

BIOMONITORING CALIFORNIA¹ RESULTS

OCTOBER 2012 UPDATE

*Materials for Agenda Item on “Program Update”
Meeting of the Scientific Guidance Panel (SGP)
November 8, 2012*

This is a brief update on results from Biomonitoring California collaborations, as of October 2012.

Table 1 displays the percentages of samples in which biomonitored chemicals were found (known as the detection frequency). The detection frequency does not indicate the measured level of a chemical, nor are these frequencies necessarily representative of chemicals in the state’s population as a whole.

The measurement of an environmental chemical in a person's blood or urine indicates exposure, and does not in itself mean that the chemical causes disease. For a few environmental chemicals, such as lead or mercury, existing research provides a good basis for understanding health risks associated with different blood levels. For most environmental chemicals, however, more research is needed to evaluate potential health risks of specific levels measured in blood, urine, or other biological samples.

Table 1 combines results from ten individual studies. This table shows the chemicals the Program has found in samples from California residents as of October 2012. The number of samples analyzed per chemical varies. In some cases, this is due to the timing of when new analytical methods were available; in other cases, collaborators only requested analyses for a subset of chemicals.

Table 2 provides more information about the chemicals listed in Table 1, including uses, sources of exposure, and whether they were measured in urine, serum, or whole blood.

¹ California Environmental Contaminant Biomonitoring Program, codified at Health and Safety Code (H&SC) sections 105440 et seq.

Table 1. Combined Results from Biomonitoring California Collaborations as of October 2012

Chemical	Study ²	Number of Samples	Detection Frequency ³
Environmental Phenols			
Bisphenol A	D	91	93%
Triclosan	D	91	95%
Benzophenone-3	D	91	88%
Flame Retardants - Polybrominated Diphenyl Ethers (PBDEs)			
BDE-28	B,D,F	203	76%
BDE-47	B,D,E,F	237	95%
BDE-66	B,D,F	203	6%
BDE-85	B,D,F	203	30%
BDE-99	B,D,E,F	236	79%
BDE-100	B,D,F	203	95%
BDE-153	B,D,E,F	236	94%
BDE-154	B,D,F	203	18%
BDE-183	B,D,F	203	5%
BDE-197	B,D,F	203	49%
BDE-206	B,D,F	203	8%
BDE-207	B,D,F	203	42%
BDE-208	B,D,F	203	10%
BDE-209	B,D,F	203	38%

² Studies: (A) CYGNET; (B) FOX; (C) MARBLES; (D) MIEEP (maternal blood results only); (E) Environmental Chemistry Lab Pilot Study; (F) UCSF Pilot Study of Second Trimester Pregnant Women; (G) Pesticide Drift 2 Study; (H) CHAMACOS; (J) BEST; (K) California Teachers' Study. Descriptions of these studies can be found in the 2012 Data Summary Report, available here: <http://www.oehha.ca.gov/multimedia/biomon/pdf/2012DataSumRpt.pdf>

³ Detection frequency is the percentage of samples that had a measurable level of a chemical out of the total number of samples in which the chemical was measured.

Chemical	Study ²	Number of Samples	Detection Frequency ³
Hydroxy-PBDEs (metabolites⁴ of PBDE flame retardants)			
4'-Hydroxy-BDE 17	F	24	58%
5-Hydroxy-BDE 47	F	24	83%
6-Hydroxy-BDE 47	F	24	92%
4'-Hydroxy-BDE 49	F	24	46%
Metals in blood			
Cadmium	A,B,D,J	822	63%
Lead	A,B,D,J	822	100%
Manganese	A,B,J	741	100% ⁵
Mercury	A,B,D,J	822	98%
Perfluorochemicals (PFCs)			
2-(N-Ethyl-perfluorooctane sulfonamido) acetic acid	B,D,F,J,K	592	64%
2-(N-Methyl-perfluorooctane sulfonamido) acetic acid	B,D,F,J,K	592	99%
Perfluorobutane sulfonic acid	B,D,F,J,K	592	14%
Perfluorodecanoic acid	B,D,F,J,K	592	86%
Perfluorododecanoic acid	B,D,F,J,K	592	26%
Perfluoroheptanoic acid	B,D,F,J,K	592	63%
Perfluorohexane sulfonic acid	B,E,F,J,K	526	99.8%
Perfluorononanoic acid	B,D,F,J,K	592	100%
Perfluorooctane sulfonamide	B,D,F,J,K	592	84%
Perfluorooctane sulfonic acid (PFOS)	B,D,E,F,J,K	625	100%
Perfluorooctanoic acid (PFOA)	B,D,E,F,J,K	625	95%
Perfluoroundecanoic acid	B,D,F,J,K	592	99%

