

# DTSC Laboratory Update



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**Environmental Chemistry Laboratory (ECL)**

**Report to Scientific Guidance Panel**  
**Oakland, CA**  
**August 14, 2013**

# Status

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- Staffing/resources
- Progress with sample analysis
- Preliminary results
- Feasibility of using archived prenatal serum (GDSP)
- Other activities

# Staffing

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Farewell and Thank you to Sara Encisco

- 2 CECBP-funded
- 4 CDC-funded
  - Filling 1 vacancy
- In-kind support from DTSC-funded positions



# CA Teachers Study (CTS)

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- 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: 2011-2013
- Blood samples from ~1,000 cases and 1,000 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 July 2013)

	n=1,763 received		
	PFC	PBDE	PCB/OCP
<b>Extraction completed</b>	<b>856</b>	<b>711</b>	<b>711</b>
<b>Instrument analysis completed</b>	<b>856</b>	<b>517</b>	<b>250</b>
<b>Data review completed</b>	<b>856</b>	<b>517</b>	<b>141</b>
<b>Data released to PI, posted on website</b>	<b>856</b>	<b>517</b>	<b>0</b>

# Specific Aim #1:

## Predictors of PBDE exposures in CTS

*Preliminary Data*

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- Blood from 481 women with no history of breast cancer drawn 2011-13
- Oversampled to ensure racial/ethnic diversity

Age (yrs)	N (%)
40-49	54 (11)
50-59	84 (17)
60-69	168 (35)
70-79	113 (24)
80+	62 (13)

Race	N (%)
White	217 (45)
Black	85 (18)
Hispanic	92 (19)
API	87 (18)

# Predictors of Serum PBDE Levels Among Older California Women

P Reynolds<sup>1,2</sup>, S Hurley<sup>1</sup>, D Goldberg<sup>1</sup>, E Garcia<sup>1</sup>, D Nelson<sup>1</sup>, Y Wang<sup>3</sup>, T Guo<sup>3</sup>, JS Park<sup>3</sup>, W Guo<sup>3</sup>, M Petreas<sup>3</sup>

<sup>1</sup>Cancer Prevention Institute of California, <sup>2</sup>Stanford University School of Medicine,

<sup>3</sup>California Department of Toxic Substances Control

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## Preliminary multivariate analysis

- No relationship between serum levels and age
- Predictors for BDE-47 and BDE-100 were notably different than for BDE-153
- Higher levels of BDE-47 & BDE-100 in women who:
  - are non-white, overweight/obese, living in the second lowest quartile of neighborhood SES
  - live in homes with more carpeting
  - flew in a plane in the last year
- Higher levels of BDE-153 in women who:
  - wash their hands more frequently and live in newer homes

*Funded by the California Breast Cancer Research Program,  
Grant #16ZB-8501 and NCI Grants  
R01 CA77398 & K05 CA136967*

Conference of ISEE, ISES and ISIAQ  
Basel, Switzerland, August 2013

# Genetic Disease Screening Program

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- Statewide archive of prenatal serum samples
- Can it be used to measure PBDEs, PFCs for Biomonitoring California?
  - Adequate volume?
  - Collection tube (Gold Top Serum Separator)
  - Chemical contamination?



# GDSP: Testing Feasibility

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- Visited the Genetic Diseases Lab (GDL) to observe operations
- At GDL, serum samples stay uncovered for several hours while being tested for genetic disease markers; three different plungers are immersed sequentially
- Exchanged samples
  - DTSC's 3 bovine serum (lab blanks) subjected to GDL's operations to test contamination;
  - DTSC obtained from GDL and analyzed 20 GDSP samples (from 2 separate clinical labs) for PBDEs, PCBs, OCPs, PFCs

# GDSP: Results

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- Bovine Blanks (n=3):
  - No background, except for PFOS, HCB
  - Not significant, given expected levels
- GDSP samples from 2 Clinical Labs (10+10):
  - Compared to MIEEP (maternal serum collected Nov 2010-July 2011)
  - Not analyzed for lipids (limited volume), results in ng/mL

## PBDEs (ng/mL) in GDSP and MIEEP samples

		DF%	Min	Median	Max
BDE-47	GDSP (n=20)	50	0.032	0.033	0.149
	MIEEP (n=77)	92	0.032	0.070	1.74
BDE-99	GDSP (n=20)	30	0.018	0.018	0.089
	MIEEP (n=77)	61	0.018	0.022	0.352
BDE-153	GDSP (n=20)	45	0.016	0.016	0.189
	MIEEP (n=77)	90	0.016	0.018	0.237

