DEPARTMENT OF TOXIC SUBSTANCES CONTROL

Environmental Chemistry Laboratory

Detoxifying California, A Laboratory Approach

2008 - 2009 Annual Report

Foreword

By Bruce La Belle, Ph.D., Chief
Environmental Chemistry Laboratory
California Department of Toxic Substances Control

Our homes and businesses are filled with products that may contain harmful chemicals. Their danger is real – to people, to the wildlife and to the environment.

As we learn more about the serious effects these chemicals have, the Department of Toxic Substances Control will play an increasingly expanding leading role in protecting California's citizens from toxic substances.

For more than 25 years, the department's Environmental Chemistry Laboratory has carried out DTSC's mission to provide the highest level of safety, and to protect public health and the environment from toxic harm. The lab is a world-renowned scientific leader, providing chemical analysis and applied research information to DTSC, Cal/EPA and other state agencies. A "gold standard" for hazardous waste and related analysis in California, its work on Chemicals of Emerging Concern and Human and Wildlife Biomonitoring has won international acclaim.

During the past year, our laboratory has been involved in several exciting new initiatives, including the study of toxic chemicals in consumer products. Many of these activities are highlighted in this Annual Report.

With California's Green Chemistry Initiative, we now have the beginning of a revolution in how the state's businesses, people and government manage chemicals. California industry leads the world in creating and designing products that change the way we live – and Green Chemistry promises to usher in a new era of innovation. The mission of DTSC's Environmental Chemistry Laboratory is to ensure that science remains at the core of California's dazzling "green" future.

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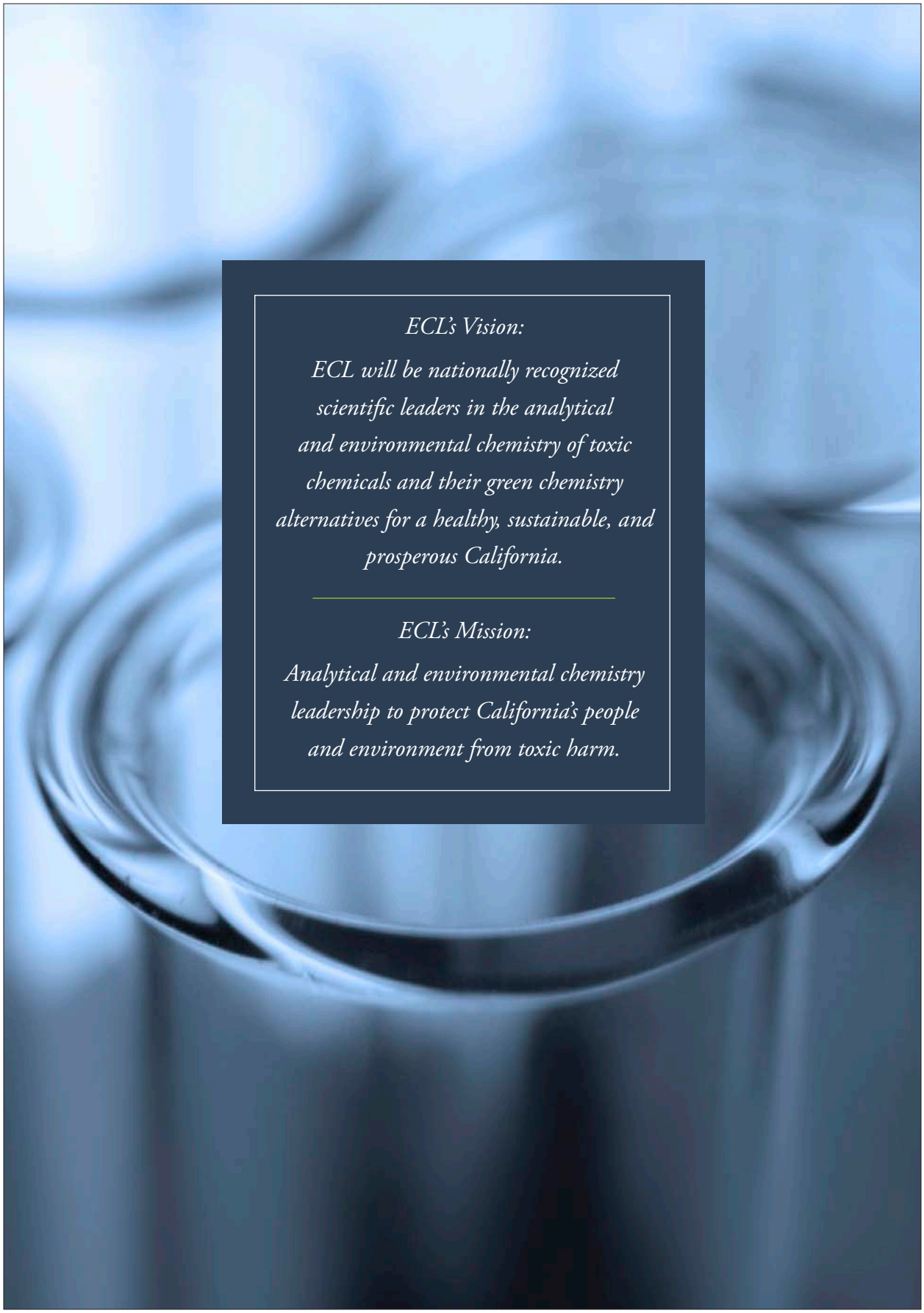