⁴ A metabolite is a chemical produced by the body when it breaks down another chemical, such as a drug or an environmental contaminant.

⁵ The 100% detection frequency of manganese was expected because it is an essential nutrient. It can also be toxic at higher exposure levels.

Chemical	Study ²	Number of Samples	Detection Frequency ³
Organochlorine Pesticides			
2,4'-Dichlorodiphenyltrichloroethane (DDT)	B,D,E	199	8%
4,4'-DDT	B,D,E,F	199	51%
4,4'-Dichlorodiphenyldichloroethene (DDE)	B,D,E,F	212	99.5%
beta-Hexachlorocyclohexane (beta-HCH)	B,D,E,F	224	79%
Hexachlorobenzene (HCB)	B,D,E,F	236	98%
Oxychlorane	B,D,E,F	237	80%
trans-Nonachlor	B,D,E,F	136	88%
Organophosphate Pesticides			
3,5,6-Trichloro-2-pyridinol	D,G	214	82%
Phthalates			
Mono-n-butyl phthalate	D,C,H	173	96%
Monoethyl phthalate	D,C,H	173	92%
Polychlorinated Biphenyls (PCBs)			
PCB-66	B,D,E,F	224	41%
PCB-74	B,D,E,F	237	63%
PCB-99	B,D,E,F	237	62%
PCB-101	B,D,F	203	32%
PCB-118	B,D,E,F	237	73%
PCB-138	B,D,E,F	237	94%
PCB-153	B,D,E,F	237	96%
PCB-156	B,D,F	203	53%
PCB-170	B,D,E,F	237	78%
PCB-180	B,D,E,F	226	96%
PCB-187	B,D,E,F	237	71%
PCB-194	B,D,E,F	237	60%
PCB-203	B,D,E	212	64%

Table 2. More Information About Chemicals Reported in Table 1

Chemical	Description	Biological medium for results in Table 1
<p>Environmental phenols - Environmental phenols share a common chemical structure and are analyzed as a group. They have a wide variety of uses, described briefly below for the three phenols reported in Table 1.</p>		
<p>Benzophenone-3 (BP-3)</p>	<p>Benzophenone-3 (oxybenzone) is used in many sunscreens and other sun-protective products to protect skin from sun damage. Benzophenone-3 is also added to packaging and some consumer products, such as cosmetics and paints, to protect the products from sun damage.</p>	<p><i>Table 1 reports results in urine for BP-3, BPA, and triclosan</i></p>
<p>Bisphenol A (BPA)</p>	<p>BPA is used to make protective coatings, like the linings in metal food cans that prevent rust and corrosion. It is also found in a hard plastic called polycarbonate and some cash register receipts.</p>	
<p>Triclosan</p>	<p>Triclosan is used to kill bacteria. It is added to some liquid hand soaps and other personal care products, such as some toothpaste and body washes. Triclosan is also incorporated into many consumer products, such as some cutting boards, toys, and clothes.</p>	
<p>Flame retardants - Flame retardants are added to products such as furniture foam (e.g., cushions), textiles, and electronics, often to meet flammability standards.</p>		
<p>Polybrominated diphenyl ethers (PBDEs)</p>	<p>PBDE flame retardants were commonly added to furniture, infant products, and electronics for many years. U.S. production of penta- and octa-PBDEs ended by 2006. DecaBDE, the last major PBDE mixture, is due to be phased out by the end of 2013. PBDEs have spread through the environment and break down slowly. Research studies have measured the world's highest PBDE levels in Californians.</p>	<p><i>Table 1 reports results in serum for 14 PBDEs and 4 hydroxy-PBDEs (metabolites of PBDEs)</i></p>

