

Laboratory Analytes Reported by Biomonitoring California

Materials for March 2019 Scientific Guidance Panel Meeting

Analytes, grouped by lab panel ¹	Sample type	Current studies ²
Environmental phenols Benzophenone-3 Bisphenol A Bisphenol F Bisphenol S Parabens – butyl, ethyl, methyl, propyl Triclocarban Triclosan	Urine	CARE Study: LA (Region 1) Under consideration for Region 2 ³ PPVS Laboratory Pilot Study
Metals Antimony (u)* Arsenic (u) Cadmium (b, u)* Cobalt (u) Lead (b)* Manganese (b, u)* Mercury (b, u)* Molybdenum (u) Thallium (u) Uranium (u)	Blood (b) and/or urine (u)	CARE Study NCFF Study (*Partial set)
Arsenic speciation Arsenic (V) acid Arsenobetaine Arsenocholine Arsenous (III) acid Dimethylarsinic acid Monomethylarsonic acid	Urine	CARE Study

¹ Includes only analytes that are currently being reported, or would be reported if the lab panel were to be run in a future study. This is a partial list of Biomonitoring California laboratory capability.

² Includes current Biomonitoring California studies and lab collaborations that are measuring these analytes. Refer to page 4 for study abbreviations.

³ Region 2 includes Mono, Inyo, San Bernardino, Riverside, and Imperial counties.

Analytes, grouped by lab panel ¹	Sample type	Current studies ²
<p>PFASs</p> <p><i>Perfluoroalkyl carboxylic acids</i></p> <p>Perfluorobutanoic acid</p> <p>Perfluoropentanoic acid</p> <p>Perfluorohexanoic acid</p> <p>Perfluoroheptanoic acid^{†^}</p> <p>Perfluorooctanoic acid^{†^}</p> <p>Perfluorononanoic acid^{†^}</p> <p>Perfluorodecanoic acid^{†^}</p> <p>Perfluoroundecanoic acid^{†^}</p> <p>Perfluorododecanoic acid^{†^}</p> <p><i>Perfluoroalkyl sulfonic acids</i></p> <p>Perfluorobutane sulfonic acid[†]</p> <p>Perfluorohexane sulfonic acid^{†^}</p> <p>Perfluorooctane sulfonic acid^{†^}</p> <p>Perfluorodecane sulfonic acid</p> <p><i>Fluorotelomer acids</i></p> <p>5:3 Fluorotelomer carboxylic acid</p> <p>7:3 Fluorotelomer carboxylic acid</p> <p>6:2 Fluorotelomer carboxylic acid</p> <p>8:2 Fluorotelomer carboxylic acid</p> <p><i>Fluorotelomer unsaturated acids</i></p> <p>6:2 Fluorotelomer unsaturated carboxylic acid</p> <p>8:2 Fluorotelomer unsaturated carboxylic acid</p> <p><i>Fluorotelomer sulfonic acids</i></p> <p>4:2 Fluorotelomer sulfonic acid</p> <p>6:2 Fluorotelomer sulfonic acid</p> <p>8:2 Fluorotelomer sulfonic acid</p> <p><i>Fluorotelomer phosphate esters</i></p> <p>8:2 Fluorotelomer phosphate monoester</p> <p>6:2 Fluorotelomer phosphate diester</p> <p>8:2 Fluorotelomer phosphate diester</p> <p><i>Perfluorooctane sulfonamides/sulfonamido acetic acids</i></p> <p>Perfluorooctane sulfonamide^{†^}</p> <p>2-(N-Ethyl-perfluorooctane sulfonamido) acetic acid^{†^}</p> <p>2-(N-Methyl-perfluorooctane sulfonamido) acetic acid^{†^}</p> <p><i>Perfluoroalkylphosphinic acids</i></p> <p>Bis(perfluorohexyl)phosphinic acid</p> <p>Perfluorohexylperfluorooctyl phosphinic acid</p> <p><i>Perfluoroalkylphosphonic acids</i></p> <p>Perfluorohexylphosphonic acid</p> <p>Perfluorooctylphosphonic acid</p>	Serum	<p>CARE Study ([†]Partial set)</p> <p>MAMAS-1⁴ ([^]Partial set)</p> <p>MAMAS-2 and -3</p> <p>NCFF Study</p> <p>ECHO</p>

⁴ See page 5 for details on MAMAS-1, -2 and -3.