ECL's Vision:

ECL will be nationally recognized scientific leaders in the analytical and environmental chemistry of toxic chemicals and their green chemistry alternatives for a healthy, sustainable, and prosperous California.

ECL's Mission:

Analytical and environmental chemistry leadership to protect California's people and environment from toxic harm.

Environmental Chemistry Laboratory

The Environmental Chemistry Laboratory, part of the Department of Toxic Substances Control, provides the scientific foundation for the state of California to protect human health, wildlife and the environment. There are two DTSC laboratories – in Berkeley and Los Angeles – as well as an advanced mobile laboratory. The sophisticated scientific work done by the labs includes:

- Sample analysis, consultation and expert witn ess testimony in support of DTSC enforcement and criminal investigations
- Measurement of chemicals in soils and groundwater from contaminated sites
- Supporting field operations and responding to emergencies
- Development of new methods to measure emerging contaminants and non-standard analytes in complex matrices
- Special studies on toxic chemicals in consumer products
- Providing data to support new statutes and regulations
- Biomonitoring studies and exposure assessment of persistent, bioaccumulative and toxic chemicals in humans and wildlife
- Investigations to provide DTSC a heads-up on emerging issues

The Environmental Chemistry Laboratory as a Reference Laboratory

The Environmental Chemistry Laboratory sets the standard for hazardous waste and related analyses in California. It is considered a reference lab by the state's laboratory certification program and by commercial labs. In this capacity, the laboratory:

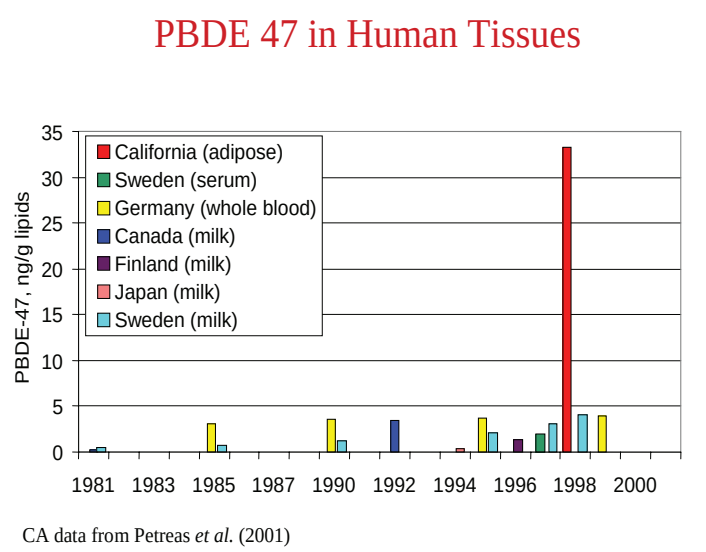
- Evaluates alternative test methods
- Provides testimony in legal proceedings to support enforcement cases
- Performs split sample analyses to evaluate the quality of commercial labs
- Reviews data submitted to DTSC by permit applicants or site cleanup consultants
- Conducts lab fraud investigations of commercial labs

A Champion for The Environment

The DTSC laboratory programs in Biomonitoring and Chemicals of Emerging Concern have received international acclaim for their environmental significance. Recognizing the close link between humans and their environment, ECL investigates toxic chemicals building up in wildlife and domestic animals through a Toxics Early Warning System that provides information on emerging chemical threats. ECL also investigates potentially toxic chemicals inside the home and in everyday consumer products. An example of such thorough work is what we discovered with brominated flame retardants.