# PCBs, OCPs and PFCs (ng/mL) in GDSP and MIEEP samples

		DF%	Min	Median	Max
p,p'-DDE	GDSP (n=20)	50	0.016	0.103	4.01
	MIEEP (n=77)	100	0.082	0.772	60.4
PCB-153	GDSP (n=20)	30	0.008	0.008	0.081
	MIEEP (n=77)	87	0.008	0.026	0.182
PFOS	GDSP (n=20)	100	0.122	2.95	11.9
	MIEEP (n=77)	100	0.512	2.43	22.6

# GDSP: Testing Feasibility

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- Can it be used for Biomonitoring California?
  - Adequate volume?
    - **Probably**
  - Collection tube (Gold Top Serum Separator)
    - **No effect**
  - Chemical contamination?

**No lab problems encountered in the analysis of GDSP serum samples for PBDEs, PCBs, OCPs, PFCs**

# Other Activities

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- FOX presentation at ISEE 2013
- Child Health & Development Studies and the Three Generations Study (3Gs)
- POPs in blood from the N. CA Childhood Leukemia Study
- Flame Retardants in Dust
- Identifying unknown chemicals

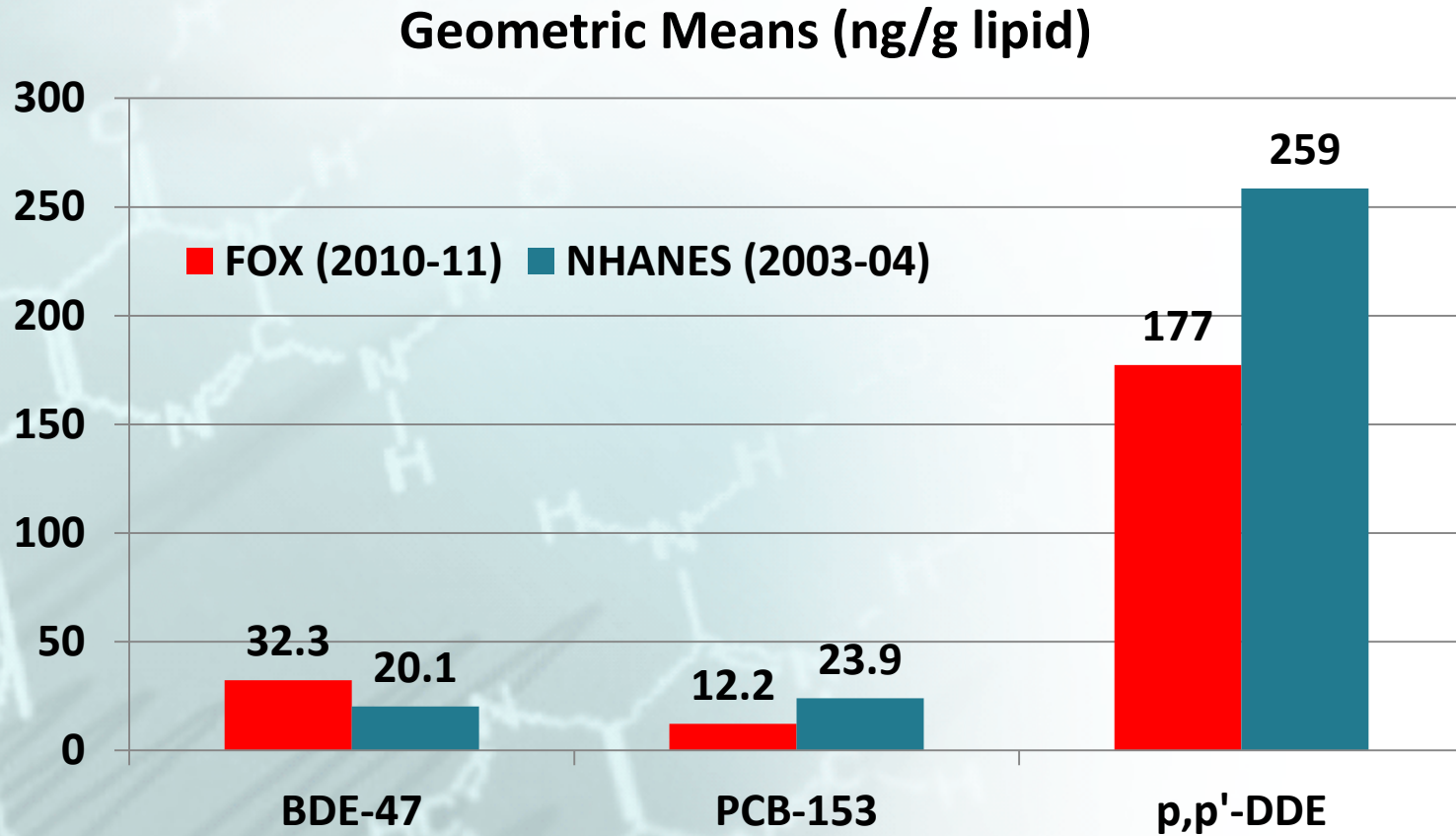
# FOX: Preliminary data analysis

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- 101 Firefighters contacted in 2010-11
- Questionnaire on demographics, work practices, activities
- Blood, urine
- Results from serum PBDEs, PCBs, OCPs
- Comparison populations:
  - NHANES (n~ 650 males >20 yrs old)
  - San Francisco Firefighters (n=12; Shaw et al. Chemosphere, 2013)

# POPs in FOX serum

Park et al: Conference of ISEE, ISES and ISIAQ  
Basel, Switzerland, August 2013





## PBDEs (ng/g lipid) in FOX & other populations

		Year	min	median	max
<b>BDE-47</b>	FOX (n=101)	2010-11	9.0	32	397
	SFFF (n=12)	2009	5	25	253
	NHANES (n=667)	2003-04	1.3	20	2350
<b>BDE-99</b>	FOX (n=101)	2010-11	3.6	6.2	377
	SFFF (n=12)	2009	1	6.0	41
	NHANES (n=659)	2003-04	0.8	3.8	692
<b>BDE-153</b>	FOX (n=101)	2010-11	3.6	15	376
	SFFF (n=12)	2009	5	33	98
	NHANES (n=675)	2003-04	0.7	6.5	821

# Predictors of PBDEs in FOX serum

(Preliminary bi-variate data analysis)

PBDE levels are a function of:

**Age:**

Younger > Older

**Job title:**

Firefighter/Engineer > Chief/Captain

**Work practices associated with lower levels:**

- Use of SCBA protection
