

DTSC Laboratory Update



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Environmental Chemistry Laboratory (ECL)

Report to Scientific Guidance Panel
Sacramento, CA
November 14, 2013

Status

- New methods, expanded capabilities/capacities
- Progress with sample analysis
- Other activities

New methods expand capabilities

POPs by Triple Quadrupole MS/MS

- Single injection (vs. 2 injections into HRMS)
- Improved throughput
- Analysis of samples from:
 - Three Generations (3G) study
 - UC Berkeley's Childhood Leukemia study

OH-BDEs by LC-MS/MS

- Improved throughput
- Eliminated derivatization step (diazomethane toxicity)
- Completed analysis of MIEEP samples

Methodological Breakthrough

- TripleQ GC-MS/MS used for the simultaneous analysis of PBDEs, PCBs, OCPs in contemporary serum
- Methodology used with:
 - 3G Study
 - Daughters' serum
 - UCB Leukemia Study
 - Moms' serum (RFI, 2012)
 - Children's whole blood (Cases)
 - ✓ **Using just 100 μ L of whole blood**

Simultaneous Determination of PCBs, PBDEs, and Organochlorine Pesticides in Small Volumes of Whole Blood Using Liquid-Liquid Extraction and GC-Triple Quadrupole Mass Spectrometry

Crispo-Smith SM, Whitehead TP, Metayer C,
Park JS, Petreas MX, Buffler PA, Rappaport SM

Presented at Dioxin 2013, Daigu Korea



Solid phase extraction of hydroxylated brominated diphenyl ethers (OH-PBDEs) from human serum and quantitative analysis by mix mode fast HPLC-MS/MS

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Temporal Comparison of PBDEs, OH-PBDEs, PCBs, and OH-PCBs in the Serum of Second Trimester Pregnant Women Recruited from San Francisco General Hospital, California

Ami R. Zota,^{*,†,‡} Linda Linderholm,^{§,||} June-Soo Park,[§] Myrto Petreas,[§] Tan Guo,^{§,⊥} Martin L. Privalsky,[#] R. Thomas Zoeller,[•] and Tracey J. Woodruff[‡]

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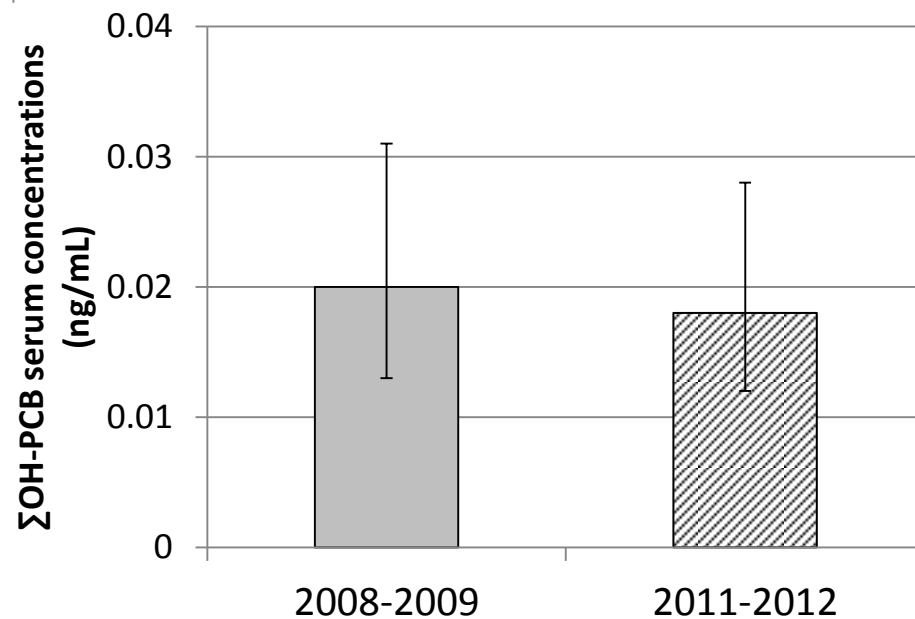
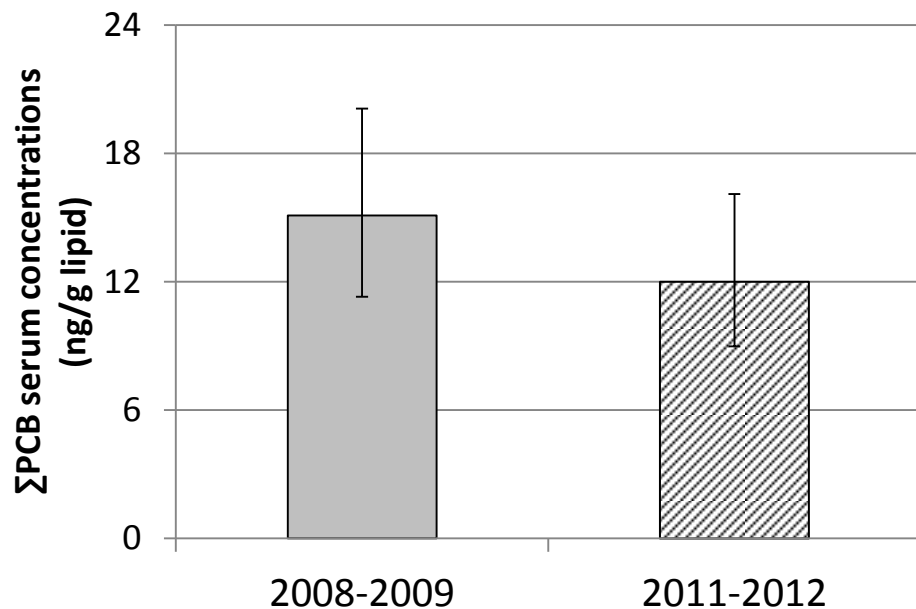
[⊥]Sequoia Foundation, La Jolla, California 92037, United States