DTSC's Pioneering Work on PBDEs, a Historical Chemical of Emerging Concern

Since the 1970s, polybrominated biphenyl ethers (PBDEs) have been added as flame retardants to thermoplastics used in electrical appliances, TV sets, computer circuit boards and casings, and building materials. PBDEs also are found in foams and upholstery in home and office furnishings, cars and in rug and drapery textiles.



CA data from Petreas *et al.* (2001)

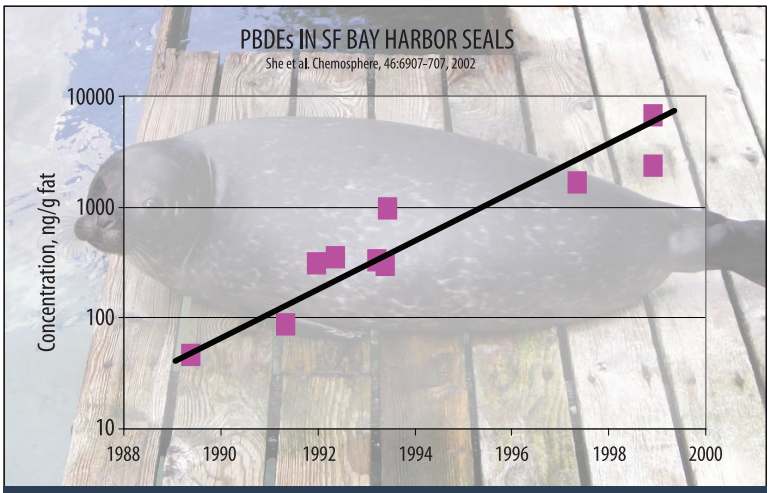
PBDEs in California women sampled in the late 1990s were about 30 times higher than in any other group studied at that time. This DTSC study was the first report of PBDEs in North America; subsequent studies confirmed the record levels of PBDEs in the US.

What sets PBDEs apart from other persistent chemical contaminants is how we are exposed to them. Most persistent chemical contamina nts bioconcentrate through the food chain and eventually end up on our plates. PBDEs, on the other hand, are present in many consumer products. Because they're additives, PBDEs can be released from products during their useful lifetime, and their presence has been detected in the dust in our homes, offices, schools and cars. Most exposures come through the accidental ingestion of dust, often through hand-to-mouth contact. Partly because they come in contact with dust so much more often, toddlers and children have much higher levels of PBDEs than adults. And even when the consumer products are thrown away, there's a chance PBDEs will escape and contaminate landfills, groundwater and wildlife.

A few years ago, DTSC laboratory scientists determined that humans and wildlife in California have the highest PBDE levels in the world, with levels increasing each year. In response to these observations, as well as to other corroborating evidence, California restricted the presence of two forms of PBDEs -- the Penta- and Octa-formulations – to no more than 0.1 percent in new products manufactured or imported after 2006.

The ban, however, has no provisions for enforcement, and its effectiveness is hard to gauge. In addition, the volume of consumer products containing Penta- and Octa-BDEs that are still in use is daunting. Moreover, Deca-BDE, the most widely used PBDE formulation, continues to be widely used only two states (Maine and Washington) and the European Union have limited its use. There is increasing evidence that Deca-BDE breaks down to components present in the now banned Penta- and Octa-formulations.

At the DTSC Laboratory, work continues on the presence of the banned Penta- and Octa-BDEs, on the break down of Deca-BDE and on new Brominated Flame Retardants introduced as replacements for the PBDEs.



PBDE levels in harbor seals from San Francisco Bay increased 100 times over the 10 year period studied.

