
Biomonitoring California Findings On Perfluoroalkyl and Polyfluoroalkyl Substances (PFASs)

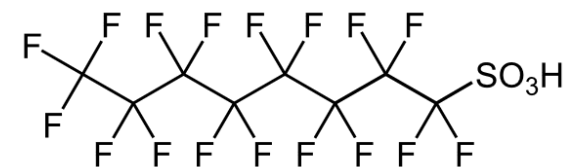
*Presentation to the Scientific Guidance Panel Meeting
August 22, 2018*

Jennifer Mann, Ph.D.
Research Scientist IV
California Department of Public Health

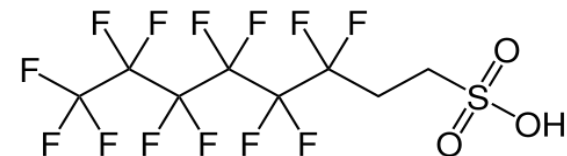


Perfluoroalkyl and Polyfluoroalkyl Substances (PFASs) - Definition

- Perfluoroalkyl substance: all of the hydrogen atoms attached to carbon atoms have been replaced by fluorine atoms
- Polyfluoroalkyl substance: all of the hydrogen atoms on at least one of the carbon atoms have been replaced by fluorine atoms



Perfluorooctane sulfonic acid (PFOS)



6:2 Fluorotelomer sulfonic acid (6:2 FTS)

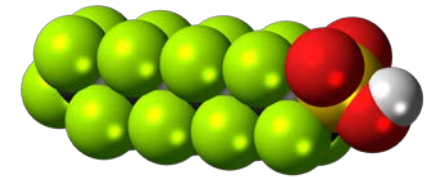
Entire class is on the designated and priority chemical lists for Biomonitoring California

Major Uses of PFASs

- Some manufacturing shifts, but thousands still produced worldwide
- Major uses include:
 - Stain-, water-, and grease-resistance treatments for textiles, leather, carpets, and food contact materials
 - Manufacture of fluoropolymers
 - Metal plating applications (e.g., fume suppressant)
 - Firefighting foams

What are the Concerns?

- Persistent in the environment - some bioaccumulate
- Widespread human exposure
- Some PFASs may:
 - Affect the developing fetus and child, including possible changes in growth, learning, and behavior
 - Harm the liver
 - Weaken the immune system
 - Increase the risk of thyroid disease and cancer



3-D representation of PFOS

Biomonitoring California Studies with PFASs

<u>Acronym</u>	<u>Study</u>	<u>12 PFASs</u>	<u>~30 PFASs</u>
FOX	Firefighters Occupational Exposures Project	X	
MIEEP	Maternal and Infant Environmental Exposure Project	X	
PBEST	Pilot Biomonitoring Exposures Study	X	
MAMAS	Measuring Analytes in Maternal Archived Samples (3 Rounds)	X (round 1)	X (later rounds)
EBEST	Expanded Biomonitoring Exposures Study	X	
ACE 1	Asian/Pacific Islander Community Exposures Project 1		X
ACE 2	Asian/Pacific Islander Community Exposures Project 2		X
CARE	California Regional Exposure Studies (8 Regions)	X	*

**Expanded panel may be added in later regions*

Biomonitoring California Studies - Selected Details

Acronym	Year	Population	Location
FOX	2010-11	Firefighters, mostly men	Southern CA
MIEEP	2010-11	Pregnant women, mostly Latina, foreign-born	SF Bay Area
PBEST	2011-12	Kaiser Members	Central Valley
MAMAS-I	2012	Pregnant Women; Biobank Samples	Orange and San Diego Counties
EBEST	2013	Kaiser Members; Oversample of Asians and Hispanics	Central Valley
ACE 1	2016	Chinese-American	San Francisco
ACE 2	2017	Vietnamese-American	San Jose
CARE LA	2018	Adults	Los Angeles County

