

Biomonitoring California Designated Chemicals February 2019

The following is a list of designated chemicals for Biomonitoring California.^a 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
Chlorinated paraffins
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)
2,3,4,5-Tetrabromobenzoic acid (TBBA)
N,N-Ethylenebis(tetrabromophthalimide)
Hexabromobenzene (HBB)
2,2',4,4',5,5'-Hexabromobiphenyl (BB 153)
Hexabromocyclododecane (HBCD)
Hexachlorocyclopentadienyl-dibromocyclooctane
2-Hydroxypropyl 2-(2-hydroxyethyl)ethyl tetrabromophthalate
Isobutoxypentabromocyclododecanes (iBPBCDs)
Octabromotrimethylphenylindane (OBIND)
Pentabromoethylbenzene (PBEB)
Pentabromophenol (PBP)
Pentabromotoluene (PBT)
1,1'-Sulfonylbis[3,5-dibromo-4-(2,3-dibromopropoxy) benzene
Tetrabromobisphenol A (TBBPA)
Tetrabromobisphenol A bis(2,3-dibromopropyl) ether (TBBPA-DBPE)
Tetrabromobisphenol A bis(2-hydroxyethyl) ether
Tetrabromobisphenol A diallyl ether
Tetrabromophthalic acid, mixed esters
Tetrabromophthalic anhydride
2,3,5,6-Tetrabromo-*p*-xylene
Tetrachlorophthalic anhydride
2,4,6-Tribromophenol
Tribromoneopentylalcohol
Tris(2-chloroethyl)phosphate (TCEP)
Bis(2-chloroethyl)phosphate (BCEP)
Tris(1-chloro-2-propyl)phosphate (TCPP)
Bis(1-chloro-2-propyl)phosphate (BCPP)
Tris(2,3-dibromopropyl) isocyanurate
Tris(2,3-dibromopropyl)phosphate (TDBPP)

- a. California Environmental Contaminant Biomonitoring Program, codified at Health and Safety Code section 105440 et seq.
- b. Known collectively as the National Reports on Human Exposure to Environmental Chemicals program.

Tris(1,3-dichloro-2-propyl)phosphate (TDCPP)
Bis(1,3-dichloro-2-propyl)phosphate (BDCPP)
Tris(2,3-dichloro-1-propyl)phosphate
Tris(tribromoneopentyl)phosphate
2,4,6-Tris(2,4,6-tribromophenoxy)-1,3,5-triazine

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)
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

1-Nitropyrene
6-Hydroxy-1-nitropyrene
8-Hydroxy-1-nitropyrene

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 ^{3, 4}

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

Chlorinated phenols ^{3, 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

Heterocyclic Amines ³

3-Amino-1,4-dimethyl-5*H*-pyrido[4,3-*b*]indole (Trp-P-1)
2-Aminodipyrido[1,2-*a*:3',2'-*d*]imidazole (Glu-P-2)
2-Amino-6-methyldipyrido[1,2-*a*:3',2'-*d*]imidazole (Glu-P-1)
2-Amino-3-methylimidazo[4,5-*f*]quinoline (IQ)
2-Amino-1-methyl-6-phenylimidazo[4,5-*b*]pyridine (PhIP)
2-Amino-3-methyl-9*H*-pyrido[2,3-*b*]indole (MeA- α -C)
2-Amino-9*H*-pyrido[2,3-*b*]indole (A- α -C)
1-Methyl-3-amino-5*H*-pyrido[4,3-*b*]indole (Trp-P-2)
1-Methyl-9*H*-pyrido[3,4-*b*]indole (Harman)
9*H*-Pyrido[3,4-*b*]indole (Norharman)

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
Butyldiphenyl phosphate
t-Butylphenyl diphenyl phosphate
Dibutylphenyl phosphate
2-Ethylhexyl diphenyl phosphate
Isodecyl diphenyl phosphate

