DTSC Laboratory Update

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Report to Scientific Guidance Panel
Oakland
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Status

- Staffing/resources
- QA/QC
- Progress with field studies
- Preliminary results
- Future activities

No Changes in Staffing

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

Quality Control

Proficiency Testing:

- **PFCs: 100% on CDC and AMAP**
- **PCBs, OCPs: 100% on AMAP Fall 2012**
- **PBDEs, PFCs, PCBs, OCPs: AMAP Winter 2013 under way**
- **Participating in inter-laboratory testing for all available analytes**
- **Using NIST certified materials, when available**
- **Internal Quality Management Program**

Status of Sample Analyses

	MIEEP (n=141)	FOX (n=104)	BEST (n=110)
PFC	141	104	110
PCB/OCP	141	104	0
PBDE	141	104	110
OH-BDEs	50	Not Requested	Not Requested

Using new LC/MS method for OH-BDEs, *Petropoulou et al., BFR2013*

CA Teachers Study

- **In collaboration with:**

  Cancer Prevention Institute of California, UCI, USC, City of Hope
- **Sub-study funded by CA Breast Cancer Research Program**
- **Blood samples from ~1,000 cases and 1,000 controls from entire State**
- **Recruitment and sample collection: 2011-2013**
- **Analysis of PCBs, PBDEs, PFCs, thyroid hormones, lipids**

Progress with the CA Teachers Study (CTS)

	n=1,763 received		
	PFC	PCB/OCP	PBDE
Extraction completed	857	632	632
Instrument Analysis Completed	614	141	462
Data Review Completed	614	0	400
Data Released to PI	614	0	323

Age and Race Distribution for 614 CTS Participants with PFC results

Race	n	%
White	395	64.3
Black	55	9.0
Hispanic	83	13.5
Asian/PI	73	11.9
Other	8	1.3
Total	**614**	**100**

Age at Blood Draw (Years)	n	%
40-49	35	5.7
50-59	93	15.2
60-69	211	34.4
70-79	177	28.8
80-89	87	14.2
90-99	11	1.8
Total	**614**	**100**

PFCs (ng/mL) in Serum Samples of 614 Women CTS Subset, 2011-12 (results as of 4/1/2013)

Perfluorochemicals (PFCs)	Geometric Mean (95% Confidence Interval)	Selected Percentiles			
		25th	50th	75th	95th
PFHpA	**0.07** (0.07 – 0.08)	***< LOD***	**0.07**	**0.13**	**0.27**
PFOA	**2.52** (2.40 – 2.64)	**1.79**	**2.52**	**3.68**	**6.18**
PFNA	**1.00** (0.95 – 1.04)	**0.72**	**0.99**	**1.40**	**2.38**
PFDeA	**0.22** (0.20 – 0.23)	**0.16**	**0.24**	**0.36**	**0.68**
PFUA	**0.14** (0.13 – 0.15)	**0.09**	**0.15**	**0.24**	**0.44**
PFDoA	*	***< LOD***	***< LOD***	***< LOD***	**0.07**
PFBuS	*	***< LOD***	***< LOD***	***< LOD***	**0.07**
PFHxS	**1.61** (1.51 – 1.72)	**1.05**	**1.57**	**2.41**	**6.23**
PFOS	**7.07** (6.66 – 7.51)	**4.86**	**7.59**	**11.1**	**20.8**
PFOSA	**0.05** (0.04 – 0.05)	**0.02**	**0.05**	**0.11**	**0.33**
Et-PFOSA-AcOH	**0.04** (0.04 – 0.05)	**0.02**	**0.04**	**0.08**	**0.26**
Me-PFOSA-AcOH	**0.26** (0.24 – 0.28)	**0.13**	**0.22**	**0.47**	**1.61**

* Geometric mean was not calculated for chemicals that were found in less than 65% of the study group.

< LOD means below limit of detection.