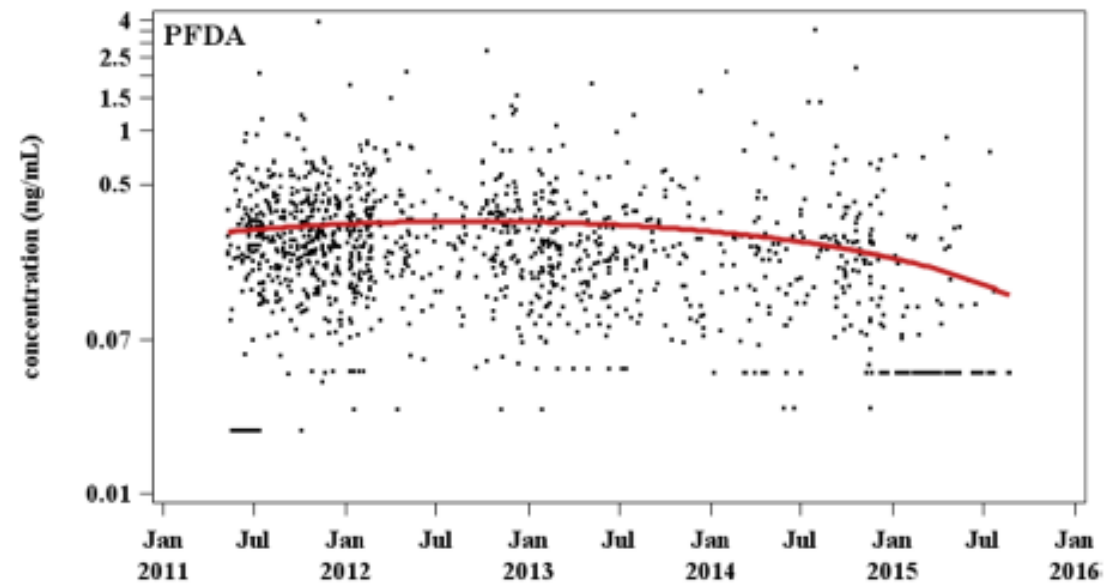
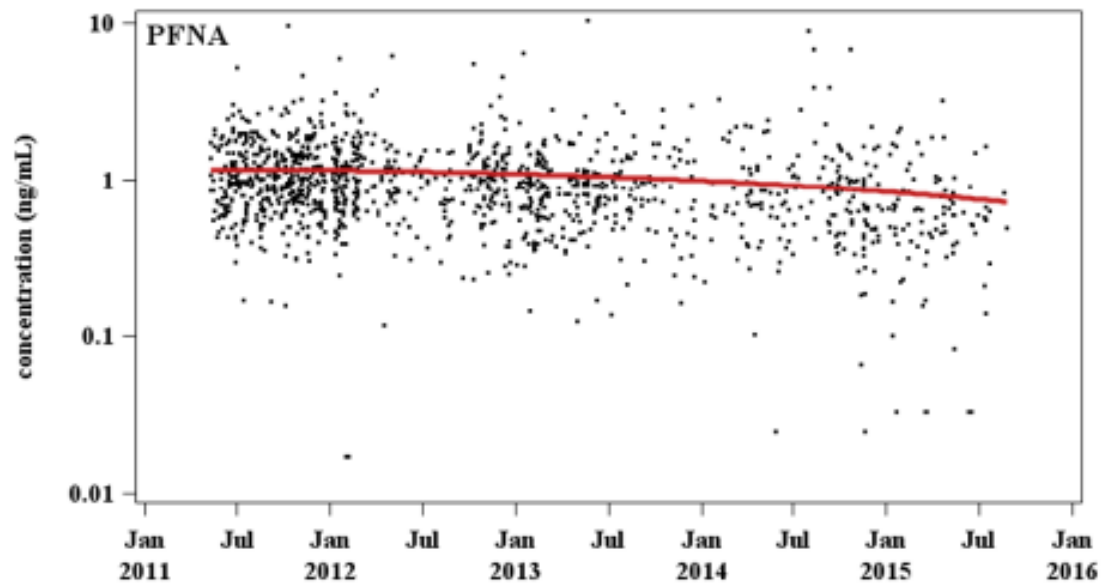
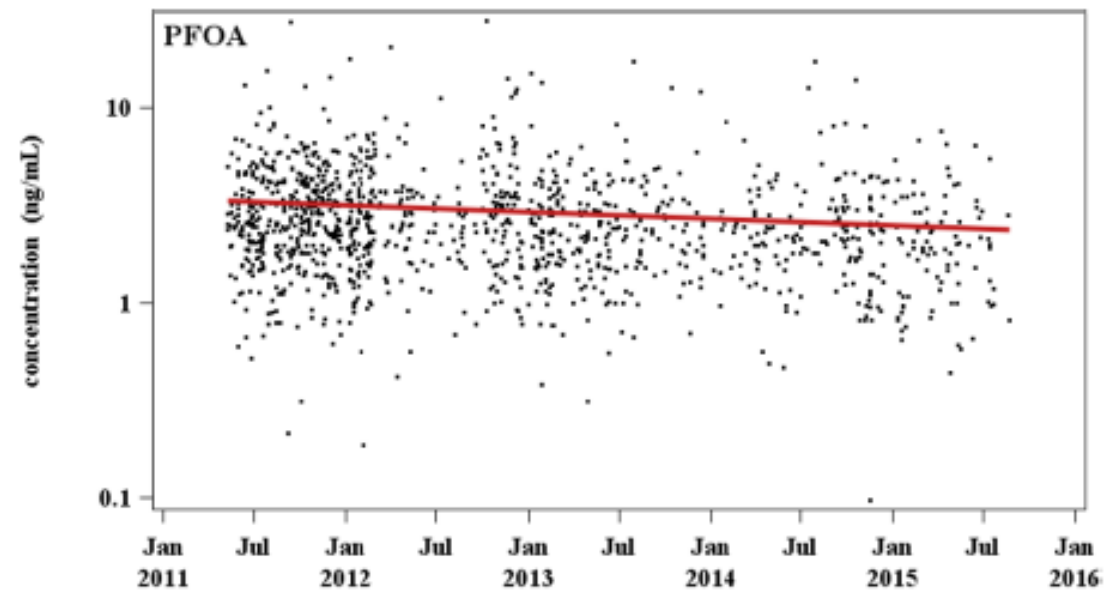
