

Biomonitoring California Analytical Capability

California Department of Public Health (CDPH) Environmental Health Laboratory
 Department of Toxic Substances Control (DTSC) Environmental Chemistry Laboratory

| Method | Equipment |
|--|---|
| <p>PFCs in serum at DTSC</p> <ul style="list-style-type: none"> 2-(N-Ethyl-perfluorooctane sulfonamido) acetic acid 2-(N-Methyl-perfluorooctane sulfonamido) acetic acid Perfluorobutane sulfonic acid Perfluorodecanoic acid Perfluorododecanoic acid Perfluoroheptanoic acid Perfluorohexane sulfonic acid Perfluorononanoic acid Perfluorooctane sulfonamide Perfluorooctane sulfonic acid Perfluorooctanoic acid Perfluoroundecanoic acid | <p>AB Sciex API 4000 QTRAP with Symbiosis Pharma online SPE-HPLC system</p> |
| <p>PFASs in serum at DTSC</p> <ul style="list-style-type: none"> Perfluoro-n-butanoic acid Perfluoro-n-pentanoic acid Perfluoro-n-hexanoic acid Perfluoro-n-heptanoic acid Perfluoro-n-octanoic acid Perfluoro-n-nonanoic acid Perfluoro-n-decanoic acid Perfluoro-n-undecanoic acid Perfluoro-n-dodecanoic acid Perfluorobutane sulfonic acid Perfluorohexane sulfonic acid Perfluorooctane sulfonic acid Perfluorodecane sulfonic acid 3-Perfluoropentyl propanoic acid 3-Perfluoroheptyl propanoic acid 2H-Perfluoro-2-ocetenoic acid 2H-Perfluoro-2-decenoic acid Sodium 1H,1H,2H,2H-perfluorohexane sulfonate Sodium 1H,1H,2H,2H-perfluorooctane sulfonate Sodium 1H,1H,2H,2H-perfluorodecane sulfonate Sodium 1H,1H,2H,2H-perfluorodecylphosphate Sodium bis (1H,1H,2H,2H-perfluorooctyl) phosphate Sodium bis (1H,1H,2H,2H-perfluorodecyl) phosphate Perfluoro-1-octanesulfonamide N-Ethylperfluoro-1-octanesulfonamidoacetic acid N-Methylperfluoro-1-octanesulfonamidoacetic acid Sodium bis(perfluorohexyl)phosphinate Sodium perfluorohexylperfluorooctylphosphinate Perfluorohexylphosphonic acid Perfluorooctylphosphonic acid | <p>AB Sciex 5500 QTRAP HPLC MS/MS</p> |

| Method | Equipment |
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| <p>PBDEs, PCBs, and OCPs in serum at DTSC</p> <p>BDE 17 PCB 66 2,4'-Dichlorodiphenyltrichloroethane BDE 28 PCB 74 4,4'-Dichlorodiphenyldichloroethene BDE 47 PCB 99 4,4'-Dichlorodiphenyltrichloroethane BDE 66 PCB 101 beta-Hexachlorocyclohexane BDE 85 PCB 105 Hexachlorobenzene BDE 99 PCB 118 Oxychlorane BDE100 PCB 138 t-Nonachlor BDE 153 PCB 153 BDE 154 PCB 156 BDE 183 PCB 170 BDE 196 PCB 180 BDE 197 PCB 183 BDE 201 PCB 187 BDE 202 PCB 194 BDE 203 PCB 203 BDE 206 BDE 207 BDE 208 BDE 209</p> | <p>Thermo Scientific DFS High Resolution GC-MS</p> <p>Agilent 7890B Quadrupole MS/MS System</p> |
| <p>PBDEs and PCBs in Dried Blood Spots at CDPH</p> | <p>Thermo Scientific DFS High Resolution GC-MS¹</p> |
| <p>Hydroxy-BDE Metabolites in serum at DTSC</p> <p>2'-OH-BDE 68 4'-OH-BDE 101 3-OH-BDE 47 4'-OH-BDE 17 4'-OH-BDE 49 3-OH-BDE 100 4-OH-BDE 42 4-OH-BDE 90 6'-OH-BDE 99 5-OH-BDE 47 5'-OH-BDE 99 6-OH-BDE 47</p> | <p>AB Sciex 5500 QTRAP HPLC MS/MS²</p> |
| <p>BPA, TBBPA, and Bromophenols in serum at DTSC</p> <p>2,4,6-Tribromophenol 2,4-Dibromophenol Bisphenol A (BPA) Tetrabromobisphenol-A (TBBPA)</p> | <p>AB Sciex 5500 QTRAP HPLC MS/MS³</p> |
| <p>OPFR Metabolites in urine at DTSC</p> <p>Bis(2-chloroethyl) phosphate (BCEP) Bis(1-chloro-2-propyl) phosphate (BCIPP) Bis(1,3-dichloro-2-propyl) phosphate (BDCIPP) Diphenyl phosphate (DPhP)</p> | <p>AB Sciex 5500 QTRAP HPLC MS/MS⁴</p> |

