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

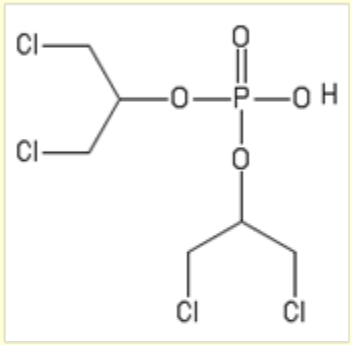
- Sample management
- LIMS
- QA/QC

Methods Updates

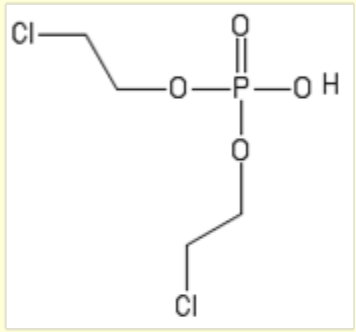
- **Organophosphate (OP) Flame Retardants**
  MS/MS detection method developed; HPLC separation method in progress
- **Bisphenol A Analogs**
  Method developed and under validation
- **“Unknown” Screening**
  Toxic Chemical Finder (TCF) database developed; application is being testing against known compounds

OP Flame Retardants Method

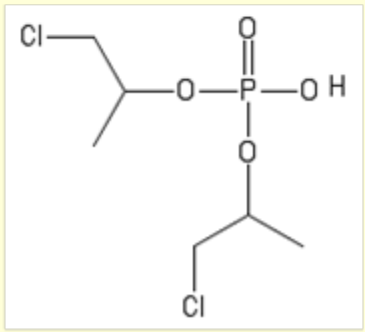
Bis(1,3-dichloro-2-propyl) phosphate (BDCPP)



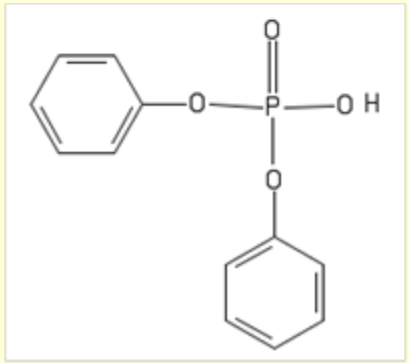
Bis(2-chloroethyl) phosphate (BCEP)