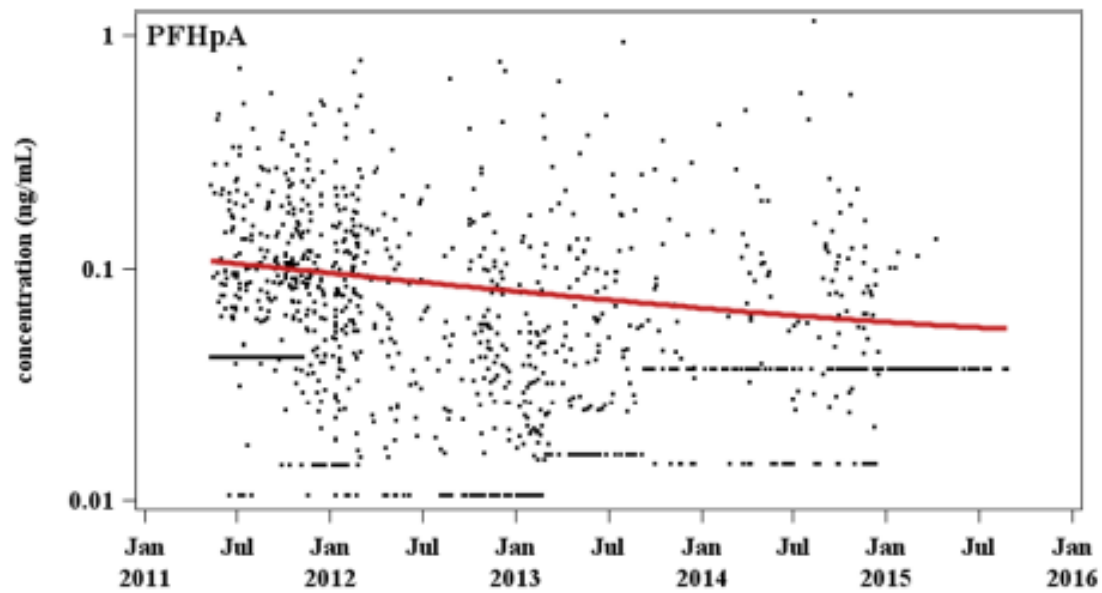
Highest PFAS Detection Frequencies - Biomonitoring California