| Method | Equipment |
|---|--|
| OPFR Metabolites in urine at CDPH Bis(2-chloroethyl) phosphate (BCEP) Bis(1-chloro-2-propyl) phosphate (BCIPP) Bis(1,3-dichloro-2-propyl) phosphate (BDCIPP) Diphenyl phosphate (DPhP) | AB Sciex 5500 LC-MS/MS ⁵ |
| Phthalates in urine at CDPH Mono-(2-ethyl-5-carboxypentyl) phthalate Mono-(3-carboxypropyl) phthalate Mono-benzyl phthalate Mono-cyclohexyl phthalate Mono-ethyl phthalate Mono-n-butyl phthalate Mono-iso-butyl phthalate Mono-(2-ethyl-5-hydroxyl) phthalate Mono-(2-ethyl-5-oxohexyl) phthalate Mono-(2-ethylhexyl) phthalate | AB Sciex API 5000 LC-MS/MS |
| Monohydroxy-Polycyclic Aromatic Hydrocarbons (OH-PAHs) in urine at CDPH 1-Hydroxynaphthalene 1-Hydroxyphenanthrene 1-Hydroxypyrene 2-Hydroxyfluorene 2-Hydroxynaphthalene 2-Hydroxyphenanthrene 3-Hydroxyfluorene 3-Hydroxyphenanthrene 9-Hydroxyfluorene | Thermo Scientific DFS High Resolution GC-MS ⁶ Or Agilent 6460 Ultra HPLC-MS Triple Quad |
| Universal Pesticides⁷ in urine at CDPH 2,4,5-Trichlorophenoxyacetic acid 2,4-Dichlorophenoxyacetic acid 2-Isopropyl-4-methyl-6-hydroxypyrimidine 3,5,6-Trichloro-2-pyridinol 3-Phenoxybenzoic Acid 4-Fluoro-3-phenoxybenzoic acid Atrazine mercapturate trans-3-(2,2-Dichlorovinyl)-2,2-dimethylcyclopropane-1-carboxylic acid N,N-Dimethyl-m-toluamide (DEET) | AB Sciex 5500 LC-MS/MS ⁸ |
| Non-specific OP Metabolites (DAPs) in urine at CDPH Diethyl dithiophosphate Diethyl phosphate Dimethyl dithiophosphate Dimethyl thiophosphate | Agilent 7000 GC-MS/MS Triple Quad |
| Environmental Phenols in urine at CDPH 2,4,5-Trichlorophenol 2,4,6-Trichlorophenol 2,4-Dichlorophenol 2,5-Dichlorophenol 4-t-Octylphenol Benzophenone-3 | AB Sciex 5500 QTRAP LC-MS/MS |

| Method | Equipment |
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| <p><i>(Environmental phenols, cont.)</i> Bisphenol A Butyl paraben Ethyl paraben Methyl paraben Ortho-phenylphenol Propyl paraben Triclosan</p> | |
| <p>Perchlorate in urine at CDPH Perchlorate</p> | AB Sciex API 5000 IC-MS/MS |
| <p>Trace Metals in blood/serum at CDPH Cadmium Lead Manganese Mercury Tungsten Uranium</p> | Agilent 7700 ICP-MS |
| <p>Metals in urine at CDPH Arsenic Cadmium Chromium Cobalt Manganese Mercury Molybdenum Selenium Thallium Tungsten</p> | Agilent 7500 ICP-MS |
| <p>Arsenic Speciation in urine at CDPH Arsenic (V) acid Arsenobetaine Arsenocholine Arsenous (III) acid Dimethylarsinic acid Monomethylarsonic acid</p> | Agilent 7700 ICP-MS with LC |
| <p>Semi-Targeted Screening at DTSC</p> | Agilent 6550 LC-QTOF |
| <p>Semi-Targeted Screening at CDPH</p> | Thermo Fisher Scientific Q Exactive Plus |
| <p>Creatinine in urine at CDPH</p> | BioTek ELx800 |
| <p>Dioxins (chlorinated and brominated) at DTSC</p> | Thermo Scientific DFS High Resolution GC-MS |

Selected Abbreviations:

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|------|----------------------------|-------|---|
| DAPS | Dialkyl phosphates | OPFRs | Organophosphate flame retardants |
| GC | Gas Chromatography | PBDEs | Polybrominated diphenyl ethers |
| LC | Liquid Chromatography | PCBs | Polychlorinated biphenyls |
| HPLC | High Performance LC | PFASs | Perfluoroalkyl and polyfluoroalkyl substances |
| ECD | Electron Capture Detector | PFCs | Perfluorinated chemicals |
| ICP | Inductively Coupled Plasma | MS | Mass Spectrometer |
| OCPs | Organochlorine pesticides | SPE | Solid Phase Extraction |
| OP | Organophosphate | | |

¹ Equipment shared with PAH method at CDPH

² Equipment shared with BPAs, TBBPA, BPs in serum and OPFR Metabolites in urine at DTSC

³ Equipment shared with Hydroxy-BDE Metabolites in serum and OPFR Metabolites in urine at DTSC

⁴ Equipment shared with Hydroxy BDE Metabolite and BPAs, TBBPA, BPs in serum at DTSC

⁵ Equipment shared with Universal Pesticides in urine at CDPH

⁶ Equipment shared with PBDEs, PCBs, OCPs in Dried Blood Spots at CDPH

⁷ Specific OP metabolites, selected pyrethroid and herbicide metabolites, and DEET

⁸ Equipment shared with OPFR Metabolites in urine at CDPH