Biomonitoring California
Designated Chemicals
October 2017

The designated chemicals for the California Environmental Contaminant Biomonitoring Program[a] (also known as Biomonitoring California) are provided in this list. Designated chemicals consist of those substances that are included in the Centers for Disease Control and Prevention's (CDC's) biomonitoring studies[b] and additional chemicals that are recommended by the Scientific Guidance Panel (SGP) for Biomonitoring California. Designated chemicals are the pool of chemicals from which the SGP can recommend priority chemicals for biomonitoring.

Targets for measurement in biomonitoring studies could include the parent chemical, metabolites and other chemical products formed in the body or the environment (e.g., hemoglobin adduct; environmental degradation product). The approach for biomonitoring a chemical may change as methods development proceeds. For some of the parent chemicals listed below, metabolites or other targets for measurement are shown indented underneath. Chemicals are grouped into categories (like "metals" and "pesticides"); some are included in more than one category. The Program determines the chemicals that are actually biomonitored and the appropriate targets for measurement. To jump to each footnote referenced in the list below, click on the relevant number.

Acrylamide

- Acrylamide hemoglobin adducts
- Glycidamide hemoglobin adducts
- N-Acetyl-S-(2-carbamoyl-2-hydroxyethyl)-L-cysteine
- N-Acetyl-S-(2-carbamoylethyl)-L-cysteine

Antimicrobials used in Food Production [1]

Brominated and Chlorinated Organic Compounds used as Flame Retardants [1]

- Allyl 2,4,6-tribromophenyl ether (ATE)
- 2,2-Bis(bromomethyl)-1,3-propanediol
- 2,2-Bis(chloromethyl)trimethylene bis[bis(2-chloroethyl)phosphate]
- Bis(2-ethyl-1-hexyl)tetrabromophthalate (TBPH)
- Bis(hexachlorocyclopentadieno)cyclooctane (Dechlorane Plus)
- 1,2-Bis(2,4,6-tribromophenoxy)ethane (BTBPE)
- 2-Bromoallyl 2,4,6-tribromophenyl ether (BATE)
- Chlorendic acid
- Decabromodiphenylethane (DBDPE)
- 1,2-Dibromo-4-(1,2-dibromoethyl)cyclohexane (TBECH)
- 2,4-Dibromophenol
- 2,3-Dibromopropyl-2,4,6-tribromophenyl ether (DPTE)
- 2-Ethyl-1-hexyl-2,3,4,5-tetrabromobenzoate (TBB)
- *N*,*N*′-Ethylenebis(tetrabromophthalimide)
- Hexabromobenzene (HBB)
- 2,2′,4,4′,5,5′-Hexabromobiphenyl (BB 153)
- Hexabromocyclododecane (HBCD)
- Hexachlorocyclopentadienyl-dibromocyclooctane
- Isobutoxypentabromocyclododecanes (iBPBCDs)
- Octabromotrimethylphenylindane (OBIND)
- Pentabromoethylbenzene (PBEB)
- Pentabromophenol (PBP)
- Pentabromotoluene (PBT)
- Short-chain chlorinated paraffins
- Tetrabromobisphenol A (TBBPA)
- Tetrabromobisphenol A bis(2,3-dibromopropyl) ether (TBBPA-DBPE)
- Tetrabromobisphenol A bis(2-hydroxyethyl) ether
- Tetrabromophthalic anhydride
- 2,3,5,6-Tetrabromo-*p*-xylene
- 2,4,6-Tribromophenol
- Tris(2-chloroethyl)phosphate (TCEP)
- Tris(1-chloro-2-propyl)phosphate (TCPP)
- Tris(2,3-dibromopropyl) isocyanurate
- Tris(2,3-dibromopropyl)phosphate (TDBPP)
- Tris(1,3-dichloro-2-propyl)phosphate (TDCPP)
- Tris(2,3-dichloro-1-propyl)phosphate

Polybrominated diphenyl ethers (PBDEs)

- 2,2′,4-Tribromodiphenyl ether (BDE 17)
- 2,4,4′-Tribromodiphenyl ether (BDE 28)
- 2,2′,4,4′-Tetrabromodiphenyl ether (BDE 47)
- 2,3′,4,4′-Tetrabromodiphenyl ether (BDE 66)
- 2,2′,3,4,4′-Pentabromodiphenyl ether (BDE 85)
- 2,2′,4,4′,5-Pentabromodiphenyl ether (BDE 99)
- 2,2′,4,4′,6-Pentabromodiphenyl ether (BDE 100)
- 2,2′,4,4′,5,5′-Hexabromodiphenyl ether (BDE 153)

a. Codified at Health and Safety Code section 105440 et seq.
b. Known collectively as the National Reports on Human Exposure to Environmental Chemicals program.