PFCs (ng/mL) in Serum Samples of 614 Women CTS Subset, 2011-12 compared to NHANES, 2009-10

Perfluorochemicals (PFCs)	Geometric Mean (95% Confidence Interval)	NHANES 09-10 (n=674) *Women 40 years and above*
PFHpA	**0.07** (0.07 – 0.08)	*
PFOA	**2.52** (2.40 – 2.64)	**3.02** (2.75 – 3.32)
PFNA	**1.00** (0.95 – 1.04)	**1.62** (1.41 – 1.87)
PFDeA	**0.22** (0.20 – 0.23)	**0.30** (0.27 – 0.32)
PFUA	**0.14** (0.13 – 0.15)	**0.20** (0.17 – 0.23)
PFDoA	*	*
PFBuS	*	*
PFHxS	**1.61** (1.51 – 1.72)	**1.47** (1.31 – 1.64)
PFOS	**7.07** (6.66 – 7.51)	**9.37** (8.17 – 10.76)
PFOSA	**0.05** (0.04 – 0.05)	*
Et-PFOSA-AcOH	**0.04** (0.04 – 0.05)	*
Me-PFOSA-AcOH	**0.26** (0.24 – 0.28)	**0.21** (0.19 – 0.24)

* Geometric mean was not calculated for chemicals that were found in less than 65% of the study group.

NHANES is the National Health and Nutrition Examination Survey.

PFCs in Serum Samples of 614 Women
CTS Subset, 2011-12 (results as of 4/1/2013) *continued*

Perfluorochemicals (PFCs)	Detection Frequency	Limit of Detection (ng/mL)
PFHpA	73.5 %	0.059
PFOA	99.8 %	0.029
PFNA	100 %	0.014
PFDeA	93.2 %	0.032
PFUA	98.4 %	0.010
PFDoA	13.7 %	0.036
PFBuS	18.4 %	0.022
PFHxS	100 %	0.012
PFOS	99.7 %	0.083
PFOSA	90.6 %	0.008
Et-PFOSA-AcOH	88.1 %	0.011
Me-PFOSA-AcOH	99.8 %	0.013

Age and Race Distribution for 323 CTS Participants with PBDE results

Race	n	%
White	240	74.3
Black	29	9.0
Hispanic	25	7.7
Asian/PI	23	7.1
Other	6	1.9
Total	**323**	**100**

Age at Blood Draw (Years)	n	%
40-49	17	5.3
50-59	40	12.4
60-69	104	32.2
70-79	102	31.6
80-89	50	15.5
90-99	10	3.1
Total	**323**	**100**

Lipid-Adjusted PBDEs (ng/g) in Serum Samples of 323 Women CTS Subset, 2011-12 (results as of 4/1/2013)

Polybrominated Diphenyl Ethers (PBDEs)	Geometric Mean (95% Confidence Interval)	Selected Percentiles			
		25th	50th	75th	95th
BDE 28	*	***< LOD***	***< LOD***	**1.89**	**4.13**
BDE 47	**13.61** (12.35 – 15.00)	**7.67**	**13.2**	**23.8**	**65.7**
BDE 99	*	***< LOD***	***< LOD***	**4.88**	**13.4**
BDE 100	**1.96** (1.76 – 2.19)	**0.99**	**1.96**	**3.79**	**9.66**
BDE 153	**5.02** (4.45 – 5.66)	**2.53**	**4.77**	**8.76**	**44.4**

* Geometric mean was not calculated for chemicals that were found in less than 65% of the study group.
< LOD means below limit of detection.

Lipid-Adjusted PBDEs (ng/g) in Serum Samples of 323 Women CTS Subset, 2011-12, compared to NHANES, 2003-04

Polybrominated Diphenyl Ethers (PBDEs)	Geometric Mean (95% Confidence Interval)	NHANES 03-04 (n=471) *Women 40 years and above*
BDE 28	*	**1.15** (0.96 – 1.38) †
BDE 47	**13.61** (12.35 – 15.00)	**17.34** (14.16 – 21.24) †
BDE 99	*	*
BDE 100	**1.96** (1.76 – 2.19)	**3.22** (2.70 – 3.85)
BDE 153	**5.02** (4.45 – 5.66)	**3.90** (3.39 – 4.98)

† BDE 28: n=462
BDE 47: n=464

***** Geometric mean was not calculated for chemicals that were found in less than 65% of the study group.
NHANES is the National Health and Nutrition Examination Survey.

