



BIOMONITORING CALIFORNIA

Program Update

Presentation to the Scientific Guidance Panel

August 27, 2025

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Program Updates

- **Surveillance**
- **Community-focused studies**
- **Laboratory work**
 - Environmental Chemistry Lab
 - Environmental Health Lab
- **Outreach and communications**

Surveillance Studies

| Study | Coverage | Sample Collection | Analytes |
|---|------------|-------------------|---|
| California Regional Exposure (CARE) Study | 3 regions | 2018 – 2020 | Perfluoroalkyl and polyfluoroalkyl substances (PFASs), metals, phenols, 1-nitropyrene |
| Studying Trends in Exposure in Prenatal Samples (STEPS) | 3 counties | 2015 – 2027 | PFASs |
| Measuring Analytes in Maternal Archived Samples (MAMAS) | 3 regions | 2012, 2015-2016 | PFASs, POPs |
| Future Surveillance | TBD | 2028 onward | TBD |

California Regional Exposure (CARE) Study

- Publications on PFAS exposures
 - Exposure to legacy per- and polyfluoroalkyl substances from diet and drinking water in California adults, 2018-2020. Environ Sci Tech 59(20). (Pennoyer, et al.)
 - Associations Between PFASs in Public Water System Drinking Water and Serum Among Southern California Adults. J. Expo Sci Environ Epidemiol. (Fillman, et al.)

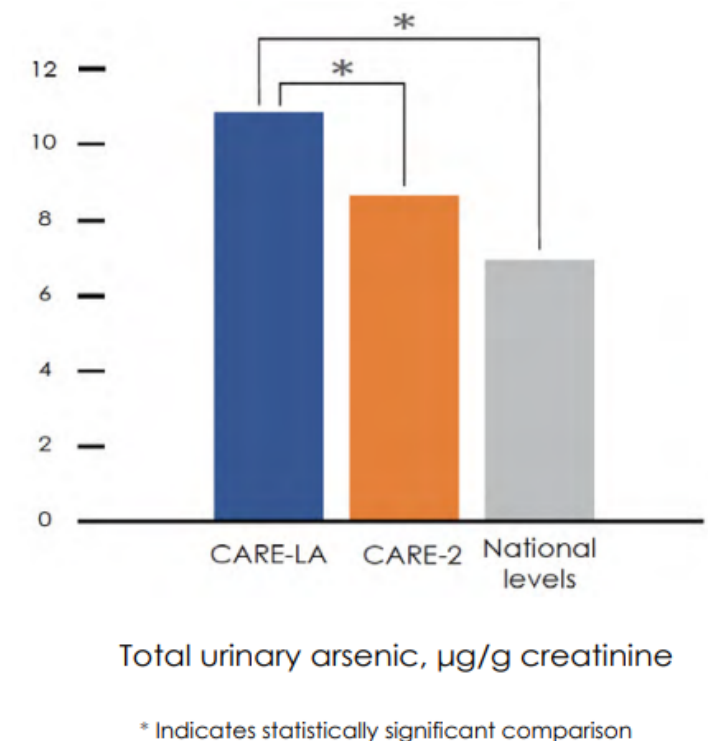
California Regional Exposure (CARE) Study

- CARE-LA: Weighted population data for speciated arsenic and phenols
 - Results return completed in August 2025
 - Web posting of weighted data pending
 - Data exploration in progress

