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*Quality is
Always
our Standard
Solution*

Persistent Toxic Chemicals in the U.S. Food Supply

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A class of chemicals known as persistent organic pollutants (POPs) have come under intense scrutiny for their toxicity and ability to cause a range of adverse effects on human health, fish, and wildlife. Most of these compounds are pesticides, including DDT, aldrin, dieldrin, and others. This group of compounds also includes industrial chemicals such as PCBs and byproducts of manufacturing processes as well as waste incineration such as dioxins.

List of POPs covered by the Stockholm Convention Treaty

Aldrin
Dieldrin
Endrin
Chlordane
Heptachlor
DDT, DDE

Dioxins and Furans
Hexachlorobenzene
Mirex
Toxaphene
PCBs

POPs are persistent in the environment, easily transported by winds and water, and toxic to many organisms. It is these characteristics that are the major factors contributing to the global environmental health problems posed by these chemicals. Bioaccumulation of these compounds in fatty tissues magnifies concentrations up the food chain, resulting in high potential for exposures to humans, marine mammals, predatory birds, and other species at the top of the food chain.

In just a few decades, POPs have spread throughout the environment to threaten human health and cause damage to land and water ecosystems all over the world. All living organisms on Earth now carry measurable levels of POPs in their tissues. These substances have been found in sea mammals at levels high enough to qualify their bodies as hazardous waste under U.S. law (Cummins, JE 1988). Evidence of POPs contamination in human blood and breast milk has been documented worldwide (CHEJ 2000, Solomon 2000).

There is strong evidence that exposure to even minuscule amounts of POPs at critical periods of

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development - particularly in the womb - can cause irreversible damage to reproductive, neurological and immune systems (Orris et al 2000). The effects of such exposures may take years to develop, sometimes appearing first in the offspring of exposed parents. Developing fetuses and children, as well as adolescents during puberty, are especially vulnerable to problems caused by exposure to POPs largely because these substances act as disruptors of the endocrine systems that control growth and development. Other human health effects now linked to POPs exposure include some types of cancer, learning disorders, impaired immune function, infertility, endometriosis and diabetes (Colburn et al 1996).

Exposures to POPs Through the U.S. Food Supply

Because they are persistent and continue to be produced and released into the global environment, even POPs already banned in the United States, such as DDT and PCBs, make their way into the U.S. food supply. Some have half-lives measured in decades and remain in water and soil or are absorbed by plants and animals that ultimately provide food for humans. POPs that were once particles in the sediment of a riverbed, in soil or in grass find their way into the fatty tissue and milk of livestock or into vegetables that absorb POPs from the soil.



In order to construct a comprehensive picture of the exposure potential for persistent toxic chemicals in the U.S. commercial food supply, Pesticide Action Network North America recently analyzed the available data on selected POPs pesticides in the US food supply. The results were published in a report, *Nowhere to Hide: Persistent Toxic Chemicals in the U.S. Food Supply*. The study used the U.S. Food and Drug Administration (FDA) Total Diet Survey (Food and Drug Administration 2000) and the 1997 pesticide residue data from the U.S. Department of Agriculture's Pesticide Data Program (Groth et al 1999, Groth et al 2000).

This study shows the ubiquitous presence of persistent toxic chemicals in the U.S. food supply, despite the fact that most of the POPs pesticides examined in this analysis have been banned in the U.S. for years. Specifically, the study found that:

- Virtually all food products are contaminated with POPs that are banned in the United States, including baked goods, fruit, vegetables, meat, poultry and dairy products.
- It is not unusual for daily diets to contain food items contaminated with three to seven individual POPs.
- A typical holiday dinner menu of 10 food items can deliver

35 "hits" of POPs exposure (where one "hit" is one persistent toxic chemical on one food item).

- A typical daily diet delivers approximately 60 hits per day.