2,2′,4,4′,5,6′-Hexabromodiphenyl ether (BDE 154)
2,2′,3,4,4′,5′,6-Heptabromodiphenyl ether (BDE 183)
2,2′,3,3′,4,4′,5,6′-Octabromodiphenyl ether (BDE 196)
2,2′,3,3′,4,4′,6,6′-Octabromodiphenyl ether (BDE 197)
2,2′,3,3′,4,5′,6,6′-Octabromodiphenyl ether (BDE 201)
2,2′,3,3′,5,5′,6,6′-Octabromodiphenyl ether (BDE 202)
2,2′,3,4,4′,5,5′,6-Octabromodiphenyl ether (BDE 203)
2,2′,3,3′,4,4′,5,5′,6-Nonabromodiphenyl ether (BDE 206)
2,2′,3,3′,4,4′,5,6,6′-Nonabromodiphenyl ether (BDE 207)
2,2′,3,3′,4,5,5′,6,6′-Nonabromodiphenyl ether (BDE 208)
2,2′,3,3′,4,4′,5,5′,6,6′-Decabromodiphenyl ether (BDE 209)

Hydroxy-PBDEs (Metabolites of PBDEs)

4′-Hydroxy-BDE 17
4-Hydroxy-BDE 42
3-Hydroxy-BDE 47
5-Hydroxy-BDE 47
6-Hydroxy-BDE 47
4′-Hydroxy-BDE 49
2′-Hydroxy-BDE 68
4-Hydroxy-BDE 90
5′-Hydroxy-BDE 99
6′-Hydroxy-BDE 99
3-Hydroxy-BDE 100
5′-Hydroxy-BDE 100
4′-Hydroxy-BDE 101
4′-Hydroxy-BDE 103

Cyclosiloxanes [1]

Decamethylcyclopentasiloxane (D5)
Dodecamethylcyclohexasiloxane (D6)
Octamethylcyclotetrasiloxane (D4)

Diesel Exhaust [2]

Diglycidyl Ethers of *p,p′*-Bisphenols [1]

Bisphenol A diglycidyl ether (BADGE)
Bisphenol F diglycidyl ether (BFDGE)

Disinfection By-Products (Trihalomethanes) [3]

Bromodichloromethane
Dibromochloromethane
Tribromomethane (Bromoform)
Trichloromethane (Chloroform)

Environmental Phenols [3]

Benzophenone-3
4-*t*-Octylphenol
o-Phenylphenol

_p,p′_-Bisphenols [1]

Bisphenol A
Bisphenol AF (BPAF)
Bisphenol B (BPB)
Bisphenol F (BPF)
Bisphenol S (BPS)
4,4′-Sulfonylbis[2-(2-propen-1-yl)phenol] (TGSA)

Brominated phenols [4]

2,4-Dibromophenol
Pentabromophenol (PBP)
Tetrabromobisphenol-A (TBBPA)
2,4,6-Tribromophenol

Chlorinated phenols [5]

2,4-Dichlorophenol
2,5-Dichlorophenol
Pentachlorophenol
2,4,5-Trichlorophenol
2,4,6-Trichlorophenol
Triclosan

Parabens [3]

Butylparaben [6]
Ethylparaben
Methylparaben
n-Propylparaben

Related chemicals

Triclocarban [7]

Metals [3]

Antimony
Arsenic
- Arsenic (V) acid
- Arsenobetaine
- Arsenocholine
- Arsenous (III) acid
- Dimethylarsinic acid
- Monomethylarsonic acid
- Trimethylarsine oxide

Barium
Beryllium
Cadmium
Cesium
Chromium
Cobalt
Copper
Lead
Manganese
Mercury
- Ethyl mercury
- Methyl mercury

Molybdenum
Platinum
Selenium
Strontium
Thallium
Tin
Tungsten
Uranium
Zinc

Non-Halogenated Aromatic Phosphates [1]

Bisphenol A bis(diphenyl phosphate)
Butylated triphenyl phosphate
t-Butylphenyl diphenyl phosphate
2-Ethylhexyl diphenyl phosphate
Isodecyl diphenyl phosphate
Isopropyl phenyl diphenyl phosphate
Isopropylated triphenyl phosphate
Resorcinol bis(diphenyl phosphate)
Tricresyl phosphate
Triphenyl phosphate

Perchlorate and Other Anions [8]

Perchlorate

Other Anions

Nitrate
Thiocyanate

Perfluoroalkyl and Polyfluoroalkyl Substances (PFASs) [1, 9]