DTSC Laboratory Scientists Find High Levels of PBDEs In California's Endangered Peregrine Falcons

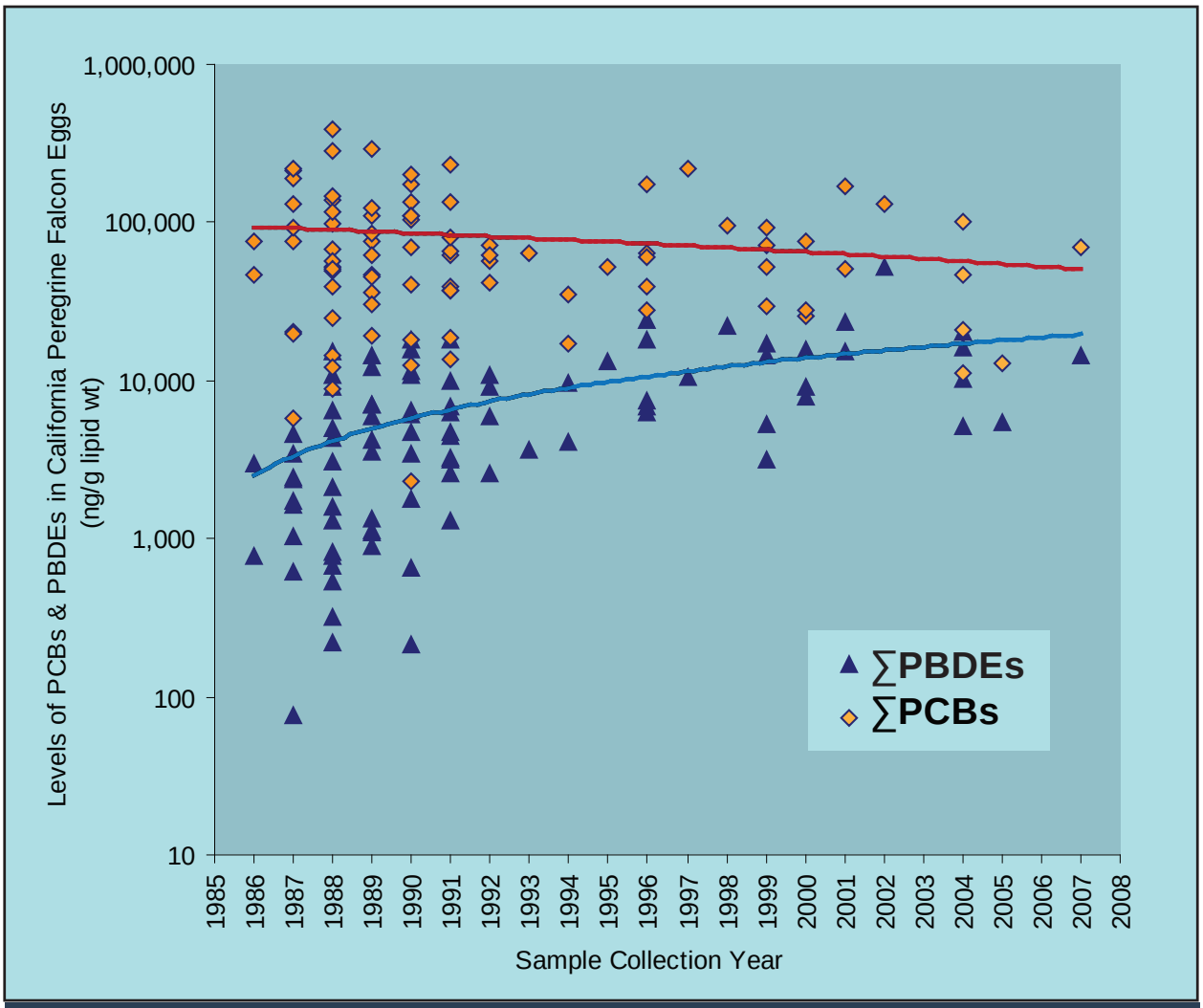
The peregrine falcon is a top predator, nesting in cliffs along California's coastline, and its survival has long been considered threatened. As part of the DTSC laboratory's Toxics Early Warning System, the levels of polychlorinated biphenyls (PCBs) and PBDE were measured in 90 California peregrine falcon eggs and seven chicks collected by bird researchers over the past 21 years.

During that time, PBDE levels in California peregrine falcon eggs doubled every decade, while PCBs seemed to level off. BDE-209, the major component of Deca-BDE, also increased.

The levels of the different types of PBDEs found in California peregrine falcon eggs varied among ecological regions, particularly between big city and coastal nesting areas. These patterns indicate that birds feeding on terrestrial animals have greater exposure to the heavier PBDE congeners, particularly BDE-209, compared with birds feeding on aquatic life.

DTSC laboratory scientists also found that BDE-209 breaks down to the lower brominated PBDEs, which are known to be more bioavailable, more persistent and more toxicologically active, and subsequently become threats to wildlife and public health. In contrast, PCB congener profiles remained consistent in these peregrine falcon eggs.