The top 10 POPs-contaminated food items, in alphabetical order, are: butter, cantaloupe, cucumbers/pickles, meatloaf, peanuts, popcorn, radishes, spinach, summer squash and winter squash. The two most pervasive POPs in food are dieldrin and DDE. Dieldrin is an organochlorine pesticide banned in the U.S. since the late 1970s. DDE is a breakdown product of DDT, which was banned in the U.S. in 1972.

When viewed in the context of daily exposures from food consumption, amounts of certain POPs pesticides in a typical American diet were found to be at or above the reference doses (RfD), or levels of concern, set by the U.S. EPA and the U.S. Agency for Toxic Substances and Disease Registry (ATSDR 2000). Additionally, the Food and Drug Administration's "action levels" (equivalent to the tolerance levels, but for unregistered pesticides) used to determine whether contaminated foods should be removed from the U.S. food market, do not protect American food consumers from the health threats of POPs. In some cases, consumption of a single food item contaminated at the action levels allowed by FDA would expose the consumer to more than 50 times the daily exposure levels considered acceptable by other agencies (Food and Drug Administration 1998).

POPS Monitoring - Working towards a solution

In May 2001, the international community successfully negotiated a global treaty to eliminate the worldwide production and use of 12 of the worst persistent toxic chemicals, including DDT, PCBs, dieldrin and dioxins (see <http://irptc.unep.ch/pops/>). The UN-sponsored accord reflects worldwide recognition that stopping further POP contamination of any country's food supply and environment can only be accomplished through effective global cooperation. The treaty is awaiting ratification by UN member nations.

For a copy of the report, see the Pesticide Action Network North America Web site: www.panna.org.

US EPA CLP Program Standards

The EPA's Contract Laboratory Program (CLP) Statement of Work (SOW) OLC03.2 is a new analytical method for the detection of low concentration volatile, semi-volatile, and pesticide/Aroclor organics in aqueous samples. For VOA and SVOA GC/MS analysis, OLC03.2 introduces the use of Deuterated Monitoring Compounds (DMCs) as a sample-by-sample accuracy indicator. The DMCs listed below are supplied as stock standards, to be diluted for various uses in the methods.

ES-5037 CLP Semi-Volatiles DMC Stock Solution

	($\mu\text{g/ml}$)	
Phenol-d ₅	2000	
bis-(2-Chloroethyl) ether-d ₈	2000	
2-Chlorophenol-d ₄	2000	
4-Methylphenol-d ₈	2000	
Nitrobenzene-d ₅	2000	
2-Nitrophenol-d ₄	2000	
2,4-Dichlorophenol-d ₃	2000	
4-Chloroaniline-d ₄	2000	Price: 1x = \$ 225
Dimethylphthalate-d ₆	2000	5x = \$ 975
Acenaphthylene-d ₈	2000	10x = \$ 1,750
4-Nitrophenol-d ₄	2000	
Fluorene-d ₁₀	2000	
4,6-Dinitro-methylphenol-d ₂	2000	
Anthracene-d ₁₀	2000	
Pyrene-d ₁₀	2000	
Benzo[a]pyrene-d ₁₂	2000	
Volume:	1.2 ml	

ES-5038* CLP Volatiles DMC Stock Solutions

	Non-Ketone DMC Stock ($\mu\text{g/ml}$)	Ketone DMC Stock ($\mu\text{g/ml}$)	
Vinyl Chloride-d ₃	100		
Chloroethane-d ₅	100		
1,1-Dichloroethene-d ₂	100		
2-Butanone-d ₅	-	200	
Chloroform-d	100		
1,2-Dichloroethane-d ₄	100		
Benzene-d ₆	100		Price: 1 kit = \$ 650
1,2-Dichloropropane-d ₆	100		5 kits = \$ 2,450
Toluene-d ₈	100		
trans-1,3-Dichloropropene-d ₄	100		
2-Hexanone-d ₅	-	200	
Bromoform-d	100		
1,1,2,2-Tetrachloroethane-d ₂	100		
1,2-Dichlorobenzene-d ₄	100		
Volume:	1.0 ml	0.5 ml	

*ES-5038 is provided as a kit containing one ampoule each of the Non-Ketone and Ketone DMC stock solutions.