- PFOS
- PFHxS
- PFNA
- MeFOSAA
- PFOA
- PFUA

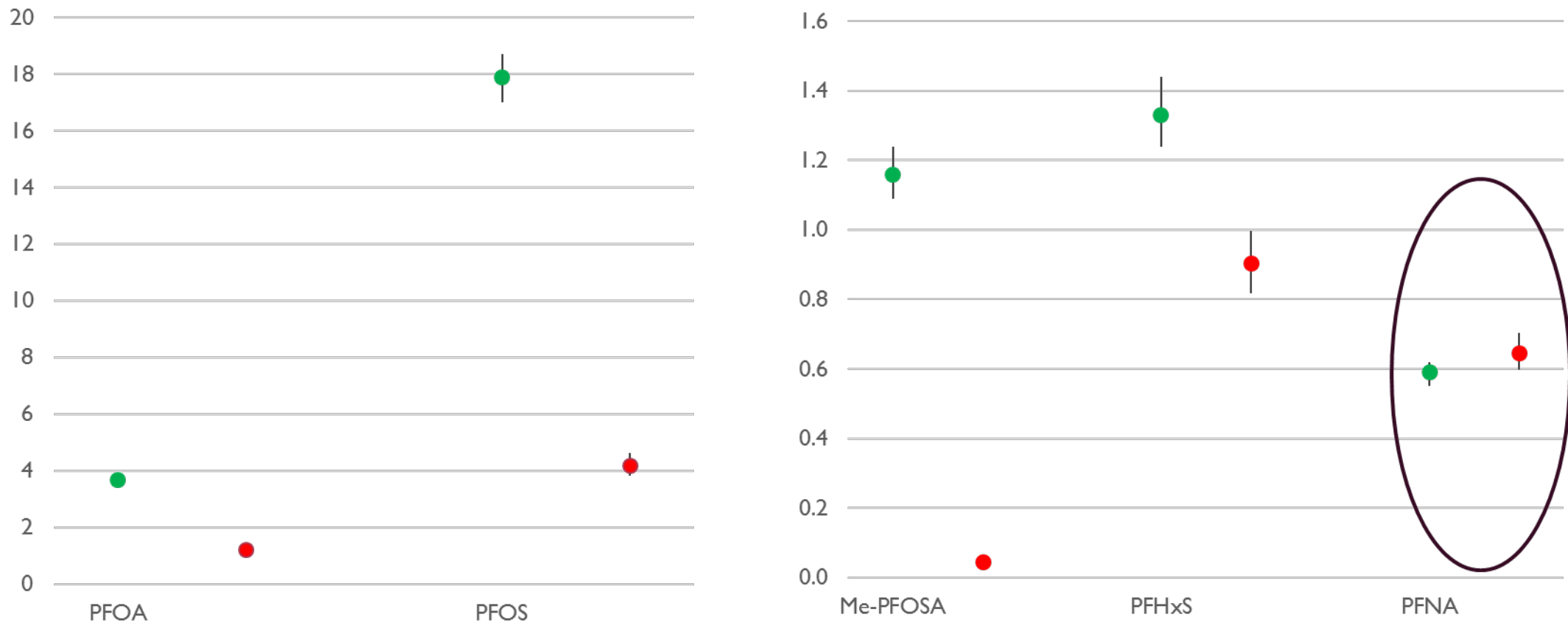
Lowest Detection Frequencies

- PFBS
- PFDoA
- PFOSA
- EtFOSAA

Time Trends in California Teachers Study – Hurley et al., 2018



Comparison of PFASs in Banked Genetic Screening Samples from 2000-2003* and 2012



● Banked Genetic Screening Samples (2000-2003) ● Biobank Samples MAMAS (2012)

*Data excerpted from Lyall K et al., 2018. Blood samples from 2000-2003 taken for genetic screening from N=433 controls.

Where do we go from here?

- Analysis of MAMAS data for temporal trends in pregnant women in CA
 - MAMAS-II (2015) PFASs data being finalized
 - Planned measurement of PFASs in MAMAS-III (2016)
- New PFASs data from CARE Study
 - PFASs measured in 8 regions over 8 years
 - Questionnaire data available

REFERENCES

- Hurley S, Goldberg D, Wang M et al. Time trends in per- and polyfluoroalkyl substances (PFASs) in California Women. Declining serum levels, 2011-2015. *Environ Sci Technol* 2018 Jan 2;52(1):277-287. doi: 10.1021/acs.est.7b04650. Epub 2017 Dec 19.
- Lyall K, Yau VM, Hansen R, Kharrazi M, Yoshida CK, Calafat AM, Windham G, Croen LA. Prenatal Maternal Serum Concentrations of Per- and Polyfluoroalkyl Substances in Association with Autism Spectrum Disorder and Intellectual Disability. *Environ Health Perspect*. 2018 Jan 2;126(1):017001. doi: 10.1289/EHP.1830. PMID: 2928162
- Joe L, Krowech G, Wang M, Fenster L et al. Levels of Poly- and Perfluoroalkyl Substances (PFASs) and Their Predictors in the Ethnically Diverse Biomonitoring Exposures Study (BEST) Cohort. Poster presentation. Council of State and Territorial Epidemiologists Annual Conference. June 19-23, 2016. Anchorage, Alaska.
- Woodruff TJ, Zota AR, Schwartz JM. Environmental chemicals in pregnant women in the United States: NHANES 2003-2004. *Environ Health Perspect*. 2011 Jun;119(6):878-85. doi: 10.1289/ehp.1002727. Epub 2011 Jan 14. PMID: 21233055