Lipid-Adjusted PBDEs in Serum Samples of 323 Women CTS Subset, 2011-12 (results as of 4/1/2013) *continued*

Polybrominated Diphenyl Ethers (PBDEs)	Detection Frequency	Limit of Detection	
		Wet wt. (ng/mL)	Lipid wt. (Range, ng/g)
BDE 28	43.7%	0.009	0.62 – 1.36
BDE 47	92.3%	0.024	1.94 – 3.54
BDE 99	31.9%	0.025	1.74 – 3.78
BDE 100	85.4%	0.004	0.30 – 0.57
BDE 153	86.7%	0.009	0.74 – 1.35

Genetic Disease Screening Program

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

Preliminary Testing

- DTSC staff visited Genetic Diseases Lab (GDL) to observe and discuss operations
- At GDL, serum samples stay uncovered for several hours while tested for genetic diseases; 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 prenatal serum samples (from 2 separate clinical labs) for POPs

Preliminary Results: PFCs

- PFOS: Consistent background (0.12-0.13 ng/mL) in lab blanks (n=3). Not significant, given expected levels.
- Contamination source unidentifiable:
  - Collection tube?
  - Clinical lab background?
  - Not from DTSC lab
- Other PFC compounds: no background levels
- Serum PFC results from the two Clinical labs (n=10 from each lab): no unusual PFC levels observed.

Future Activities

- Complete GDL study analysis (PBDEs, PCBs, OCPs)
- Collaborations
  - Child Health & Development Studies
    - Three Generations Study (3G)
- New Instrumentation to identify unknown chemicals

chds

Child Health and Development Studies

Barbara Cohn, Ph.D., PI

National Institute of Environmental Health Sciences
National Cancer Institute
National Institutes of Child Health and Human Development
Lance Armstrong Foundation
California Breast Cancer Research Program