PCB Certified Standards



In a continual effort to produce $^{13}\text{C}_{12}$ labeled PCBs and PCB mixtures of the highest quality, CIL announces the introduction of 20 new PCB Certified Standards. These standards are prepared using triplicate weighings by three different chemists using NIST-traceable Class S weights on a Sartorius M 3 P microbalance. Three separate solutions are prepared independently and the Relative Standard Deviations (RSD) for each individual solution from multiple GS/MS analyses must be less than 5%. The solutions are mixed together, with the resultant solution analyzed as well. The addition of the following PCB Certified Standards, brings the total of PCB Certified Standards offered by CIL to 71:

New PCB Certified Standards

All solutions are 1.2 ml

PCB-10-CS	PCB-66-CS	PCB-146-CS	PCB-177-CS
PCB-18-CS	PCB-74-CS	PCB-149-CS	PCB-195-CS
PCB-30-CS	PCB-87-CS	PCB-151-CS	PCB-196-CS
PCB-44-CS	PCB-99-CS	PCB-158-CS	PCB-201-CS
PCB-49-CS	PCB-110-CS	PCB-172-CS	PCB-203-CS

All solutions were prepared at 100µg/ml in isoctane. The Certificate of Analysis provided with each product includes a summary of the data acquired to validate the preparation, and a summary of the statistical analysis of the data.

Each product listed is available from CIL at a cost of \$125.

Persistent Organic Pollutants (POPs) available from CIL

Catalog #	Compound (Isotope, Atom % Enrichment)	Price
CLM-4725-1.2	Aldrin ($^{13}\text{C}_{12}$, 99%), 100 µg/ml in nonane	\$ 895
CLM-4726-1.2	Dieldrin ($^{13}\text{C}_{12}$, 99%), 100 µg/ml in nonane	\$ 950
CLM-4782-1.2	Endrin ($^{13}\text{C}_{12}$, 99%), 100 µg/ml in nonane	\$ 950
CLM-4792-1.2	trans-Chlordane ($^{13}\text{C}_{10}$, 99%), 100 µg/ml in nonane	\$ 895
CLM-4759-1.2	Heptachlor ($^{13}\text{C}_{10}$, 99%), 100 µg/ml in nonane	\$ 895
CLM-4692-1.2	2,4'-DDT (ring- $^{13}\text{C}_{12}$, 99%), 100 µg/ml in nonane	\$ 375
CLM-1281-1.2	4,4'-DDT (ring- $^{13}\text{C}_{12}$, 99%), 100 µg/ml in nonane	\$ 350
CLM-4693-1.2	2,4'-DDE (ring- $^{13}\text{C}_{12}$, 99%), 100 µg/ml in nonane	\$ 375
CLM-1627-1.2	4,4'-DDE (ring- $^{13}\text{C}_{12}$, 99%), 100 µg/ml in nonane	\$ 350
ED-900	2,3,7,8-TCDD ($^{13}\text{C}_{12}$, 99%), 50 µg/ml in nonane	\$ 925
EF-904	2,3,7,8-TCDF ($^{13}\text{C}_{12}$, 99%), 50 µg/ml in nonane	\$ 1900
CLM-351-1.2	Hexachlorobenzene ($^{13}\text{C}_6$, 99%), 100 µg/ml in nonane	\$ 150
CLM-4813-1.2	Mirex ($^{13}\text{C}_{10}$, 99%), 100 µg/ml in nonane	\$ 895
EC-1404-1.2	3,3',4,4'-Tetrachlorobiphenyl ($^{13}\text{C}_{12}$, 99%), 40 µg/ml in nonane	\$ 310