Ammonium 4,8-dioxa-3H-perfluorononanoate (ADONA)
Bis(perfluorohexyl)phosphinic acid
Bis(perfluorooctyl)phosphinic acid
N-Ethyl-perfluorooctane sulfonamido acetic acid
6:2 Fluorotelomer acetate
8:2 Fluorotelomer acetate
10:2 Fluorotelomer acetate
6:2 Fluorotelomer acrylate
8:2 Fluorotelomer acrylate
10:2 Fluorotelomer acrylate
5:3 Fluorotelomer carboxylic acid
6:2 Fluorotelomer carboxylic acid
7:3 Fluorotelomer carboxylic acid
8:2 Fluorotelomer carboxylic acid
10:2 Fluorotelomer carboxylic acid
6:2 Fluorotelomer phosphate diester
6:2/8:2 Fluorotelomer phosphate diester
8:2 Fluorotelomer phosphate diester
6:2 Fluorotelomer phosphate monoester
4:2 Fluorotelomer sulfonic acid
6:2 Fluorotelomer sulfonic acid
8:2 Fluorotelomer sulfonic acid
6:2 Fluorotelomer unsaturated carboxylic acid
8:2 Fluorotelomer unsaturated carboxylic acid
10:2 Fluorotelomer unsaturated carboxylic acid
N-Methyl-perfluorooctane sulfonamido acetic acid
Perfluorobutane sulfonic acid (PFBS)
Perfluorobutanoic acid
Perfluorodecanoic acid
Perfluorodecylphosphonic acid
Perfluorododecanoic acid
Perfluoroethylcyclohexane sulfonic acid
Perfluoroheptane sulfonic acid
Perfluoroheptanoic acid
Perfluorohexadecanoic acid
Perfluorohexane sulfonic acid (PFHxS)
Perfluorohexanoic acid
Perfluorohexylperfluorooctylphosphinic acid
Perfluorohexylphosphonic acid
Perfluorononane sulfonic acid
Perfluorononanoic acid (PFNA)
Perfluorooctadecanoic acid
Perfluorooctane sulfonamide
Perfluorooctane sulfonic acid (PFOS), including linear and branched isomers
Perfluorooctanoic acid (PFOA), including linear and branched isomers
Perfluorooctylphosphonic acid
Perfluoropentane sulfonic acid
Perfluoropentanoic acid
Perfluorotetradecanoic acid
Perfluorotridecanoic acid
Perfluoroundecanoic acid
Potassium 1,1,2,2,-tetrafluoro-2-({1,1,1,2,3,3-hexafluoro-3-[(trifluorovinyl)oxy]-2-propanyl}oxy)ethanesulfonate tetrafluoroethene
Sodium bis-[2-(N-ethylperfluorooctane-1-sulfonamido)ethyl] phosphate
Sodium 2-(N-ethylperfluorooctane-1-sulfonamido)ethyl phosphate
2,3,3,3-Tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)propanoic acid

Pesticides [3, 10]

Carbamate Insecticides [3]

Benfuracarb
  Carbofuranphenol
Carbaryl
  1-Hydroxynaphthalene [11]
  2-Hydroxynaphthalene [11]
Carbofuran
  Carbofuranphenol
Carbosulfan
  Carbofuranphenol
Furathiocarb
  Carbofuranphenol
Propoxur
  2-Isopropoxyphenol

Fungicides [3]

Captafol
  Tetrahydrophthalimide

Captan
- Phthalimide
- Tetrahydrophthalimide

Chlorothalonil
Dichloran
Folpet
- Phthalimide

Iprodione
Mancozeb
- Ethylene thiourea

Maneb
- Ethylene thiourea

Metalaxyl
Metiram
- Ethylene thiourea

Nabam
- Ethylene thiourea

Pentachlorophenol
o-Phenylphenol
Propineb
- Propylene thiourea

Thiram
- Ethylene thiourea

Ziram
- Ethylene thiourea

Herbicides - Substituted Ureas [3]

Bensulfuron-methyl
Chlorimuron-ethyl
Chlorsulfuron
Diuron
Ethametsulfuron-methyl
Foramsulfuron
Halosulfuron
Iodosulfuron
Linuron
Mesosulfuron-methyl
Metsulfuron-methyl
Nicosulfuron
Oxasulfuron
Primisulfuron-methyl
Prosulfuron
Rimsulfuron
Sulfometuron-methyl
Sulfosulfuron
Thifensulfuron-methyl
Triasulfuron
Triflusulfuron-methyl
Non-specific metabolites
- Dimethoxy pyrimidine
- Dimethyl pyrimidine
- Methyl methoxytriazine

Organochlorine Pesticides [3]

Aldrin
- Dieldrin

Chlordane
- *trans*-Nonachlor
- Oxychlordane

Dichlorodiphenyltrichloroethane (DDT) (including *p,p'*-DDT and *o,p'*-DDT)
- *p,p'*-Dichlorodiphenyldichloroethene (*p,p'*-DDE)