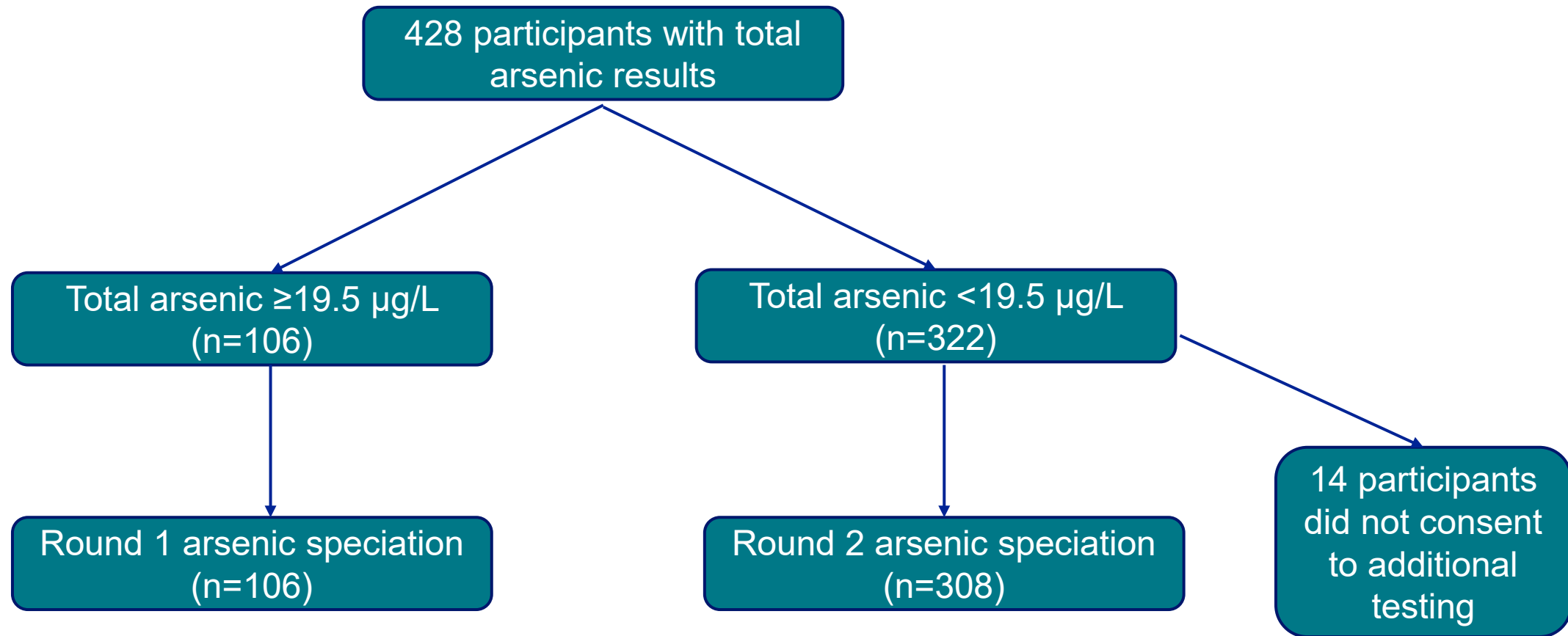


Why Speciate Arsenic?

- Organic and inorganic arsenic are generally from different exposure sources
- Inorganic arsenic is more toxic and associated with more health impacts
- Additional data will enable us to look at:
 - Impacts of inorganic arsenic exposure across the population
 - Identify sub-populations that are highly impacted
 - Evaluate exposure contributions from drinking water and other sources



CARE-LA Total Arsenic and Speciation



CARE-LA Speciated Arsenic (n=412)

| Analyte | Detection frequency | Geometric mean (µg/g creatinine) | 95th percentile (µg/g creatinine) |
|---|---------------------|----------------------------------|-----------------------------------|
| Sum of inorganic-related species | 100% | 6.0 | 22.0 |
| Arsenous (III) acid | 84% | 0.4 | 2.3 |
| Arsenic (V) acid | 22% | * | 1.1 |
| Dimethylarsinic acid | 100% | 4.5 | 13.7 |
| Monomethylarsonic acid | 95% | 0.6 | 1.7 |
| Sum of organic species | 83% | 1.8 | 38.0 |
| Arsenobetaine | 82% | 1.5 | 37.9 |
| Arsenocholine | 10% | * | 0.5 |

Of the 414 samples analyzed for speciated arsenic, two could not be creatinine adjusted.