Chemical	Description	Biological medium for results in Table 1
Metals - Metals occur in nature and are used in many industries and products.		
Cadmium	Cadmium is found in cigarette smoke, some cheap metal jewelry, nickel-cadmium batteries, and some paints and pigments.	<p><i>Table 1 reports results in whole blood for cadmium, lead, manganese, and mercury</i></p>
Lead	Lead was formerly used in paint and gasoline and is still used in many consumer products, including some dishes and pottery, and some plastic products. It is found in dust and soil in and around houses built before 1978 and at some job sites, such as construction sites and battery recycling facilities.	
Manganese	Manganese is an essential nutrient found mainly in food. It can be toxic at higher exposure levels, which can occur in metalworking occupations like welding. Manganese is also a component of two fungicides widely used in California.	
Mercury	Mercury occurs naturally in California and was released into the environment from mining operations in the past. It is also found in emissions from coal-burning plants. Mercury in the environment builds up in certain types of fish. It is used in silver dental fillings and fluorescent light bulbs. It has also been found in some imported skin-lightening and anti-aging creams.	
Perfluorochemicals (PFCs)	PFCs are used to make various products resistant to oil, stains, grease, and water. Example products include stain-resistant carpets, wrinkle-free clothing, and grease-proof food containers.	<p><i>Table 1 reports results in serum for 12 PFCs</i></p>

Chemical	Description	Biological medium for results in Table 1
<p>Pesticides - Pesticides are chemicals used to control pests, such as insects, fungi, and unwanted plant species.</p>		
<p>Organochlorine pesticides (OCPs)</p>	<p>The OCPs measured by Biomonitoring California are no longer used in the U.S. Because OCPs last a long time in the environment, they can still be found in high-fat fish, meat, and dairy products. DDT, which is still used in some other countries, and chlordane are examples of OCPs.</p>	<p><i>Table 1 reports results in serum for:</i></p> <ul style="list-style-type: none"> • <i>Two isomers of DDT (2,4'-DDT and 4,4'-DDT)</i> • <i>DDE (metabolite and environmental breakdown product of DDT)</i> • <i>beta-HCH</i> • <i>HCB</i> • <i>Oxychlordane (metabolite of chlordane)</i> • <i>trans-Nonachlor (component of the chlordane mixture)</i>
<p>Organophosphate pesticides (OPs)</p>	<p>OPs are used in commercial agriculture to control pests on fruit and vegetable crops. Chlorpyrifos was one of the top 20 agricultural pesticides used in California in 2010. Some OPs, such as malathion, are used for landscape maintenance. OPs are also used in home gardens, for flea control on pets, and in some no-pest strips. In the past, OPs were widely used inside homes to control other pests like termites and ants, but these uses have been discontinued.</p>	<p><i>Table 1 reports results in urine for 3,5,6-trichloro-2-pyridinol (metabolite of chlorpyrifos)</i></p>
<p>Phthalates</p>	<p>Phthalates are added to vinyl to make it soft and flexible. Vinyl products include shower curtains, flooring, and plastic tubing. Phthalates are also found in scented products, coatings like nail polish and paint, and a variety of other consumer goods.</p>	<p><i>Table 1 reports results in urine for:</i></p> <ul style="list-style-type: none"> • <i>Mono-n-butyl phthalate (metabolite of di-n-butyl phthalate and benzylbutyl phthalate)</i> • <i>Monoethyl phthalate (metabolite of diethyl phthalate)</i>

Chemical	Description	Biological medium for results in Table 1
Polychlorinated biphenyls (PCBs)	PCBs were widely used to insulate electrical equipment and as plasticizers. PCBs were banned in the late 1970s but are still in some old equipment and products. They have spread through the environment and take a long time to break down. They are found in some high-fat fish and high-fat animal products. PCBs are also found in old caulk and old fluorescent light fixtures.	<i>Table 1 reports results in serum for 13 PCBs</i>