Dieldrin
Endosulfan
- Endosulfan-ether
- Endosulfan-lactone
- Endosulfan-sulfate

Endrin
Heptachlor
- Heptachlor epoxide

Hexachlorobenzene
- Pentachlorophenol
- 2,4,5-Trichlorophenol
- 2,4,6-Trichlorophenol

Hexachlorocyclohexanes (HCH) (including *beta*-HCH and *gamma*-HCH [lindane])
- Pentachlorophenol
- 2,4,5-Trichlorophenol
- 2,4,6-Trichlorophenol

Methoxychlor
- Dihydroxy methoxychlor
- Monohydroxy methoxychlor

Mirex
2,4,5-Trichlorophenol
2,4,6-Trichlorophenol

Organophosphorus Pesticides [1]

Acephate
Azinphos methyl
- Dimethyldithiophosphate
- Dimethylphosphate
- Dimethylthiophosphate

Bensulide
Chlorethoxyphos
- Diethylphosphate
- Diethylthiophosphate

Chlorpyrifos
- Diethylphosphate
- Diethylthiophosphate
- 3,5,6-Trichloro-2-pyridinol (TCPy)

Chlorpyrifos methyl
- Dimethylphosphate
- Dimethylthiophosphate
- 3,5,6-Trichloro-2-pyridinol (TCPy)

Coumaphos
- 3-Chloro-7-hydroxy-4-methyl-2H-chromen-2-one/ol
- Diethylphosphate
- Diethylthiophosphate

Diazinon
- Diethylphosphate
- Diethylthiophosphate
- 2-Isopropyl-4-methyl-6-hydroxypyrimidine

Dichlorvos (DDVP)
- Dimethylphosphate

Dicrotophos
- Dimethylphosphate

Dimethoate
- Dimethyldithiophosphate
- Dimethylphosphate
- Dimethylthiophosphate
- Omethoate

Disulfoton
- Diethyldithiophosphate
- Diethylphosphate
- Diethylthiophosphate

Ethion
- Diethyldithiophosphate
- Diethylphosphate
- Diethylthiophosphate

Ethoprop

Fenitrothion
- Dimethylphosphate
- Dimethylthiophosphate

Fenthion
- Dimethylphosphate
- Dimethylthiophosphate

Glufosinate-ammonium
- 3-Methylphosphinicopropionic acid (3-MPPA)

Glyphosate
- Aminomethylphosphonic acid (AMPA)

Isazophos-methyl
- 5-Chloro-1,2-dihydro-1-isopropyl-[3H]-1,2,4-triazol-3-one
- Dimethylphosphate
- Dimethylthiophosphate

Malathion
- Dimethyldithiophosphate
- Dimethylphosphate
- Dimethylthiophosphate
- Malathion dicarboxylic acid

Methamidophos

Methidathion
- Dimethyldithiophosphate
- Dimethylphosphate
- Dimethylthiophosphate

Methyl parathion
- Dimethylphosphate
- Dimethylthiophosphate
- *p*-Nitrophenol

Naled
- Dimethylphosphate

Oxydemeton-methyl
- Dimethylphosphate
- Dimethylthiophosphate

Parathion (Ethyl parathion)
- Diethylphosphate
- Diethylthiophosphate
- *p*-Nitrophenol

Phorate
- Diethyldithiophosphate
- Diethylphosphate
- Diethylthiophosphate

Phosmet (Imidan)
- Dimethyldithiophosphate
- Dimethylphosphate
- Dimethylthiophosphate

Pirimiphos-methyl
- 2-(Diethylamino)-6-methylpyrimidin-4-ol/one
- Dimethylphosphate
- Dimethylthiophosphate

Sulfotep
- Diethylphosphate
- Diethylthiophosphate

Temephos
- Dimethylphosphate
- Dimethylthiophosphate

Terbufos
- Diethyldithiophosphate
- Diethylphosphate
- Diethylthiophosphate

Tetrachlorvinphos
- Dimethylphosphate

Tribufos

Pyrethroid Pesticides [1]

Allethrin
- *cis/trans*-Dimethylvinylcyclopropane carboxylic diacid

Bifenthrin

Cyfluthrin
- *cis*-3-(2,2-Dichlorovinyl)-2,2-dimethylcyclopropane carboxylic acid (*cis*-DCCA)
- *trans*-3-(2,2-Dichlorovinyl)-2,2-dimethylcyclopropane carboxylic acid (*trans*-DCCA)
- 4-Fluoro-3-phenoxybenzoic acid

Cyhalothrin (including *lamba*- and *gamma*-)
- 3-Phenoxybenzoic acid (3-PBA)

