Standards and Retention times available

1. Chemical structures known
2. Standards and RTs may be available

1. Chemical structures *may be* known
2. Standards and RTs *may be* available

**Xcalibur Qual Browser  
layout search  
and PBC library search**

**Try Xcalibur layout search  
DBC, TCF library search**

**DBC, TCF library search  
Statistical analysis  
ChemSpider search**

**Targeted  
are confirmed**

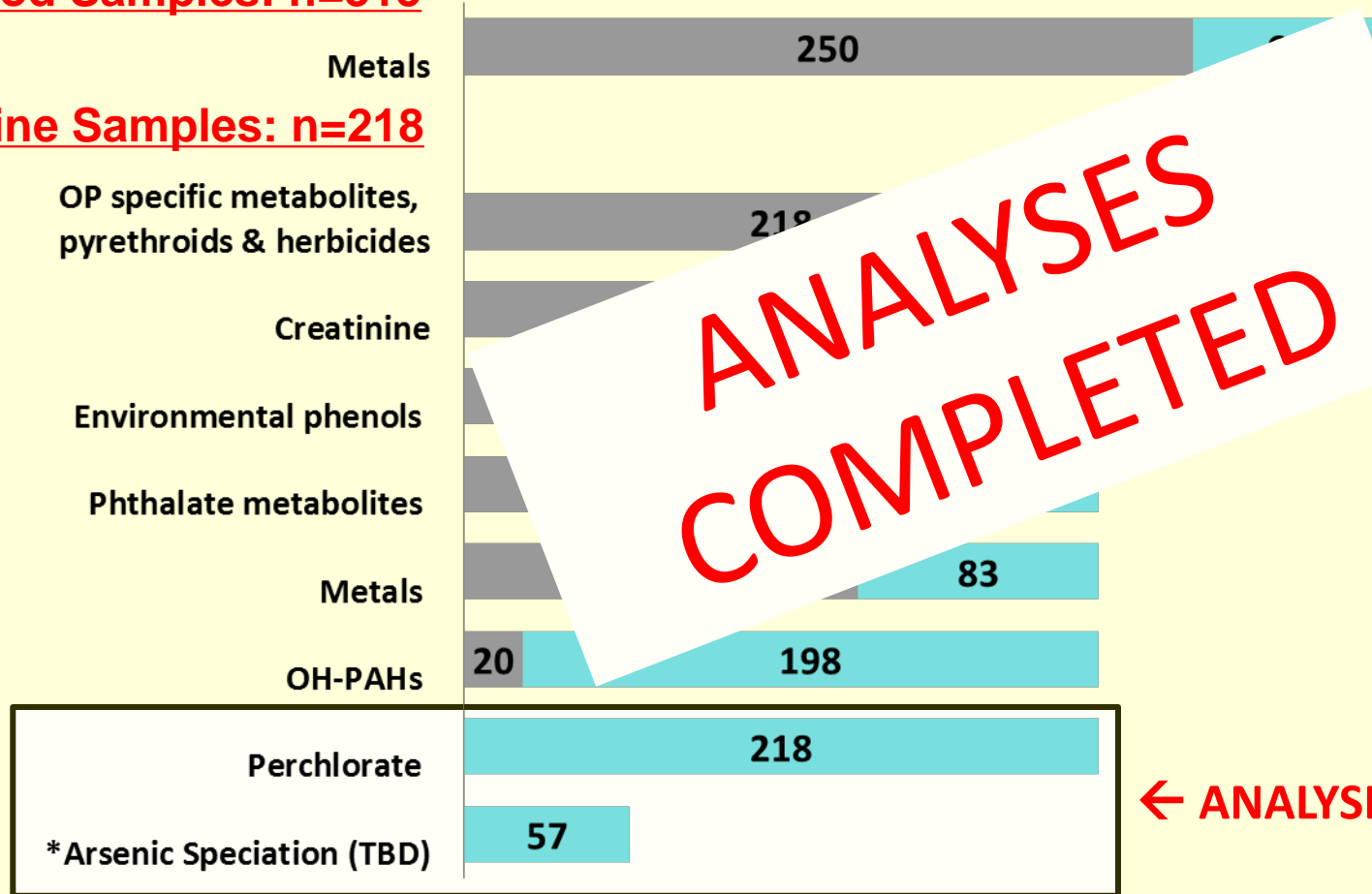
**Putative hit-list generated**

**Putative hit-list generated**

# Expanded BEST Analysis Update

**Blood Samples: n=315**

**Urine Samples: n=218**



← ANALYSES PENDING

■ Total # of samples analyzed    ■ Total # of samples awaiting analysis

\*Samples are only analyzed if total urinary arsenic levels are  $\geq 20\mu\text{g/L}$

# CDC Biomonitoring Proficiency Testing



## Phthalates

- *mono-n-butyl phthalate (mBP)*
- *mono-3-carboxypropyl phthalate (mCPP)*
- *monoethyl phthalate (mEP)*
- *mono-2-ethyl-5-carboxypentyl phthalate (mECPP)*
- *monobenzyl phthalate (mBzP)*
- *mono-2-ethylhexyl phthalate (mEHP)*
- *mono-2-ethyl-5-hydroxyhexyl phthalate (mEHHP)*
- *mono-2-ethyl-5-oxohexyl phthalate (mEOHP)*
- *mono-isobutyl phthalate (miBP)*

## Polycyclic aromatic hydrocarbons (PAHs)

- *1-hydroxynaphthalene (1-NAP)*
- *2-hydroxynaphthalene (2-NAP)*
- *2-hydroxyfluorene (2-FLU)*
- *3-hydroxyfluorene (3-FLU)*
- *9-hydroxyfluorene (9-FLU)*
- *1-hydroxyphenanthrene (1-PHE)*
- *2-hydroxyphenanthrene (2-PHE)*
- *3-hydroxyphenanthrene (3-PHE)*
- *1-hydroxypyrene (1-PYR)*