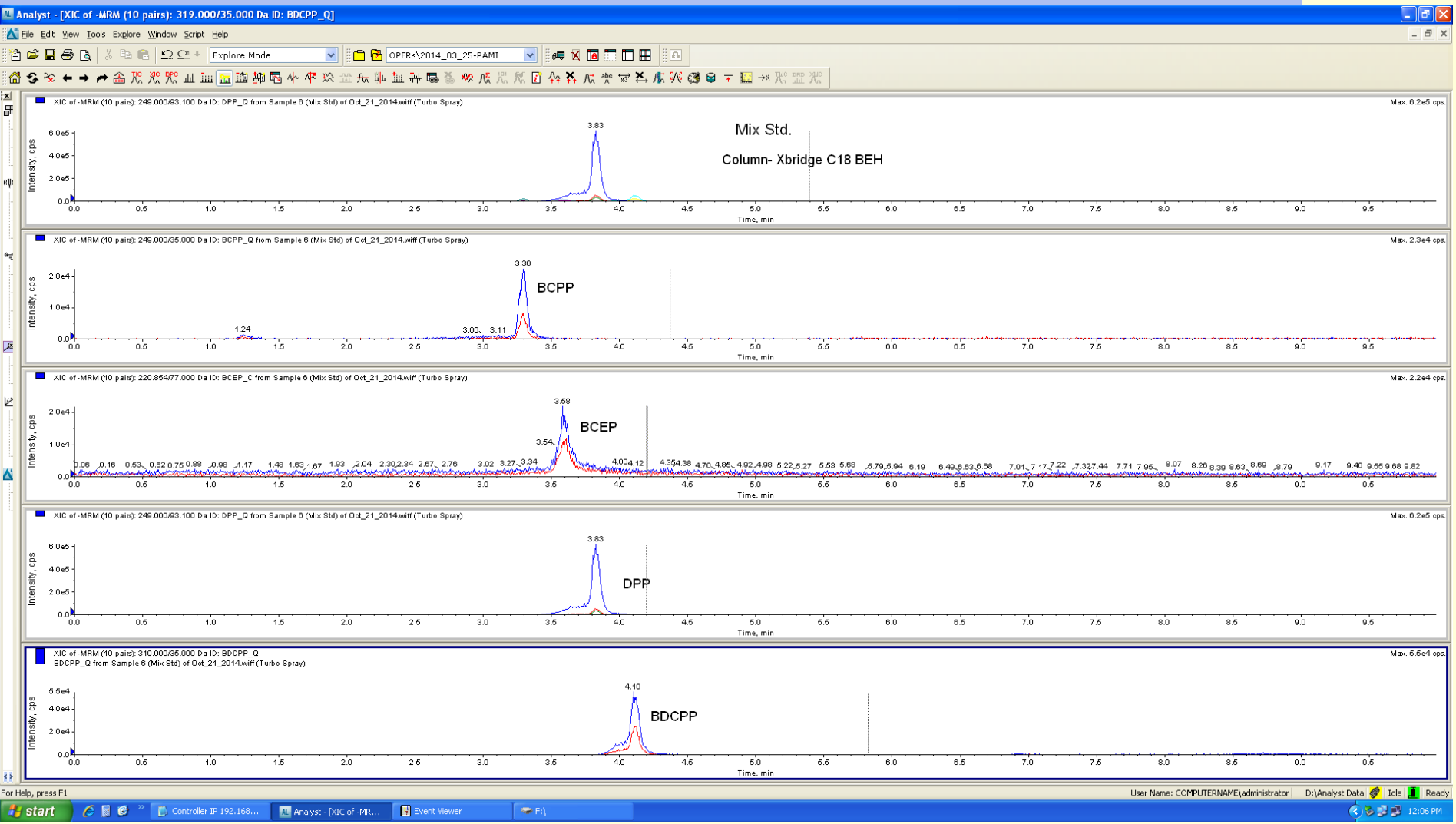
Bis(2-chloroisopropyl) phosphate (BCPP)



Diphenyl phosphate (DPP)

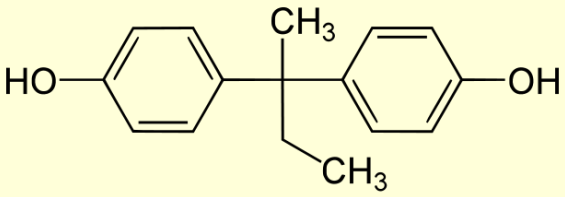


OP Flame Retardants Method (2)

