

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-carbamoyl-ethyl)-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'-Dichlorodipenyldichloroethene (*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	Dimethylthiophosphate
Dimethyldithiophosphate	Pirimiphos-methyl
Dimethylphosphate	2-(Diethylamino)-6-methylpyrimidin-4-ol/one
Dimethylthiophosphate	Dimethylphosphate
Omethoate	Dimethylthiophosphate
Disulfoton	Sulfotep
Diethyldithiophosphate	Diethylphosphate
Diethylphosphate	Diethylthiophosphate
Diethylthiophosphate	Temephos
Ethion	Dimethylphosphate
Diethyldithiophosphate	Dimethylthiophosphate
Diethylphosphate	Terbufos
Diethylthiophosphate	Diethyldithiophosphate
Ethoprop	Diethylphosphate
Fenitrothion	Diethylthiophosphate
Dimethylphosphate	Tetrachlorvinphos
Dimethylthiophosphate	Dimethylphosphate
Fenthion	Tribufos
Dimethylphosphate	Pyrethroid Pesticides ¹
Dimethylthiophosphate	Allethrin
Glufosinate-ammonium	<i>cis/trans</i> -Dimethylvinylcyclopropane carboxylic diacid
3-Methylphosphinicopropionic acid (3-MPPA)	Bifenthrin
Glyphosate	Cyfluthrin
Aminomethylphosphonic acid (AMPA)	<i>cis</i> -3-(2,2-Dichlorovinyl)-2,2-dimethylcyclopropane carboxylic acid (<i>cis</i> -DCCA)
Isazophos-methyl	<i>trans</i> -3-(2,2-Dichlorovinyl)-2,2-dimethylcyclopropane carboxylic acid (<i>trans</i> -DCCA)
5-Chloro-1,2-dihydro-1-isopropyl-[3H]-1,2,4-triazol-3-one	4-Fluoro-3-phenoxybenzoic acid
Dimethylphosphate	Cyhalothrin (including <i>lambda</i> - and <i>gamma</i> -)
Dimethylthiophosphate	3-Phenoxybenzoic acid (3-PBA)
Malathion	Cypermethrin (including <i>cis</i> - and <i>trans</i> -)
Diethyldithiophosphate	<i>cis</i> -3-(2,2-Dichlorovinyl)-2,2-dimethylcyclopropane carboxylic acid (<i>cis</i> -DCCA)
Diethylphosphate	<i>trans</i> -3-(2,2-Dichlorovinyl)-2,2-dimethylcyclopropane carboxylic acid (<i>trans</i> -DCCA)
Diethylthiophosphate	3-Phenoxybenzoic acid (3-PBA)
Malathion dicarboxylic acid	Cyphenothrin
Methamidophos	Deltamethrin
Methidathion	<i>cis</i> -3-(2,2-Dibromovinyl)-2,2-dimethylcyclopropane carboxylic acid
Diethyldithiophosphate	3-Phenoxybenzoic acid (3-PBA)
Diethylphosphate	Esbiothrin
Diethylthiophosphate	Esfenvalerate
Methyl parathion	Etofenprox
Dimethylphosphate	Fenpropathrin
Dimethylthiophosphate	3-Phenoxybenzoic acid (3-PBA)
<i>p</i> -Nitrophenol	Fenvalerate
Naled	Imiprothrin
Dimethylphosphate	Metofluthrin
Oxydemeton-methyl	Permethrin (including <i>cis</i> - and <i>trans</i> -)
Dimethylphosphate	<i>cis</i> -3-(2,2-Dichlorovinyl)-2,2-dimethylcyclopropane carboxylic acid (<i>cis</i> -DCCA)
Dimethylthiophosphate	
Parathion (Ethyl parathion)	
Diethylphosphate	
Diethylthiophosphate	
<i>p</i> -Nitrophenol	
Phorate	
Diethyldithiophosphate	
Diethylphosphate	
Diethylthiophosphate	
Phosmet (Imidan)	
Diethyldithiophosphate	
Dimethylphosphate	

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-isodecyl 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.