Cypermethrin (including *cis*- and *trans*-)
- *cis*-3-(2,2-Dichlorovinyl)-2,2-dimethylcyclopropane carboxylic acid (*cis*-DCCA)
- *trans*-3-(2,2-Dichlorovinyl)-2,2-dimethylcyclopropane carboxylic acid (*trans*-DCCA)
- 3-Phenoxybenzoic acid (3-PBA)

Cyphenothrin

Deltamethrin
- *cis*-3-(2,2-Dibromovinyl)-2,2-dimethylcyclopropane carboxylic acid
- 3-Phenoxybenzoic acid (3-PBA)

Esbiothrin

Esfenvalerate

Etofenprox

Fenpropathrin
- 3-Phenoxybenzoic acid (3-PBA)

Fenvalerate

Imiprothrin

Metofluthrin

Permethrin (including *cis*- and *trans*-)
- *cis*-3-(2,2-Dichlorovinyl)-2,2-dimethylcyclopropane carboxylic acid (*cis*-DCCA)

trans-3-(2,2-Dichlorovinyl)-2,2-dimethylcyclopropane carboxylic acid (*trans*-DCCA)
3-Phenoxybenzoic acid (3-PBA)
Phenothrin (Sumithrin)
Prallethrin
Pyrethrin 1
cis/trans-Dimethylvinylcyclopropane carboxylic diacid
Resmethrin
cis/trans-Dimethylvinylcyclopropane carboxylic diacid
Tetramethrin
Tralomethrin
3-Phenoxybenzoic acid (3-PBA)

Other Herbicides

Acetochlor
Acetochlor mercapturate
Alachlor
Alachlor mercapturate
Atrazine
Atrazine mercapturate
Diaminochlorotriazine
Desethylatrazine
Desisopropylatrazine
Hydroxyatrazine
Dacthal
2,4-Dichlorophenoxyacetic acid (2,4-D), salts and esters
2,4-Dichlorophenoxyacetic acid
2,4-Dichlorophenol
Metolachlor
Metolachlor mercapturate
Pendimethalin
2,4,5-Trichlorophenoxyacetic acid (2,4,5-T), salts and esters
2,4,5-Trichlorophenoxyacetic acid
Trifluralin

Other Pesticides

1,4-Dichlorobenzene (*p*-Dichlorobenzene)
2,5-Dichlorophenol
N,*N*-Diethyl-3-methylbenzamide (DEET)
3-Diethylcarbamoyl benzoic acid (DCBA)
N,N-Diethyl-3-(hydroxymethyl) benzamide (DHMB)
Fipronil
Octhilinone

ortho-Phthalates [1]

Benzylbutyl phthalate (BzBP)
Mono-benzyl phthalate (MBzP)
Mono-*n*-butyl phthalate (MnBP)
Diallyl phthalate
Di-*n*-butyl phthalate (DnBP)
Mono-*n*-butyl phthalate (MnBP)
Di-isobutyl phthalate (DIBP)
Mono-isobutyl phthalate (MIBP)
Dicyclohexyl phthalate (DCHP)
Mono-cyclohexyl phthalate (MCHP)
Diethyl phthalate (DEP)
Mono-ethyl phthalate (MEP)
Di-2-ethylhexyl phthalate (DEHP)
Mono-(2-carboxymethylhexyl) phthalate
Mono-(2-ethyl-5-carboxypentyl) phthalate (MECPP)
Mono-2-ethylhexyl phthalate (MEHP)
Mono-(2-ethyl-5-hydroxyhexyl) phthalate (MEHHP)
Mono-(2-ethyl-5-oxohexyl) phthalate (MEOHP)
Di-*n*-hexyl phthalate
Di-isodecyl phthalate (DIDP)
Mono-(carboxynonyl) phthalate (MCNP)
Di-isoheptyl phthalate
Di-isononyl phthalate (DINP)
Mono-(carboxyoctyl) phthalate (MCOP)
Mono-(hydroxyisononyl) phthalate
Mono-isononyl phthalate (MINP)
Mono-(oxoisononyl) phthalate
Dimethyl phthalate (DMP)
Mono-methyl phthalate (MMP)
Di-*n*-octyl phthalate (DnOP)
Mono-(3-carboxypropyl) phthalate (MCPP)
Mono-*n*-octyl phthalate (MnOP)
Di-*n*-pentyl phthalate
Di-2-propylheptyl phthalate
Diundecyl phthalate
Di-isoundecyl phthalate
Di-isotridecyl phthalate

Phthalate Alternatives [3]

1,2-Cyclohexane dicarboxylic acid, diisononyl ester (DINCH)
Cyclohexane-1,2-dicarboxylic acid-mono (hydroxy-isononyl ester) (MHNCH)

Phytoestrogens [3]

