Application of a GC-MSMS Method for the Simultaneous Determination of Persistent Organic Pollutants in Serum from California First Time Mothers

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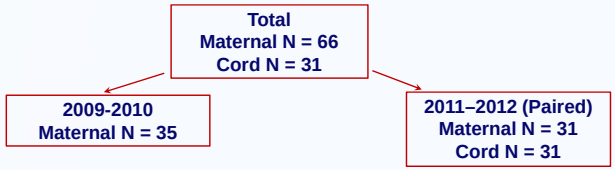
ABSTRACT

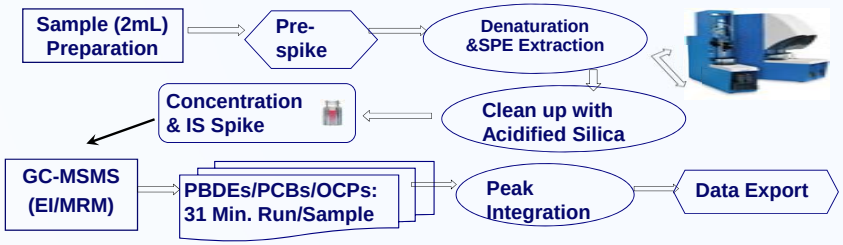
- **In our "Survey of Body Burdens in California Communities" we measured chemical contaminants (e.g., persistent organic pollutants (POPs)). We provide evidence that mothers may have been exposed to harmful environmental contaminants and passed them to their newborns.**
- **A GC-MSMS method of simultaneously measuring legacy/emerging POPs (PCBs, OCPs and PBDEs) in serum was developed and applied to this study.**

STUDY DESIGN



1. **Convenience sampling from first time mothers who have lived in California for at least 3 years.**
2. **Maternal and cord blood collection at Women's Health and Birth Center, Santa Rosa, CA.**
3. **Analyses at Environmental Chemistry Laboratory (ECL); DTSC, CA.**

ANALYTICAL METHODS



- **Batch Size = 20**
  14 Samples + 2 Method Blanks + 2 Matrix Spiked Controls + 2 Standard Reference Material
- **Analytes = 29**
  17 PCBs (PCB-28, 66, 74, 99, 101, 105, 118, 138, 153, 156, 167, 170, 180, 183, 187, 194, 203)
  7 OCPs (HCB, BHC, oxychlodane, t-nonachlor, p,p'-DDE, o,p'-DDT, p,p'-DDT)
  5 PBDEs (BDE-47, 99, 100, 153, and 154)
- **MDL (method detection limit) was defined as three times the standard deviation (SD) of the method blanks, or the LOQ (signal to noise ratio >5) whichever was greater.**

RESULTS

Figure. **Twenty Nine Measured Compounds Plus 5 Internal Standards Separated Within 31 Minutes**

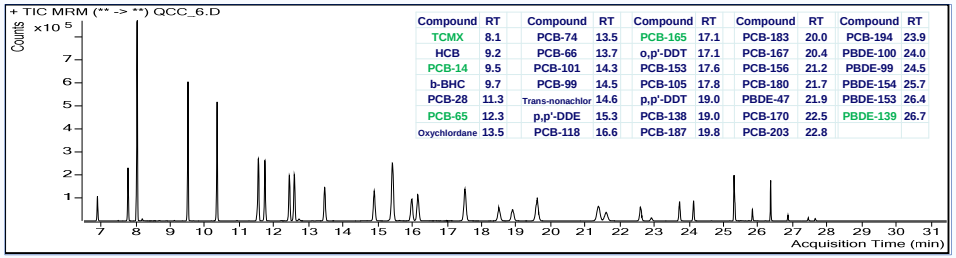


Table. **Preliminary Results of Major POP Levels (ng/g lipid) Measured in the Present Study in Comparison to Published Levels in U.S. Female Participants**

Study Name	Sample	Time	HCB	Trans-nonachlor	p,p'-DDE	PCB-118	PCB-138	PCB-180	PCB-187	BDE-47	BDE-153
NHANES[1]	N = 1000	2003-4	15.7	15.0	207	n/a	15.8[a]	17.8	4.7	19.1	4.1
Zota, 2011[2]	N = 25	2008-9	12.9	5.1	130	2.3	3.8	4.9	1.9	42.2	16.5
Zota, 2013[3]	N = 36	2011-12	n/a	n/a	n/a	1.5	1.8	1.9	NP[b]	21.8	11.7
BBCC-M[c]	N = 66	2009-12	8.4	4.3	123	2.8	4.3	6.2	2.1	17.1	4.8
Paired-M	N = 31	2011-12	6.4	4.1	96	2.5	4.1	6.1	2.0	14.4	5.3
Paired-C[d]	N = 31	2011-12	9.2	5.4	84	4.3	4.9	5.8	2.5	21.1	6.6

[a] coelute with PCB158; [b] not published; [c] maternal blood; [d] cord blood

SUMMARY & KEY FINDINGS

- **A GC-MSMS method to simultaneously measure 29 POP compounds was successfully applied to this biomonitoring study.**
- **California PBDE levels may be decreasing as suggested in previous published data.**
- **Newborns may have higher exposures than their mothers to some environmental contaminants-POPs.**

REFERENCES

1. Centers for Disease Control and Prevention, Fourth national report on human exposure to environmental chemicals, 2009
2. Zota, A.R., et al., *Polybrominated diphenyl ethers, hydroxylated polybrominated diphenyl ethers, and measures of thyroid function in second trimester pregnant women in California.* Environ Sci Technol, 2011. 45(18): 7896-905
3. Zota, A.R., et al., Temporal comparison of PBDEs, OH-PHDEs, PCBs, and OH-PCBs in the serum of second trimester pregnant women recruited from San Francisco general hospital, California. Environ Sci Technol, 2013. 47, 111776-111784

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The views expressed herein are those of the authors and do not necessarily reflect those of the California Department of Toxic Substances Control.