Our analysis indicates that BDE-209 escapes from consumer products and becomes an environmental contaminant. It can be taken up by wildlife (particularly in urban locations) and it breaks down into the banned PBDEs. Our results will play a central role in elucidating the risks of continuing production and use of Deca-BDE. Most importantly, the conclusions will provide the scientific basis for legislative action to reduce exposures to these flame retardants.

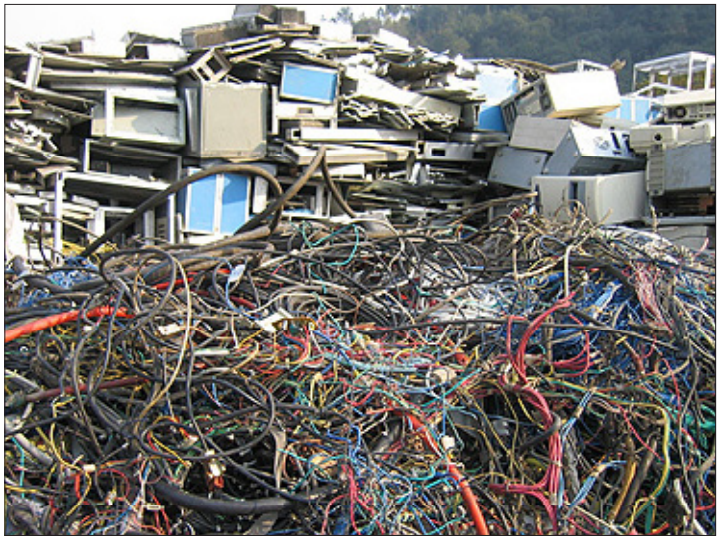


PCBs were banned 30 years ago, but continue to contaminate wildlife. PBDEs, still in use, are doubling in concentration every decade. We are now finding new brominated flame retardants in California wildlife.

Where Have All the PBDEs Gone?

Exposure to PBDEs may start indoors with the use of consumer products, but it continues beyond the useful life of these goods when they are thrown away. Depending on waste management practices, PBDEs may contaminate the environment and accumulate in wildlife and in the food chain.

Based on the DTSC laboratory's measurements of PBDEs in samples of wastestreams and on assumptions of use, electronic wastes are by far the predominant waste stream with about 1,200 metric tons (MT) of PBDEs per year. Next closest: autoshredder waste, with about 31 MT of PBDEs a year and sewage sludge, about 2.3 MT of PBDEs a year. When these estimates were compared with the reported use of all PBDEs in California, DTSC laboratory scientists determined that about half of the PBDEs could not be accounted for in the wastestreams examined. This suggests that additional waste streams, such as household wastes, should be evaluated for their PBDE content. To prevent public health and ecologic catastrophes, information on the presence and fate of PBDEs in all wastestreams needs to be included in waste management decisions.