Daidzein
O-Desmethylangolensin
Equol
Enterodiol
Enterolactone
Genistein

Polychlorinated Biphenyls (PCBs), Dioxin-Like [3]

Coplanar PCBs [3]

3,4,4′,5-Tetrachlorobiphenyl (PCB 81)
3,3′,4,4′,5-Pentachlorobiphenyl (PCB 126)
3,3′,4,4′,5,5′-Hexachlorobiphenyl (PCB 169)

Mono-*ortho*-Substituted PCBs [3]

2,3,3′,4,4′-Pentachlorobiphenyl (PCB 105)
2,3′,4,4′,5-Pentachlorobiphenyl (PCB 118)
2,3,3′,4,4′,5-Hexachlorobiphenyl (PCB 156)

2,3,3′,4,4′,5′-Hexachlorobiphenyl (PCB 157)
2,3′,4,4′,5,5′-Hexachlorobiphenyl (PCB 167)
2,3,3′,4,4′,5,5′-Heptachlorobiphenyl (PCB 189)

Polychlorinated Biphenyls (PCBs), Non-Dioxin-Like [3]

2,2′,5-Trichlorobiphenyl (PCB 18)
2,4,4′-Trichlorobiphenyl (PCB 28)
2,2′,3,5′-Tetrachlorobiphenyl (PCB 44)
2,2′,4,5′-Tetrachlorobiphenyl (PCB 49)
2,2′,5,5′-Tetrachlorobiphenyl (PCB 52)
2,3′,4,4′-Tetrachlorobiphenyl (PCB 66)
2,4,4′,5-Tetrachlorobiphenyl (PCB 74)
2,2′,3,4,5′-Pentachlorobiphenyl (PCB 87)
2,2′,4,4′,5-Pentachlorobiphenyl (PCB 99)
2,2′,4,5,5′-Pentachlorobiphenyl (PCB 101)
2,3,3′,4′,6-Pentachlorobiphenyl (PCB 110)
2,2′,3,3′,4,4′-Hexachlorobiphenyl (PCB 128)
2,2′,3,4,4′,5′-Hexachlorobiphenyl (PCB 138)
2,2′,3,4′,5,5′-Hexachlorobiphenyl (PCB 146)
2,2′,3,4′,5′,6-Hexachlorobiphenyl (PCB 149)
2,2′,3,5,5′,6-Hexachlorobiphenyl (PCB 151)
2,2′,4,4′,5,5′-Hexachlorobiphenyl (PCB 153)
2,3,3′,4,4′,6-Hexachlorobiphenyl (PCB 158)
2,2′,3,3′,4,4′,5-Heptachlorobiphenyl (PCB 170)
2,2′,3,3′,4,5,5′-Heptachlorobiphenyl (PCB 172)
2,2′,3,3′,4,5′,6′-Heptachlorobiphenyl (PCB 177)
2,2′,3,3′,5,5′,6-Heptachlorobiphenyl (PCB 178)
2,2′,3,4,4′,5,5′-Heptachlorobiphenyl (PCB 180)
2,2′,3,4,4′,5′,6-Heptachlorobiphenyl (PCB 183)
2,2′,3,4′,5,5′,6-Heptachlorobiphenyl (PCB 187)
2,2′,3,3′,4,4′,5,5′-Octachlorobiphenyl (PCB 194)
2,2′,3,3′,4,4′,5,6-Octachlorobiphenyl (PCB 195)
2,2′,3,3′,4,4′,5,6′-Octachlorobiphenyl (PCB 196)
2,2′,3,3′,4,5,5′,6-Octachlorobiphenyl (PCB 199)
2,2′,3,4,4′,5,5′,6-Octachlorobiphenyl (PCB 203)
2,2′,3,3′,4,4′,5,5′,6-Nonachlorobiphenyl (PCB 206)
2,2′,3,3′,4,4′,5,5′,6,6′-Decachlorobiphenyl (PCB 209)

Polychlorinated Biphenyls (PCBs)

Hydroxy-PCBs (Metabolites of PCBs)

4-Hydroxy-PCB 107
4-Hydroxy-PCB 120
4′-Hydroxy-PCB 130
3′-Hydroxy-PCB 138
4-Hydroxy-PCB 146
3-Hydroxy-PCB 153
4′-Hydroxy-PCB 172
3′-Hydroxy-PCB 180
4-Hydroxy-PCB 187
4′-Hydroxy-PCB 193

Polychlorinated Dibenzo-*p*-dioxins [3]