- Gear cleaned outside, stored in ventilated / open areas

- Over 15,000 pregnancies at Kaiser, Oakland from 1959-1967
  - Archived perinatal serum; demographics; reproductive history; behavior
- Adult daughters are part of the Three Generations Study (3G)
- Contemporary samples

**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

# 3Gs and Biomonitoring California

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Contemporary (daughters') serum (n=300) analyzed for:

- OCPs, PCBs, PBDEs, OH-BDEs
- PFCs

Results will be returned to participants by CHDS (Spring 2014);  
Participants' reactions evaluated

Upon study completion, results to be posted onto the  
Biomonitoring California website

**Synergy, Program sustainability**

# N. CA Childhood Leukemia Study (NCCLS)

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- Project selected among responses to RFI issued in 2012
- In collaboration with UC Berkeley (P. Buffler, PI)
- Developed method for PBDEs in small volume of whole blood from children w/leukemia
- Sample analysis in progress
- Blood levels to be compared to house dust levels

# Flame Retardants in Dust

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- Methodology for PBDEs, PCBs, PAHs, BFRs has been applied to dust samples from homes and firehouses
- New method for Phosphorus-Flame Retardants in dust:
  - TCEP: tris(2-chloroethyl)-phosphate
  - TCPP: tris(1-chloro-2-propyl)-phosphate
  - TDCPP: tris(1,3-dichloro-isopropyl)-phosphate
  - TPHP: triphenyl phosphate

**Environmental measurements complement biomonitoring,  
help assess exposure pathways**

# Instrumentation for Identifying Unknowns

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- Non-targeted analytes may be important new candidates for biomonitoring
- High resolution mass spectrometer (often referred to as TOF)
- CDC requirement: Must have both qualitative and quantitative capabilities
- In Yr-5 CDC budget
- Exploring vendors (specifications, performance on samples sent blindly, price)

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**QUESTIONS?**