Analytes, grouped by lab panel ¹			Sample type	Current studies ²
PBDEs BDE 17 BDE 28 BDE 47 BDE 66 BDE 85 BDE 99 BDE 100 BDE 153 BDE 154 BDE 183 BDE 196 BDE 197 BDE 201 BDE 202 BDE 203 BDE 206 BDE 207 BDE 208 BDE 209	PCBs PCB 66 PCB 74 PCB 99 PCB 101 PCB 105 PCB 118 PCB 138 PCB 153 PCB 156 PCB 170 PCB 180 PCB 183 PCB 187 PCB 194 PCB 203	OCPs 2,4'-DDT 4,4'-DDT 4,4'-DDE beta-HCH Hexachlorobenzene Oxychlorane t-Nonachlor	Serum	FREES (PBDEs) NCFF Study (PBDEs and PCBs) MAMAS Laboratory Pilot Study (PBDEs)
OPFR metabolites Bis(2-chloroethyl) phosphate (BCEP) Bis(1,3-dichloroisopropyl) phosphate (BDCIPP) Diphenyl phosphate (DPhP)			Urine	FREES Laboratory Pilot Study
PAH metabolites (hydroxy-PAHs) 1-Hydroxynaphthalene 1-Hydroxyphenanthrene 1-Hydroxypyrene 2-Hydroxyfluorene 2-Hydroxynaphthalene 2-Hydroxyphenanthrene 3-Hydroxyfluorene 3-Hydroxyphenanthrene 9-Hydroxyfluorene			Urine	Laboratory Pilot Study (All except 1-hydroxynaphthalene)
Pesticides <i>OP pesticide metabolites - specific</i> IMPY – metabolite of diazinon TCPy – metabolite of chlorpyrifos <i>Pyrethroid metabolites – non-specific</i> trans-DCCA 4-Fluoro-3-phenoxybenzoic acid 3-Phenoxybenzoic acid <i>Herbicide</i> 2,4-Dichlorophenoxyacetic acid			Urine	Under consideration for CARE Study, Region 2
Tobacco smoke – nicotine metabolites Cotinine Hydroxycotinine			Serum	MACOTA Study (Cotinine)

Analytes, grouped by lab panel ¹	Sample type	Current studies ²
Perchlorate	Urine	--
Phthalate metabolites Mono-(2-ethyl-5-carboxypentyl) phthalate Mono-(3-carboxypropyl) phthalate Mono-benzyl phthalate Mono-cyclohexyl phthalate Mono-ethyl phthalate Mono-n-butyl phthalate Mono-isobutyl phthalate Mono-(2-ethyl-5-hydroxyhexyl) phthalate Mono-(2-ethyl-5-oxohexyl) phthalate Mono-(2-ethylhexyl) phthalate	Urine	--
Volatile organic compound (VOC) metabolites Method ⁵ under development, funded by Proposition 99	Urine	--

Abbreviations:

CARE Study = California Regional Exposure Study
 BDE = Brominated diphenyl ether
 DCCA = 3-(2,2-Dichlorovinyl)-2,2-dimethylcyclopropane carboxylic acid
 DDE = Dichlorodiphenyldichloroethene
 DDT = Dichlorodiphenyltrichloroethane
 ECHO⁶ = Environmental Influences on Child Health Outcomes
 FREES = Foam Replacement Environmental Exposure Study
 HCH = Hexachlorocyclohexane
 IMPY = 2-Isopropyl-4-methyl-6-hydroxypyrimidine
 LA = Los Angeles County
 MACOTA Study⁷ = Maternal Cotinine and Autism Study

MAMAS = Measuring Analytes in Maternal Archived Samples
 NCF Study = Northern California Firefighter Study
 OCPs = Organochlorine pesticides
 OP = Organophosphate
 OPFRs = Organophosphate flame retardants
 PAHs = Polycyclic aromatic hydrocarbons
 PBDEs = Polybrominated diphenyl ethers
 PCBs = Polychlorinated biphenyls
 PFASs = Perfluoroalkyl and polyfluoroalkyl substances
 PPVS⁸ = Phenols & Phthalates Validation Study
 TCPy = 3,5,6-Trichloro-2-pyridinol

⁵ https://wwwn.cdc.gov/nchs/data/nhanes/2015-2016/labmethods/UVOC_UVOCS_I_MET.pdf

⁶ Laboratory collaboration with University of California San Francisco and University of Illinois Urbana-Champaign. Samples from pediatric cohorts UG3/UH3.

⁷ Laboratory collaboration with Gayle Windham at the California Department of Public Health.

⁸ Laboratory collaboration with San Jose State University.

Description of MAMAS

Maternal serum samples from pregnant women are collected by regional laboratories as a part of the State's Genetic Disease Screening Program (GDSP). Biomonitoring California has obtained three sets of samples from GDSP, selected across racial groups (White, Hispanic, Black, and Asian) and region (see table below). Analytes being measured include PFASs, PBDEs, PCBs, and OCPs.

MAMAS-1 (n=460)	MAMAS-2 (n=540)	MAMAS-3 (n=300)
<i>2012 samples</i>	<i>2015 samples</i>	<i>2015-2016 samples</i>
Orange San Diego	Los Angeles San Bernardino Riverside Contra Costa Alameda Del Norte Siskiyou Modoc Humboldt Trinity Shasta Lassen Mendocino Lake Tehama Glenn Colusa Sutter Yuba Butte Plumas Sierra Nevada Placer	Sonoma Marin Napa Solano Yolo Sacramento San Francisco San Mateo Santa Cruz Santa Clara San Benito Monterey San Luis Obispo Santa Barbara Ventura Imperial