# CDC Biomonitoring Proficiency Testing (2)



## Environmental Phenols

- *Bisphenol A (BPA)*
- *2,4-dichlorophenol*
- *2,5-dichlorophenol*
- *benzophenone-3 (BP-3)*
- *Triclosan*
- *methyl-paraben*
- *ethyl-paraben*
- *propyl-paraben*
- *butyl paraben*

## Universal Pesticides

- *3,5,6-trichloro-2-pyridinol (TCPy)*
- *3-phenoxybenzoic acid (3-PBA)*
- *2-Isopropyl-4-methyl-6-hydroxypyrimidine (IMPY)*
- *Trans-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropane-1-carboxylic acid (trans-DCCA)*
- *4-fluoro-3-phenoxy-benzoic acid (4F-3-PBA)*
- *2,4-dichlorophenoxyacetic acid*
- *2,4,5-trichlorophenoxyacetic acid*

**EHL success rate for last CDC PT event = 97%**

# Recent Publications

- **Exposures to environmental phenols in California firefighters and findings of elevated urinary benzophenone-3 levels**  
(submitted to *Environ. Health Perspect.*)
- **Validation of a simple and robust method for arsenic speciation in human urine using HPLC-ICP-MS**  
(submitted to *Journal of AOAC International*)
- **Method development for the simultaneous analysis of *trans*, *trans*-muconic acid, 1, 2-dihydroxybenzene, *S*-phenylmercapturic acid and *S*-benzylmercapturic acid in human urine by liquid chromatography/tandem mass spectrometry**  
(in press, *Analytical Method*)
- ❖ Visit the [Biomonitoring CA website](#) for a list of all publications



# Future work

- Methods development and validation
- Collaboration with Kaiser Permanente Northern California (KPNC) Division of Research
- Analyses of GDSP maternal serum samples