1,2,3,4,6,7,8-Heptachlorodibenzo-*p*-dioxin
1,2,3,4,7,8-Hexachlorodibenzo-*p*-dioxin
1,2,3,6,7,8-Hexachlorodibenzo-*p*-dioxin
1,2,3,7,8,9-Hexachlorodibenzo-*p*-dioxin
1,2,3,4,6,7,8,9-Octachlorodibenzo-*p*-dioxin
1,2,3,7,8-Pentachlorodibenzo-*p*-dioxin
2,3,7,8-Tetrachlorodibenzo-*p*-dioxin (TCDD)

Polychlorinated Dibenzofurans [3]

1,2,3,4,6,7,8-Heptachlorodibenzofuran
1,2,3,4,7,8,9-Heptachlorodibenzofuran
1,2,3,4,7,8-Hexachlorodibenzofuran
1,2,3,6,7,8-Hexachlorodibenzofuran
1,2,3,7,8,9-Hexachlorodibenzofuran
2,3,4,6,7,8-Hexachlorodibenzofuran
1,2,3,4,6,7,8,9-Octachlorodibenzofuran
1,2,3,7,8-Pentachlorodibenzofuran
2,3,4,7,8-Pentachlorodibenzofuran
2,3,7,8-Tetrachlorodibenzofuran

Polycyclic Aromatic Hydrocarbons (PAHs) [3]

Benz[a]anthracene
- 1-Hydroxybenz[a]anthracene
- 3-Hydroxybenz[a]anthracene
- 9-Hydroxybenz[a]anthracene

Benzo[a]pyrene
- 3-Hydroxybenzo[a]pyrene

Benzo[c]phenanthrene
- 1-Hydroxybenzo[c]phenanthrene
- 2-Hydroxybenzo[c]phenanthrene
- 3-Hydroxybenzo[c]phenanthrene

Chrysene
- 1-Hydroxychrysene
- 2-Hydroxychrysene
- 3-Hydroxychrysene
- 4-Hydroxychrysene
- 6-Hydroxychrysene

Fluoranthene
- 3-Hydroxyfluoranthene

Fluorene
- 2-Hydroxyfluorene
- 3-Hydroxyfluorene
- 9-Hydroxyfluorene

Naphthalene
- 1-Hydroxynaphthalene
- 2-Hydroxynaphthalene

Phenanthrene
- 1-Hydroxyphenanthrene
- 2-Hydroxyphenanthrene
- 3-Hydroxyphenanthrene
- 4-Hydroxyphenanthrene
- 9-Hydroxyphenanthrene

Pyrene
- 1-Hydroxypyrene

Synthetic Hormones used in Food Production [1]

Melengestrol acetate
Trenbolone acetate
Zeranol

Synthetic Polycyclic Musks [1]

4-Acetyl-1,1-dimethyl-6-tert-butylindan (ADBI)
6-Acetyl-1,1,2,3,3,5-hexamethylindane (AHMI)
7-Acetyl-1,1,3,4,4,6-hexamethyl-tetrahydronaphthalene (AHTN)
5-Acetyl-1,1,2,6-tetramethyl-3-isopropylindan (ATII)
Acetylethyltetramethyltetralin (AETT)
6,7-Dihydro-1,1,2,3,3-pentamethyl-4[5H]indanone (DPMI)
1,3,4,6,7,8-Hexahydro-4,6,6,7,8,8-hexamethyl-cyclopenta[g]-2-benzopyran (HHCB)

Tetramethyl Acetyloctahydronaphthalenes [1]

1-(1,2,3,4,6,7,8,8a-Octahydro-2,3,8,8-tetramethyl-2-naphthalenyl)ethanone (alpha isomer)
1-(1,2,3,4,5,6,7,8-Octahydro-2,3,8,8-tetramethyl-2-naphthalenyl)ethanone (beta isomer; OTNE)
1-(1,2,3,5,6,7,8,8a-Octahydro-2,3,8,8-tetramethyl-2-naphthalenyl)ethanone (gamma isomer)
1-(1,2,3,4,5,6,7,8-Octahydro-2,3,5,5-tetramethyl-2-naphthalenyl)ethanone

Tobacco Smoke

Nicotine
  Cotinine
NNK (4-[Methylnitrosamino]-1-[3-pyridyl]-1-butanone)
  NNAL (4-[Methylnitrosamino)-1-(3-pyridyl)-1-butanol)

Volatile Organic Compounds [3]