Data weighted to underlying population

* GM not reported for analytes with DF ≤ 65%

Comparison of CARE-LA and NHANES: Detection Frequencies

| | CARE-LA | NHANES (2017-2018) |
|---|---------------------|---------------------|
| Analyte | Detection frequency | Detection frequency |
| Sum of inorganic-related species | 100% | 74% |
| Arsenous (III) acid | 79% | 32% |
| Arsenic (V) acid | 24% | 7% |
| Dimethylarsinic acid | 100% | 69% |
| Monomethylarsonic acid | 93% | 43% |
| Sum of organic species | 84% | 48% |
| Arsenobetaine | 84% | 46% |
| Arsenocholine | 10% | 8% |

Weighted data re-censored to highest MDL

* GM not reported for analytes with DF ≤ 65%

Comparison of CARE-LA and NHANES: Geometric Means

| Analyte | CARE-LA | NHANES (2017-2018) |
|---|-------------------------------------|-------------------------------------|
| | Geometric mean (µg/g creatinine) | Geometric mean (µg/g creatinine) |
| Sum of inorganic-related species | 7.0 ↑ | 4.7 |
| Arsenous (III) acid | 0.4 | * |
| Arsenic (V) acid | * | * |
| Dimethylarsinic acid | 4.9 ↑ | 3.3 |
| Monomethylarsonic acid | 0.6 | * |
| Sum of organic species | * | * |
| Arsenobetaine | * | * |
| Arsenocholine | * | * |

Weighted data re-censored to highest MDL

Arrows indicate statistically significant differences

* GM not reported for analytes with DF ≤ 65

CARE-LA Arsenic Data: Next Steps

Current Issues

- Drinking water
 - California Water Boards is evaluating the feasibility of lowering the MCL
- Diet

Potential partners

- California Water Boards
- OEHHA
- Community partners
- Academic partners

Potential analysis directions

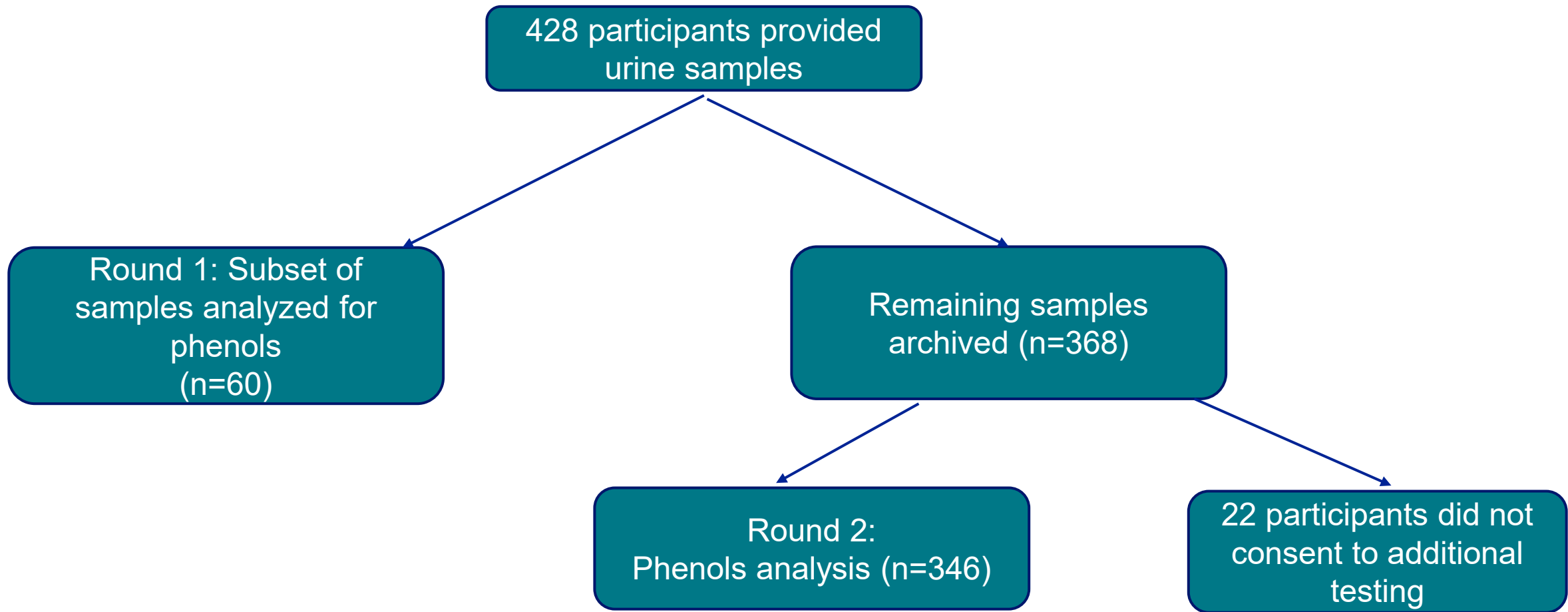
- Demographic trends
- Associations with exposure sources
 - Drinking water
 - Diet