[#]Department of Microbiology, University of California, Davis, Davis, California 95616, United States

**Power of biomonitoring to gauge efficacy
of regulatory actions**

PCBs and OH-PCBs

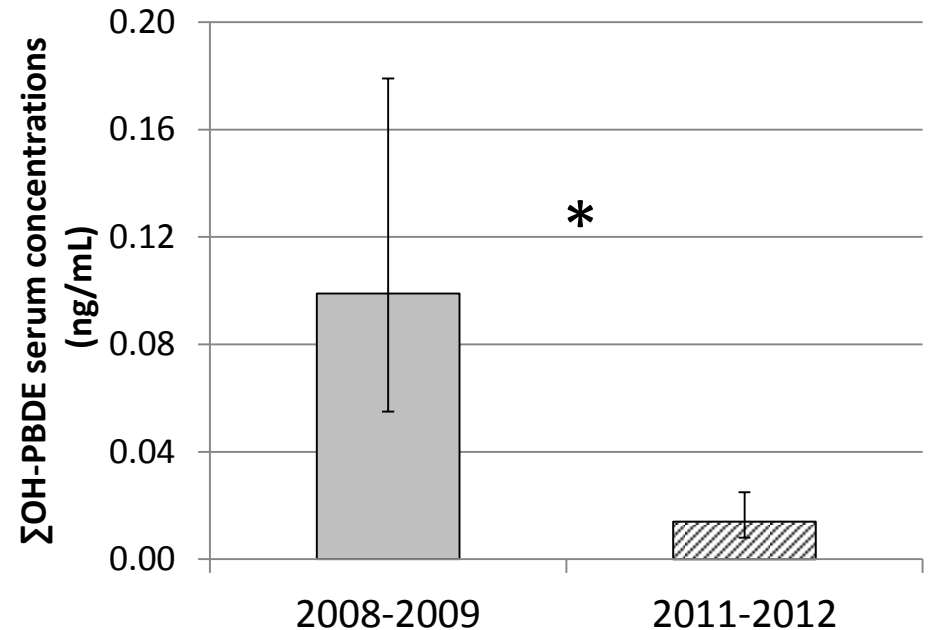
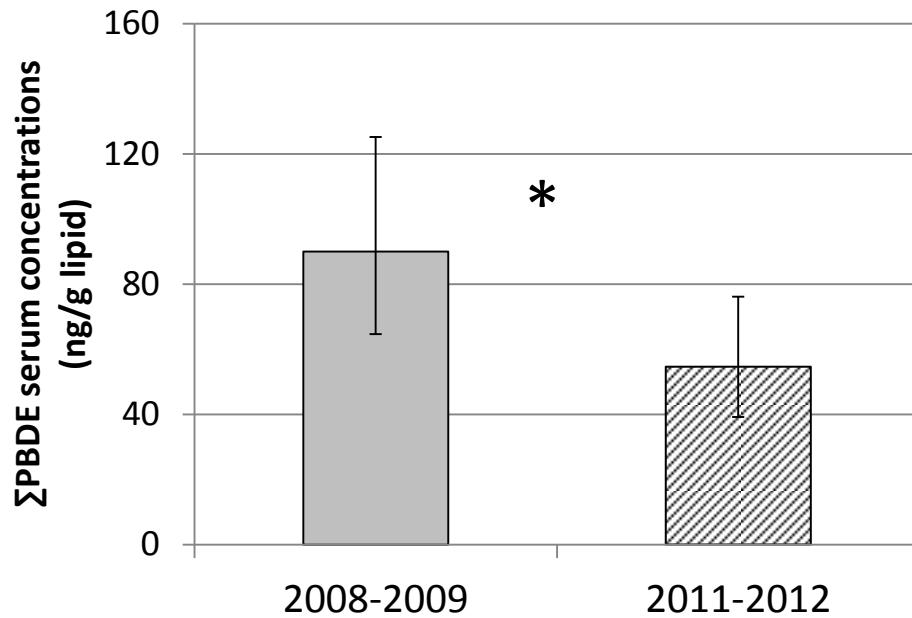
Least square geometric mean serum concentration adjusted by maternal age, gestational age, race/ethnicity, parity, and insurance status. Error bars indicate 95% confidence intervals.