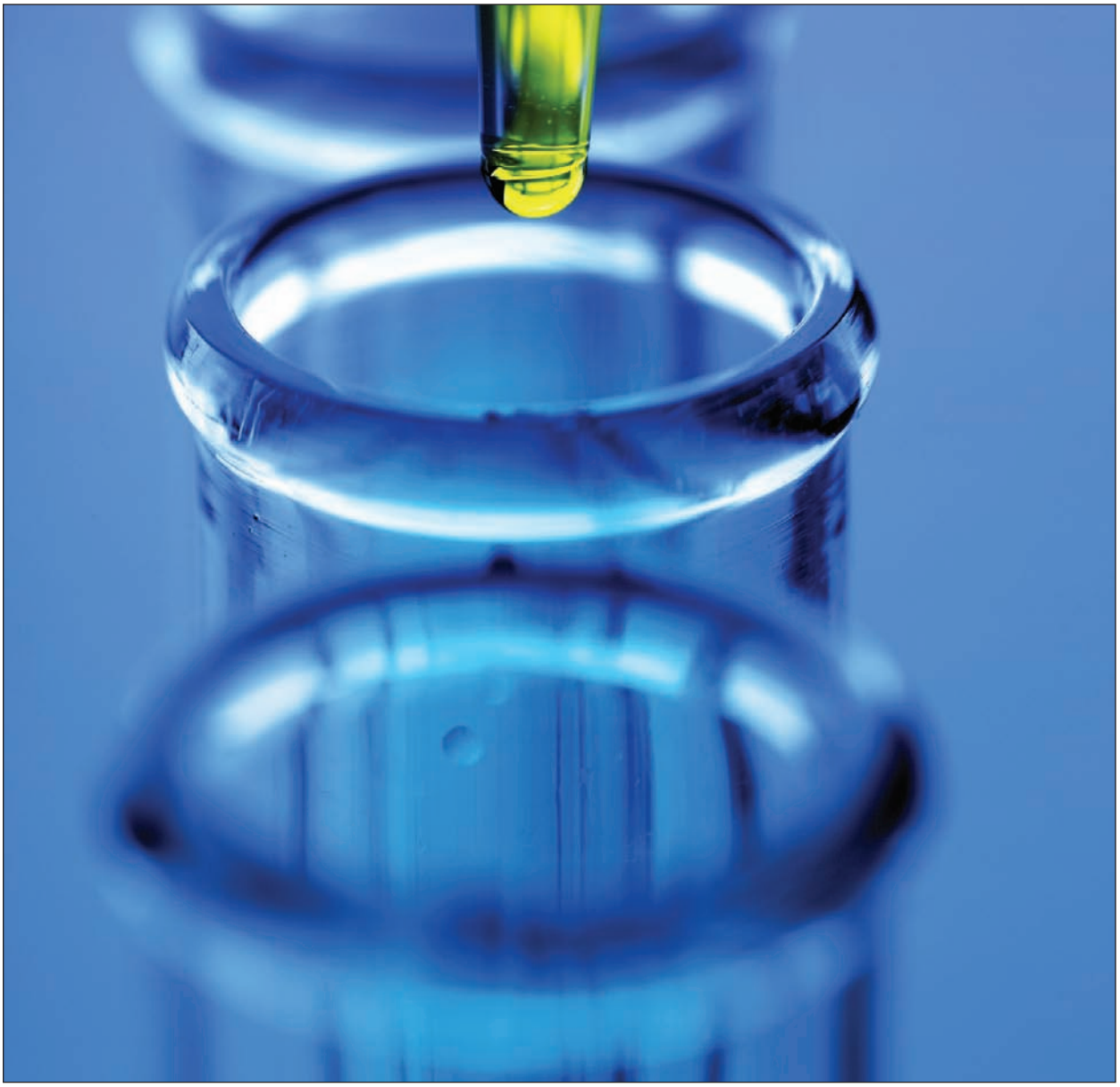
Discarded consumer electronics (e-waste) contain high levels of PBDEs

Evaluating the Presence of New Brominated Flame Retardants

New brominated flame retardants (BFRs) have been introduced into consumer products as replacements for the Penta- and Octa-BDE commercial mixtures that are banned in California, and for the Deca-BDE commercial mixture banned in Maine, Washington and the European Union. The new BFRs raise similar environmental concerns as PBDEs, and some are starting to appear in house dust and wildlife. For example, one of these new BFRs – decabromodiphenyl ethane (DBDPE) – has been reported present around the world; research also suggested it might be more bioaccumulative than BDE-209. We are developing methods to

Will new brominated flame retardants build up in humans and contaminate the environment as PBDEs do? ECL scientists are working to find out.

measure these BFRs in a variety of biological and environmental matrices, including serum from humans and wildlife, breast milk, bird eggs and house dust. Unlike PBDE congeners, which share a common structure, the new BFRs have different chemical structures. Currently, the DTSC laboratory is evaluating methods for 11 new BFR compounds. Chicken eggs are used as the model matrix systems for the tissue and egg sample preparation method. Once the methods are developed, archived extracts from peregrine falcon eggs, plasma of urban/suburban raptors and other wildlife, and contemporary human serum will be tested for the presence of these new BFR compounds. This work will help DTSC better understand bioaccumulation and exposure pathways of the new BFRs in wildlife and humans – and lead to the safer alternatives that are the driving principles behind California's Green Chemistry Initiative.