**Note: Many other Priority Pollutant Standards, Dioxins, Furans, and PCBs are available from CIL.
Please call us or visit our Web site at www.isotope.com to request a copy of our new Environmental Contaminant Standards catalog.
All solutions listed above are 1.2 ml.*

Interlaboratory Study on Brominated Flame Retardants

Between November 1999 and April 2000 the first interlaboratory study on Polybrominated Diphenyl Ethers (PBDEs) was organized. The study was coordinated by the Netherlands Institute for Fisheries Research and funded by the Bromine and Science Environmental Forum (BSEF). The results were presented at Dioxin 2000 in Monterey, CA. A scientific publication on the results has been accepted for publication in *Chemosphere*. There is now worldwide interest in the analysis of PBDEs as well as other brominated flame retardants such as Hexabromocyclododecane and Tetrabromobisphenol-A in the environment and in humans. A second interlaboratory study has been commissioned by this same group and will be held between November 2001 and March 2002. The following compounds will be studied:

Compound	¹³ C Catalog #	Price	Unlabeled Catalog #	Price
BDE 28	EO-5002	\$ 675	EO-4920	\$ 250
BDE 47	EO-4982	\$ 675	EO-4111	\$ 250
BDE 99	EO-4983	\$ 975	EO-4091	\$ 250
BDE 100	EO-4993	\$ 975	EO-4194	\$ 250
BDE 153	EO-4984	\$ 975	EO-4093	\$ 250
BDE 154		Request Price	EO-4925	\$ 250
BDE 183	EO-4985	\$ 975	EO-4953	\$ 250
BDE 209	EO-5003	\$ 975	EO-4928	\$ 250
α-Hexabromocyclododecane			ULM-4834-1.2	\$ 300
β-Hexabromocyclododecane			ULM-4835-1.2	\$ 300
γ-Hexabromocyclododecane			ULM-4836-1.2	\$ 300
Tetrabromobisphenol-A (TBBPA)	CLM-4694-1.2	\$ 395	ULM-4694-1.2	\$ 395
Dimethyl TBBPA			ULM-6236-1.2	\$ 195

New from CIL – ¹³C₁₀ labeled

Polychlorinated Naphthalene Standards & Additional Unlabeled Naphthalene Standards

CIL has added seven ¹³C₁₀ labeled Polychlorinated Naphthalene (PCN) and ten new unlabeled PCN standards to our existing PCN product line. Our labeled PCNs range from tetra to octachloronaphthalene, while our unlabeled PCNs range from mono to octachloronaphthalene. The new PCNs are:

¹³ C ₁₀ Labeled			Unlabeled		
Catalog #	Compound	Price	Catalog #	Compound	Price
ECN-5240	1,2,3,4-TetraCN	\$ 450	ECN-2642	1,2,5,6-TetraCN	\$ 300
ECN-5241	1,3,5,7-TetraCN	\$ 450	ECN-2641	1,3,5,7-TetraCN	\$ 300
ECN-5250	1,2,3,5,7-PentaCN	\$ 450	ECN-2643	2,3,6,7-TetraCN	\$ 300
ECN-5260	1,2,3,4,5,7-HexaCN	\$ 450	ECN-2653	1,2,3,6,7-PentaCN	\$ 350
ECN-5261	1,2,3,5,6,7-HexaCN	\$ 450	ECN-2663	1,2,3,5,6,7-HexaCN	\$ 350
ECN-5270	1,2,3,4,5,6,7-HeptaCN	\$ 450	ECN-2664	1,2,3,5,6,8-HexaCN	\$ 350
ECN-5280	OctaCN	\$ 450	ECN-2665	1,2,3,6,7,8-HexaCN	\$ 350
			ECN-2666	1,2,4,5,6,8-HexaCN	\$ 350
			ECN-2670	1,2,3,4,5,6,7-HeptaCN	\$ 350
			ECN-2671	1,2,3,4,5,6,8-HeptaCN	\$ 350

New Faces Changing Places at CIL

Tom Dorsey joined us at the end of last year as our new Quality Control Manager. Tom is a Ph.D. analytical chemist with 20 years of experience in organic chemistry, mostly applied to problem-solving with biochemical, atmospheric, and aquatic samples. He comes to CIL from MIT's Center for Environmental Health Sciences where he was investigating toxic substances in environmental samples and human health effects using GC, LC/MS, UV fluorescence, etc. Tom's consulting and analytical experience in the private sector includes work with Global Geochemistry Corp., Energy Resources Co., and Hoechst AG.