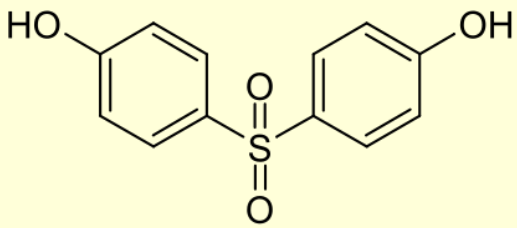


BPA Analogs*

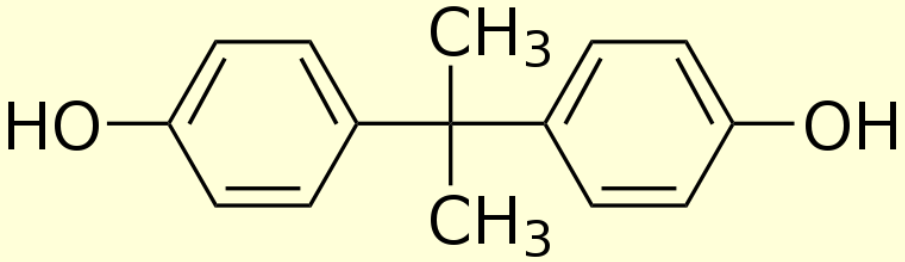
BPB



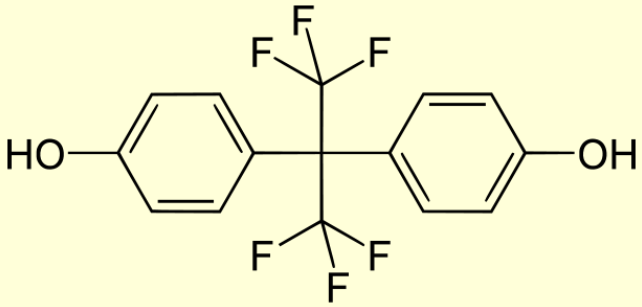
BPS



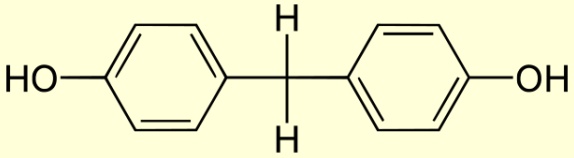
BPA



BPAF



BPF



*p,p'-Bisphenols

Method Validation

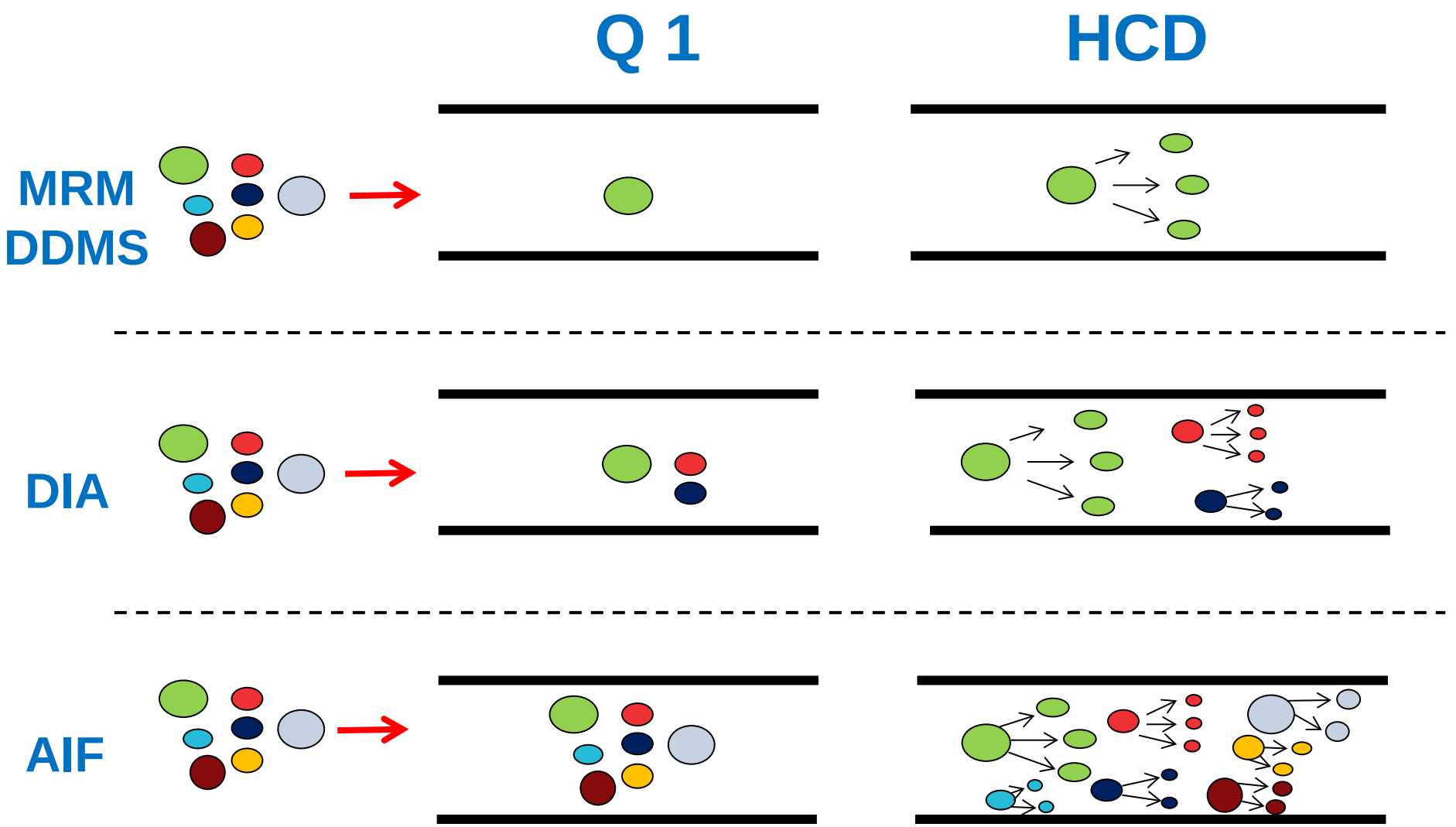
		QC-Low-level 0.5 ppb (n=9)		QC-High-level 5 ppb (n=9)	
	Linear range (ppb)	Precision (RSD)	Accuracy (Recovery)	Precision (RSD)	Accuracy Recovery)
BPS	0.1-50 (R^2=0.967)	6%	86%	13%	103%
BPB	0.1-100 (R^2=0.982)	11%	94%	13%	106%
BPAF	0.1-8 (R^2=0.996)	12%	86%	15%	106%
BPF	0.1-100 (R^2=0.999)	6%	108%	9%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