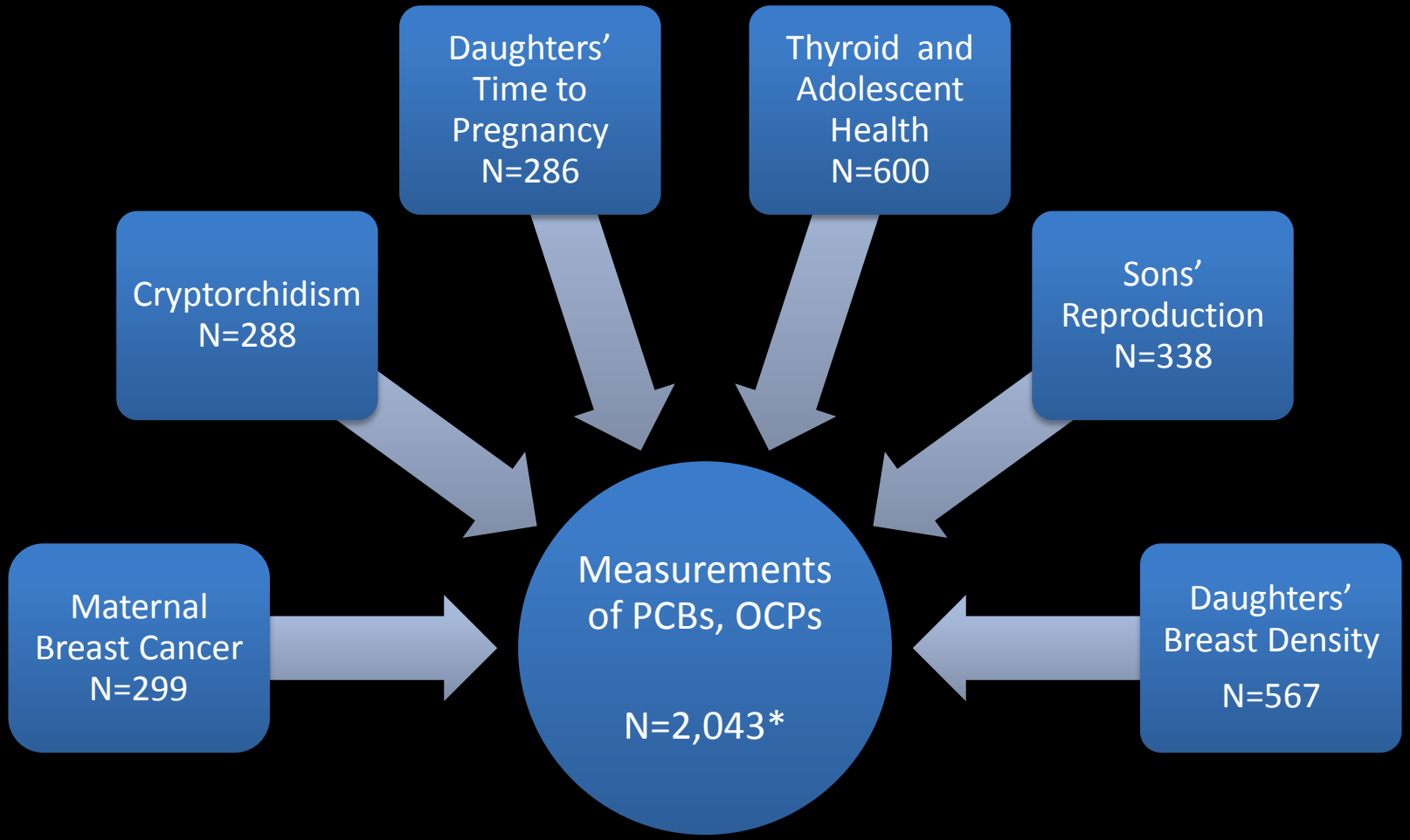
chds
Child Health and Development Studies

About 50 years ago,
over 15,000 pregnant women in the Kaiser Permanente Health Plan joined the CHDS.

The Child Health and Development Studies (CHDS)

- 90+ percent of pregnant women (N=15,528) who received obstetric care at Kaiser, Oakland, CA from 1959-1967
- Archived data from medical records and baseline interview:
  - Demographics: age, race/ethnicity
  - Pregnancy and reproductive history
  - Behavior (smoking, alcohol consumption)
- Archived pregnancy serum from the 1st, 2nd and 3rd trimesters and the post-partum

DTSC's Collaboration in CHDS Studies of Prenatal Exposure Using Maternal Serum



* As of 2011. Total eligible do not equal the sum of the studies due to overlap of subjects between studies

New CHDS Studies in Progress

Three Generations Breast Cancer Study (3Gs)

Funded by the California Breast Cancer Research Program

- **Expands the CHDS by adding:**
  - ADULT 2nd Generation daughters
  - 3rd Generation daughters

Some 3Gs Research Questions

- Does a daughter's exposure in the womb to environmental chemicals in her mother's blood increase her risk of breast cancer later in life? (Maternal Serum)
- Are environmental chemicals and metabolites in daughters' blood different by race and income? (Daughters' Serum Collected in 2012-13)
- How do levels compare between mothers and daughters?

3Gs and Biomonitoring California

- Contemporary (daughters') serum (n=300) will be analyzed for:
  - OCPs, PCBs
  - PFCs, PBDEs, OH-BDEs
- Results will be incorporated into the Biomonitoring California database
- Synergy, Program Sustainability

Instrumentation for Identifying Unknowns

- Non-targeted analytes may be important new candidates for biomonitoring
- High resolution mass spectrometer with MS^n capabilities (referred to as TOF)
- CDC requirement: Must have both qualitative and quantitative capabilities
- Place holder in Yr-5 CDC budget
- Exploring vendors (specifications, price)

QUESTIONS?