Eloise Young, a Ph.D. Organic Chemist, joined us this year as a Technical Services Scientist. Eloise has 11 years of industry experience, having worked as the Manager of the Polymer Synthesis Group at Triton Systems where she was responsible for developing and managing custom syntheses of high performance polymers and monomers. Prior to Triton, Eloise spent 8 years at Polaroid Corporation as a Scientist in the Organic and Analytical Chemistry departments.

Susiladevy (Susi) Anton also joined Cambridge Isotope Laboratories this year as an Environmental Products chemist. Susi has 5 years of experience at Maxxam Analytics Inc. and IDS Intelligent Detection Systems Inc. Susi has a BS Chemistry degree from University of Toronto and will be using her experience to formulate standards for the analysis of environmental pollutants.

Dr. Tim Eckersley has been promoted to Chief Scientist. As Chief Scientist he is dedicated to synthetic route development, technique optimization and analytical development. Tim has spent 12 years at CIL in the Research Products area as Sr. Chemist, Group Leader, Research Products Manager and (currently) Chief Scientist. He has 20+ years of experience in isotope chemistry. Tim holds a Ph.D. in Physical Organic Photochemistry from the University of Lancaster.

New Catalog

The new Environmental Contaminants Standards Catalog is now available online as a searchable database on our new Web site at www.isotope.com. Our new Web site has full "shopping cart" accessibility for placing orders or requesting quotations. New products will be added periodically to this site. If you would like to receive a hard copy of the new catalog, please contact our Environmental Sales department via phone (1-978-749-8000), fax (1-978-749-2768) or e-mail (envsales@isotope.com). There are over 400 new listings in this latest catalog, covering new solutions for existing items, new items in existing categories, and totally new categories. Some of our new offerings include:

- Over 20 new individual $^{13}\text{C}_{12}$ labeled PCBs
- Smaller package size for $^{13}\text{C}_{12}$ labeled PCBs for low-volume users
- New formulations for both dioxins and furan and PCB analysis
- Dozens of new Endocrine Disrupting Compounds (EDCs) for a total of over 70 suspected EDCs
- Brominated Flame Retardants (BFRs) including both native and $^{13}\text{C}_{12}$ brominated diphenyl ether standards and Tetrabromobisphenol-A (TBBPA)
- $^{13}\text{C}_{10}$ labeled Polychlorinated Naphthalene (PCN) Standards
- An index that includes both individual compounds and also components of formulations
- Multiple listings for items with multiple uses. For example, 2,3,7,8-TCDD is listed with the individual dioxin standards as well as with the Endocrine Disrupting Compounds.

Chemical Weapons **Metabolites**

Cambridge Isotope Laboratories has many metabolites of various chemical weapons available for environmental analysis. Please contact us for an up-to-date list of standards available for this analysis as well as custom synthesis.

Cerilliant name change

CIL has maintained a 20 year collaboration with Radian International, LLC. Last year, the Analytical Reference Materials division of Radian was incorporated as an independent entity called Cerilliant. The ISO 9001 certification that Radian obtained in 1997 and renewed in 2000 will be maintained by Cerilliant. We will continue to offer the same high quality products and product lines produced and formulated by the same management and employees as with Radian.

Cerilliant is a privately held Texas corporation formed in August 2000. Previous to incorporation, Cerilliant (Radian Analytical Products) was a division of Radian International which began producing chemical reference materials in 1980 to address needs in the Environmental Analysis industry.



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