Isopropyl phenyl diphenyl phosphate
Isopropylated triphenyl phosphate
Resorcinol bis(diphenyl phosphate)
Tribenzyl phosphate (TBzP)
 Dibenzyl phosphate (DBzP)
Tricresyl phosphate (TCP)
Tri-*o*-cresylphosphate (ToCP)
 Di-*o*-cresylphosphate (DoCP)
Tri-*p*-cresylphosphate (TpCP)
 Di-*p*-cresylphosphate (DpCP)
Triphenyl phosphate (TPP)
 Diphenyl phosphate (DPhP)

Organophosphate Flame Retardants (OPFRs) ³

Tri-*n*-butyl phosphate (TBuP)
Dibutyl phosphate (DBuP)

Additional OPFRs are listed under the categories "Brominated and Chlorinated Organic Compounds used as Flame Retardants" and "Non-Halogenated Aromatic Phosphates."

Perchlorate and Other Anions ⁸

Perchlorate

Other Anions

Nitrate
Thiocyanate

Perfluoroalkyl and Polyfluoroalkyl Substances (PFASs) ^{1, 9}

Ammonium 4,8-dioxa-3*H*-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
8:2 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
 Perfluorodecane sulfonic 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
 Perfluoromethylheptane sulfonic 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
 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
 1,1,2,2-Tetrafluoro-2-({1,1,1,2,3,3-hexafluoro-3-
 [(trifluorovinyl)oxy]-2-propanyl}oxy)ethane
 sulfonic 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 (IMPY)
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 *lambda*- 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)
 Mono-3-hydroxybutyl phthalate (MHBP)
 Di-isobutyl phthalate (DIBP)
 Mono-isobutyl phthalate (MIBP)
 Mono-2-methyl-2-hydroxypropyl phthalate
 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 (MCP)
 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 carboxyisooctyl ester (MCOCH)
 Cyclohexane-1,2-dicarboxylic acid-mono (hydroxy-isononyl ester) (MHNCH)
 Di-2-ethylhexyl terephthalate (DEHTP)
 Mono-2-ethyl-5-carboxypentyl terephthalate (MECPTP)
 Mono-2-ethyl-5-hydroxyhexyl terephthalate (MEHHTP)

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 114)
 2,3',4,4',5-Pentachlorobiphenyl (PCB 118)
 2',3,4,4',5-Pentachlorobiphenyl (PCB 123)
 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) ¹²

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

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

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)

Synthetic Hormones used in Food Production ¹

Melengestrol acetate
Trenbolone acetate
Zeranol

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

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)
Acetyلهthyltetramethyltetralin (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)

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

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
Hydroxycotinine
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
 Benzonitrile
 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
 Chloroethane
 Crotonaldehyde
 N-Acetyl-*S*-(3-hydroxypropyl-1-methyl)-*L*-
 cysteine
 Cyanide
 2-Aminothiazoline-4-carboxylic acid
 Cyclohexane
 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
 Diethylether
N,N-Dimethylformamide
 N-Acetyl-*S*-(*N*-methylcarbamoyl)-*L*-cysteine
 2,5-Dimethylfuran
 Ethyl acetate
 Ethylbenzene
 Phenylglyoxylic acid
 Ethylene oxide
 N-Acetyl-*S*-(2-hydroxyethyl)-*L*-cysteine
 Furan
 Hexachloroethane
 Heptane
 Isobutyronitrile
 Isopropylbenzene (Cumene)
 Methyl-*t*-butyl ether (MTBE)
 Methylcyclopentane
 Nitrobenzene
 Nitromethane
 Octane
 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
 Tetrahydrofuran
 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
 α,α,α -Trifluorotoluene
 Toluene
 N-Acetyl-*S*-(benzyl)-*L*-cysteine
 Vinyl bromide
 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 PFASs are fluorinated aliphatic substances that contain the moiety C_nF_{2n+1} . In a perfluoroalkyl substance, 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.
- ¹² Hydroxy-PCBs are measured as biomarkers of exposure to the listed PCBs.