Exposure questionnaire data: demographics, diet, drinking water source, occupation, hobbies, smoking

Environmental Phenols Background

- **Environmental phenols** are a broad class of chemicals with a common chemical structure that are used in many different materials.
- Examples include
 - Bisphenol A (BPA) - used in hard plastics, fabric adhesives, and some cash register receipts
 - Bisphenol S (BPS) and Bisphenol F (BPF) - substituted for BPA in some uses
 - Parabens - added as preservatives to personal care and other products
 - Benzophenone-3 (BP-3) - UV stabilizer and the active ingredient in many sunscreens
- Many phenols affect the endocrine system.

CARE-LA Phenols Analyses



CARE-LA Environmental Phenols (n = 406)

| Analyte | Detection Frequency | Geometric Mean (µg/g creatinine) | 95 th Percentile (µg/g creatinine) |
|----------------|---------------------|----------------------------------|---|
| Benzophenone-3 | 96% | 35.3 | 783 |
| Bisphenol A | 78% | 0.6 | 5.1 |
| Bisphenol F | 28% | * | 5.9 |
| Bisphenol S | 76% | 0.8 | 6.9 |
| Ethyl paraben | 35% | * | 66.7 |
| Methyl paraben | 83% | 18.4 | 389 |
| Propyl paraben | 66% | 3.5 | 158 |
| Triclocarban | 16% | * | 0.3 |
| Triclosan | 38% | * | 528 |

Data weighted to underlying population

* GM not reported for analytes with DF ≤ 65%

Comparison of CARE-LA and NHANES: Detection Frequencies

| Analyte | CARE-LA (2018) Detection Frequency | NHANES (2015-2016) Detection Frequency |
|----------------|---------------------------------------|---|
| Benzophenone-3 | 96% | 93% |
| Bisphenol A | 70% | 94% |
| Bisphenol F | 28% | 46% |
| Bisphenol S | 76% | 81% |
| Ethyl paraben | 28% | 49% |
| Methyl paraben | 82% | 98% |
| Propyl paraben | 66% | 97% |
| Triclocarban | 16% | 32% |
| Triclosan | 38% | 66% |

Weighted data re-censored to highest MDL

Comparison of CARE-LA and NHANES: Geometric Means

| Analyte | CARE-LA (2018) Geometric Mean (µg/g creatinine) | | NHANES (2015-2016) Geometric Mean (µg/g creatinine) |
|----------------|---|---|---|
| Benzophenone-3 | 35.3 | ↑ | 21.2 |
| Bisphenol A | 0.67 | ↓ | 1.1 |
| Bisphenol F | * | | * |
| Bisphenol S | 0.8 | ↑ | 0.5 |
| Ethyl paraben | * | | * |
| Methyl paraben | 20.6 | ↓ | 36.2 |
| Propyl paraben | 3.5 | | 4.9 |
| Triclocarban | * | | * |
| Triclosan | * | | 6.2 |

Weighted data re-censored to highest MDL
Arrows indicate statistically significant differences

* GM not reported for analytes with $DF \leq 65$

CARE-LA Phenols Data: Next Steps

Current Issues

- Consumer products and personal care products
 - Propyl and butyl paraben in skin applied/leave-in products
- SB-1226 – bans bisphenols in juvenile products (January 2026)

Potential Partners

- Other California programs
 - Safer Consumer Products Program
 - California Safe Cosmetics Program
 - OEHHA
- Academic and other research partners