“Unknown” Screening

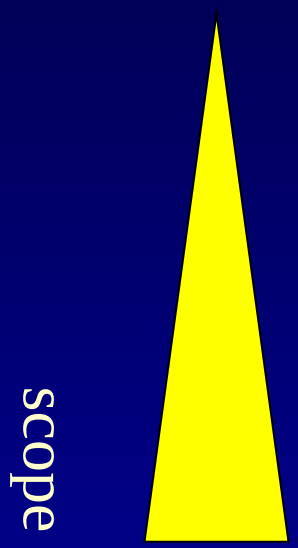
Recently approved $250K upgrade of our ***Exactive Plus*** to ***Q-Exactive Plus***

- Installation pending

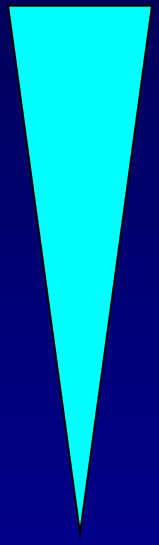
Q-Exactive plus



Metabolomics: Detect the Unexpected !



1. **Target analysis**
   few metabolites
2. **Metabolite profiling**
   some selected metabolites
3. **Metabolomics**
   all metabolites



Metabolic fingerprinting
classifying samples

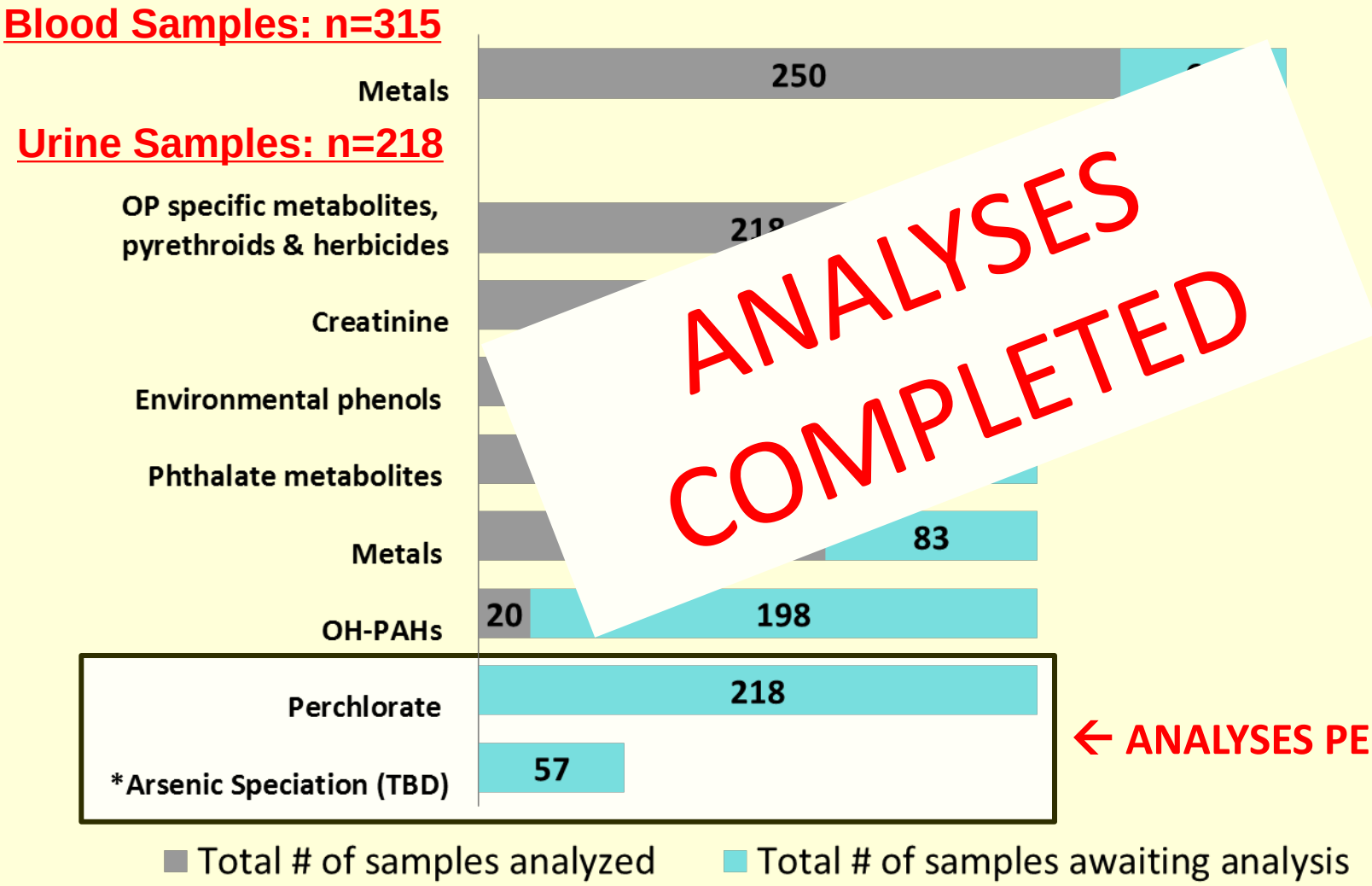
Comp.Funct. Genom. **2** (155-168) 2001

Plant Mol. Biol. **48** (155-171) 2002

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



*Samples are only analyzed if total urinary arsenic levels are ≥20µg/L

CDC Biomonitoring Proficiency Testing

Phthalates	Polycyclic aromatic hydrocarbons (PAHs)
• *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)*	• *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	Universal Pesticides
• *Bisphenol A (BPA)* • *2,4-dichlorophenol* • *2,5-dichlorophenol* • *benzophenone-3 (BP-3)* • *Triclosan* • *methyl-paraben* • *ethyl-paraben* • *propyl-paraben* • *butyl paraben*	• *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