Adapted from Zota et al (2013) Figure 2.

PBDEs and OH-PBDEs

Least square geometric mean serum concentration adjusted by maternal age, gestational age, race/ethnicity, parity, and insurance status. Error bars indicate 95% confidence intervals and asterisks reflect statistically significant differences ($p < 0.05$).



Adapted from Zota et al (2013) Figure 2.

CA Teachers Study (CTS)

- In collaboration with:
Cancer Prevention Institute of California, UCI, USC, City of Hope
- Sub-study on chemicals as risk factors for breast cancer, funded by CA Breast Cancer Research Program
- Recruitment and sample collection: 2011-2014
- Blood samples from ~1,000 cases and 1,400 controls from entire State
- Analysis of PCBs, PBDEs, PFCs, thyroid hormones, lipids
- Females, 45-94 years old

Progress with the CA Teachers Study (CTS)

(as of November 1, 2013)

	n=2,439 received		
	PFC	PBDE	PCB/OCP
Aliquoted	1792	1792	1792
Extraction completed	856	711	711
Instrument analysis completed	856	517	250
Data review completed	856	517	176
Data released to PI, posted on website	856	517	0



chds

Child Health and
Development Studies

Three Generations Study (3G)

Barbara Cohn, Ph.D., PI.

Funded by NIEHS, NCI, CBCRP

- Over 15,000 pregnancies at Kaiser, Oakland from 1959-1967
- Adult daughters (n=300) sampled in 2011-12

Age (years)
Range: 46-54
Median = 50

Race	n	%
White	137	45.7
Black	150	50.0
Latina	6	2.0
Asian	5	1.7
Mixed/other	2	0.7

Progress with 3 Generations Study

(as of November 1, 2013)

	n=300 Daughters (sampled 2001-12)		
	PFC	PBDE/PCB/OCP	OH-BDE
Extraction completed	300	300	300
Instrument analysis completed	300	300	
Data review completed	300	In review	
Data released to PI	300		

3Gs and Biomonitoring California

Results will be returned to participants by CHDS (Spring 2014);
Upon study completion, results will be posted onto the
Biomonitoring California website

Synergy, Program sustainability

California Childhood Leukemia Study (Children's whole blood)

- Case-control study on environmental and genetic risk factors for childhood leukemia
- Children's Whole Blood (cases)
 - 195 children between 1997-2008
 - 100 μ L of whole blood
 - No lipids determination

Target Analyte	Detection Frequency (%)
PBDE-47	88
PBDE-99	70
PBDE-100	56
PBDE-153	66
PCB-118	55
PCB-138	64
PCB-153	80
PCB-180	62
p,p'-DDE	100
HCB	94



CALIFORNIA
CHILDHOOD
LEUKEMIA
STUDY



Using new method (single injection)

Children's whole blood (n= 195)

- Blood PBDE/PCB/OCP levels/patterns to be compared to house dust levels/patterns
- Age hypothesis (younger children have more contact with dust)

Mothers' serum (n=50)

- Study selected among responses to RFI issued in 2012
- Serum PBDE/PCB/OCP levels/patterns to be compared to house dust levels/patterns

Progress with UCB Leukemia Study

(as of November 1, 2013)

	PBDEs / PCBs / OCPs	
	N=50 Mothers	N=195 Children
Extraction completed	50	195
Instrument analysis completed	50	135
Data review completed	50	135
Data released to PI	0	0

Other Activities

Manuscripts submitted

- Comparison of blood drawing tubes for the analysis of POPs/PFCs/lipids (Guo et al.)

FOX manuscripts in preparation

- Serum POPs (Park et al.)
- POPs/PAHs in dust: firehouse vs. residential (Shen et al.)
- Serum PFCs and blood metals (McNeel et al.)

New methods for DTSC that will benefit the Biomonitoring Program

- Linear/branched PFC isomers (in serum and in ground water)
- PFC precursors (fluorotelomer alcohols)

Instrumentation for Identifying Unknowns

- Chemicals identified via non-targeted screening may be important new candidates for biomonitoring
- Exploring vendors (specifications, performance on samples sent blindly, price)

Looking for more chemicals under the lamp post



Looking for chemicals beyond the lamp post



The background of the slide features faint, light blue chemical structures. These include a complex polycyclic aromatic system with multiple nitrogen atoms and carbonyl groups, and a smaller, more complex heterocyclic structure with nitrogen and oxygen atoms. The structures are rendered in a low-contrast, sketchy style.

QUESTIONS?