Acrolein
  N-Acetyl-S-(2-carboxyethyl)-L-cysteine
  N-Acetyl-S-(3-hydroxypropyl)-L-cysteine
Acrylonitrile
  N-Acetyl-S-(2-cyanoethyl)-L-cysteine
  N-Acetyl-S-(2-hydroxyethyl)-L-cysteine
Benzene
  N-Acetyl-S-(phenyl)-L-cysteine
  t,*t*-Muconic acid
1-Bromopropane
  N-Acetyl-S-(*n*-propyl)-L-cysteine
1,3-Butadiene
  N-Acetyl-S-(3,4-dihydroxybutyl)-L-cysteine
  N-Acetyl-S-(2-hydroxy-3-butenyl)-L-cysteine
  N-Acetyl-S-(4-hydroxy-2-butenyl)-L-cysteine
  N-Acetyl-S-(1-hydroxymethyl-2-propenyl)-L-cysteine
Carbon disulfide
  2-Thioxothiazolidine-4-carboxylic acid
Carbon tetrachloride
Chlorobenzene
Crotonaldehyde
  N-Acetyl-S-(3-hydroxypropyl-1-methyl)-L-cysteine
Cyanide
  2-Aminothiazoline-4-carboxylic acid
Dibromomethane
1,2-Dibromo-3-chloropropane (DBCP)
1,2-Dibromoethane
1,2-Dichlorobenzene (*o*-Dichlorobenzene)
1,3-Dichlorobenzene (*m*-Dichlorobenzene)
1,4-Dichlorobenzene (*p*-Dichlorobenzene)
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethene
cis-1,2-Dichloroethene
trans-1,2-Dichloroethene
Dichloromethane (Methylene chloride)
1,2-Dichloropropane
N,N-Dimethylformamide
  N-Acetyl-S-(N-methylcarbamoyl)-L-cysteine
2,5-Dimethylfuran
Ethylbenzene
  Phenylglyoxylic acid
Ethylene oxide
  N-Acetyl-S-(2-hydroxyethyl)-L-cysteine
Furan
Hexachloroethane
Isopropylbenzene (Cumene)
Methyl-*t*-butyl ether (MTBE)
Nitrobenzene
Nitromethane
Propylene oxide
  N-Acetyl-S-(2-hydroxypropyl)-L-cysteine
Styrene
  N-Acetyl-S-(1-phenyl-2-hydroxyethyl)-L-cysteine
  N-Acetyl-S-(2-phenyl-2-hydroxyethyl)-L-cysteine
  Mandelic acid
  Phenylglyoxylic acid
1,1,1,2-Tetrachloroethane
1,1,2,2-Tetrachloroethane
Tetrachloroethene (Perchloroethylene)
  N-Acetyl-S-(trichlorovinyl)-L-cysteine
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethene (Trichloroethylene)
  N-Acetyl-S-(1,2-dichlorovinyl)-L-cysteine
  N-Acetyl-S-(2,2-dichlorovinyl)-L-cysteine
1,2,3-Trichloropropane
Toluene
  N-Acetyl-S-(benzyl)-L-cysteine
Vinyl chloride
  N-Acetyl-S-(2-hydroxyethyl)-L-cysteine

m-Xylene
- N-Acetyl-S-(dimethylphenyl)-L-cysteine
- 3-Methylhippuric acid

o-Xylene
- N-Acetyl-S-(dimethylphenyl)-L-cysteine
- 2-Methylhippuric acid

p-Xylene
- N-Acetyl-S-(dimethylphenyl)-L-cysteine
- 4-Methylhippuric acid

Notes

[1] All members of the chemical group are designated chemicals, including, but not limited to, the chemicals shown.

[2] Diesel exhaust is a complex mixture that contains many components, one or more of which may be useful as an indicator for biomonitoring.

[3] All members of the chemical group are not designated chemicals; only the specific chemicals listed are designated chemicals.

[4] These brominated phenols are part of the chemical group "brominated and chlorinated organic chemicals used as flame retardants", which are listed as designated chemicals. The brominated phenols are also included in the category "environmental phenols" because the laboratory measures them with other environmental phenols.

[5] These chlorinated phenols, with the exception of triclosan, are metabolites of certain pesticides that are listed as designated chemicals. These chlorinated phenols are also included in the category "environmental phenols" because the laboratory measures them with other environmental phenols.

[6] Includes *n*-butylparaben and isobutylparaben.

[7] Triclocarban is not a phenol but can be analytically measured with environmental phenols. When it is released into the environment, it is commonly found in the same environmental media as triclosan.

[8] CDC measures nitrate and thiocyanate along with perchlorate, because all three anions can affect iodine uptake by the thyroid.

[9] A chemical is a perfluoroalkyl substance if all carbon atoms, except for carbon atoms associated with functional groups (such as an aldehyde group), are fully fluorinated. In a polyfluoroalkyl substance, at least one (but not all) of the carbon atoms is fully fluorinated.

[10] Fungicides, herbicides, and insecticides are grouped under the general heading of "Pesticides."

[11] 1-Hydroxynaphthalene is the metabolite of both carbaryl and naphthalene. To determine the percent of 1-hydroxynaphthalene attributable to carbaryl alone, 2-hydroxynaphthalene (which is only a metabolite of naphthalene) must also be measured.