Potential analysis directions

- Demographic trends
- Associations with exposure sources

Exposure questionnaire data:
demographics, diet,
occupation, hobbies

Studying Trends in Exposures in Prenatal Samples (STEPS)



| Sample Collection Location/Years | # Samples Acquired | Status |
|----------------------------------|--------------------|--------|
|----------------------------------|--------------------|--------|

| | | |
|---------------------------|------|---|
| Orange County (2015-2021) | 521 | All samples analyzed for PFASs ECL conducting QA |
| Fresno County (2015-2021) | 523 | 298 samples analyzed for PFASs |
| Los Angeles County (2024) | 1856 | Sample selection and analysis not yet initiated |

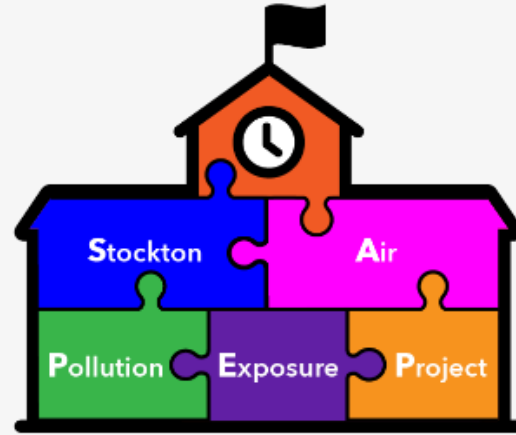
Measuring Analytes in Maternal Archived Samples (MAMAS)

- Trends of perfluoroalkyl and polyfluoroalkyl substances (PFASs) and persistent organic pollutants (POPs) in pregnant Californians (Dobraca et al.)
- Persistent organic pollutant (POP) levels in Californians:
Shouldn't hexachlorobenzene be decreasing? (Tang et al.)

Future Surveillance Planning

- Developing study protocol
 - Primary goal: to develop a methodology that can be implemented consistently into the future
 - Considering what analytes are most important to include
 - Considering potential study regions
 - Working on making field work more efficient through the evaluation of micro-samplers





Community-Focused Studies

- Asian/Pacific Islander Community Exposures (ACE) Project
- Stockton Air Pollution Exposure Project (SAPEP)
- Biomonitoring component of the San Joaquin Valley Pollution and Health Environmental Research Study (BiomSPHERE)
- Farmworker women & Respiratory Exposure to Smoke from Swamp Cooler Air (FRESSCA–Mujeres)

Results Communications for Community-Focused Studies



- Results returned for polycyclic aromatic hydrocarbons (PAHs) and volatile organic compounds (VOCs)
- Evaluation of results return materials ongoing



- Results returned for PAHs, VOCs, and metals
- Community meeting held on July 29th

Findings from Community-Focused Studies



- Associations between seafood consumption and serum PFAS levels among Asian/Pacific Islanders in the San Francisco Bay Area, California (ACE Project) – in review



- Levels of urinary PAH and VOC biomarkers among California schoolchildren living in an area heavily impacted by air pollution (SAPEP) - submitted for publication

Environmental Chemistry Laboratory

STEPS Samples

- PFAS analyses for 819 samples completed
 - Orange County: 521 samples analyzed
 - Fresno County: 298 samples analyzed

Continued Method Development

- Preparing for demonstration of new methods using Intraprogram Pilot (IPP) serum samples
 - Cyclosiloxanes
 - PAHs

Environmental Health Laboratory (EHLB)

California Regional Exposure (CARE) Study

- CARE-LA: Environmental phenols results reported (n=346)
- CARE-2: Arsenic speciation analyses almost complete (n=299)
- CARE-2: Phenols analyses to start (n=194)

Exploration of New Biomarkers

- Using non-targeted screening to improve targeted methods and potentially identify additional chemicals of concern
 - Identifying new biomarkers of PAH exposure, including carboxylated PAH metabolites
 - Using AI to support staff efforts to identify new potential biomarkers in both biomonitoring and product samples

Outreach and Communications

Are harmful chemicals lurking in your home?

Your old couch may contain more chemicals than you know!

Since the 1970s, products, in car seats, into dust and

PFAS and drinking water: lessons from the CARE Study

The California Regional Exposure (CARE) Study measured levels of chemicals in adults from southern and eastern counties of California from 2018-2020. CARE participants completed exposure questionnaires and provided blood serum samples for perfluoroalkyl and polyfluoroalkyl substances (PFAS) analysis. Over 99% of CARE participants had at least one PFAS detected in their body. Serum PFAS levels in the CARE population were lower than national levels, but may still pose potential health risks, especially for sensitive populations.

We linked CARE participants' home addresses to drinking water data from the California State Water Resources Control Board (SWRCB) to estimate the association between PFAS detections in drinking water and levels of PFAS in blood serum.

563 of 879 CARE participants' home addresses (64%) were matched to 70 public water systems monitored by the SWRCB for PFAS.

314 of 563 participants (56%) lived in a public water system service area with a detection of at least 1 of 18 PFAS.

History of Chemical Flame Retardants in California

- Due to old fire safety standards, polybiphenyl ether (PBDEs) levels in Calif are higher than the rest of the country.
- Upholstered furniture made with foam 2015 is more likely to contain chemical retardants than new furniture.
- In 2013, California updated its fire safety standard for upholstered furniture (TB 2013). Manufacturers can now meet requirements without using chemical flame retardants.

Furniture made with padding or cushion(s) covered with fabric or leather

Key Findings

- PBDE blood levels went down in FREI and the comparison group. However, decreased faster in the FREI participants.
- Replacing older furniture with furniture without chemical flame retardants effective way to reduce exposure.
- However, changes in OPFR urine level relationship with furniture replacement.

Key findings

We looked at PFAS levels in 563 participants living in public water system service areas with PFAS testing in untreated source wells and/or treated drinking water.

- Participants whose public water system had at least one perfluorooctane sulfonic acid (PFHxS) detection had 32% higher serum PFHxS levels.
- Participants whose public water system had PFHxS detections in more than half of the sampling locations had 64% higher serum PFHxS levels.

We looked at the subset of 235 participants living in the 29 public water system service areas where treated drinking water was tested for PFAS.

- Participants whose public water system had at least one PFHxS detection had 80% higher serum PFHxS levels.
- For additional PFAS, participants whose public water system had at least one PFAS detection had 30-42% higher serum PFAS levels.

Overall, PFAS contamination in drinking water may be a significant contributor to PFAS levels for adults in southern and eastern California.

Fact Sheets

← Posts

capublichealth

CDPH 1/4

4 Ways to Avoid Forever Chemicals like PFASs

Filter Drinking Water

Heart icon Q1 Comment icon Share icon Bookmark icon

Social Media

Biomonitoring CA Intro 4 min

Play (k) 0:44 / 3:34 Scroll for details

Videos

Staff Update

Dinesh Adhikari

Kathleen Attfield

Hyoung Gee Baek

Paramjit Behniwal

Emily Beglarian*

Rebecca Belloso

Kelly Chen

Key-Young Choe

Josephine DeGuzman

Jagdish Dhaliwal*

Dina Dobraca

Julian Edwards

Toki Fillman

Songmei Gao

Qi Gavin

Ranjit Gill

Raymond Hughley*

Susan Hurley

Stephanie Jarmul

Duyen Kauffman

Amber Kramer*

Kiera Melton

Meltem Musa

Bishnu Neupane

June-Soo Park

Eimi Percival

Aalekhya Reddam

Martha Sandy

Roshni Sarala

Maya Shattuck

Jianwen She

Kaitlin Stitt*

Wenlu Song

Justin Sturgess

Dan Sultana

Sayaka Takaku-Pugh

Ian Tang

Darcy Tarrant

McKenna Thompson

Jeff Wagner

Miaomiao Wang

Shizhong Wang

Yunzhu (Judy) Wang

Nerissa Wu

Ruihong Xiao

Mylanah Yolangco^

^ New staff

*** Departed staff**



Questions?