Providing Scientific Leadership for Today's Challenges

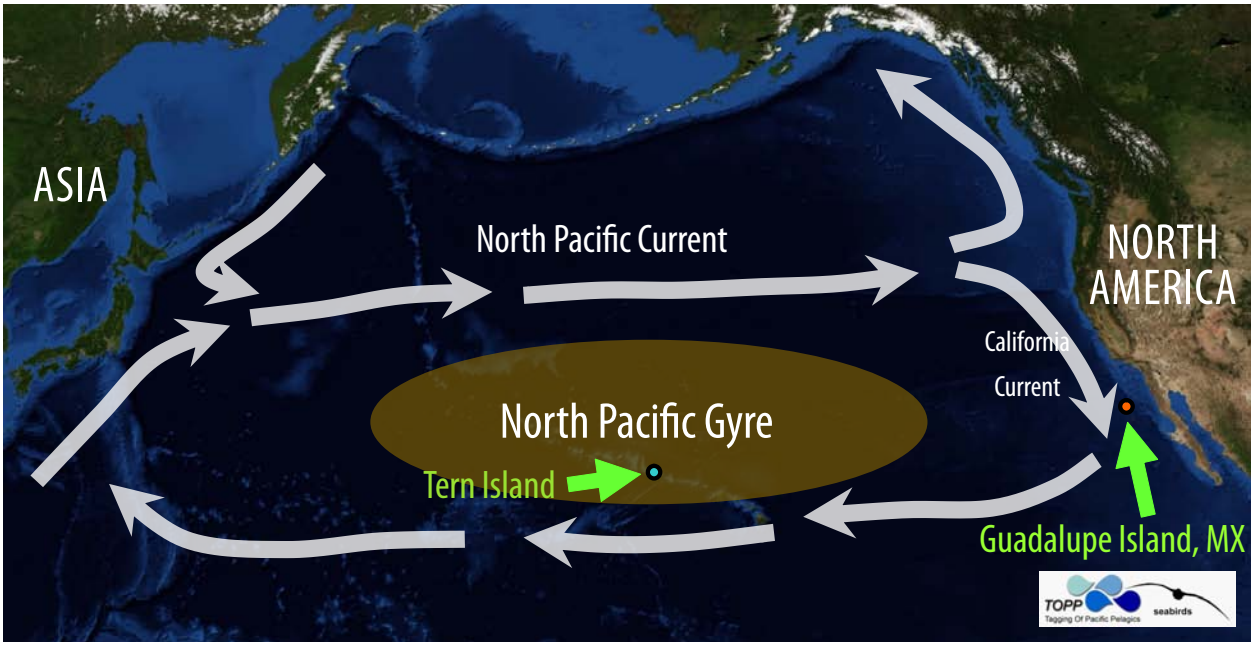
DTSC laboratory scientists provide the scientific data to support major programs, including the Green Chemistry Initiative, by developing testing methods and measuring chemical contaminants in a variety of everyday consumer products.

Ocean Protection

Governor Schwarzenegger has made protecting the oceans one of his key initiatives. The DTSC's Environmental Chemistry Laboratory's work provides valuable data on the condition of California's coastal waters and aquatic life. For many years, the laboratory has analyzed California fish, shellfish and marine mammal tissues for dioxins, organochlorine pesticides, PCBs and PBDEs. Such data give regulators and public health officials the scientific basis for risk management and public health advisories. In 2008, DTSC laboratory scientists collaborated on several projects with the Ocean Protection Council, the Algalita Foundation, the Jean Michel Cousteau Ocean Futures Society, the University of Maine and the Long Marine Laboratory at the University of California, Santa Cruz.

Measuring Chemical Contaminants in Albatrosses from the North Pacific Gyre

Reports on the North Pacific gyre, often coined the North Pacific 'garbage patch', have drawn much attention due to currents in the North Pacific Ocean forming an entrenched area where plastic debris and other non-biodegradable man-made materials accumulate. These materials are often consumed and found in the stomachs of top trophic level predators, such as Albatross birds. Albatrosses can help us measure the



A depiction of current patterns in the North Pacific Ocean, which generate the North Pacific gyre, commonly referred to as the North Pacific garbage patch. In green are the two islands from which serum samples from Albatross birds were taken.

A general representation of Albatross birds from which serum samples were taken for analysis.

health of our oceans because they are top predators, magnifying environmental contaminants from lower trophic species. To this end, DTSC collaborated with the Long Marine Laboratory at the University of California, Santa Cruz, to measure contaminant levels in Albatross and create valuable temporal trends of these contaminants. In this study, serum samples from 57 Albatrosses were analyzed for levels of 28 PCBs, 11 organochlorine pesticides, and 3 PBDEs. Samples were collected in 2005 – 2006 from Black-footed or Laysan Albatrosses from either Guadalupe or Tern Islands, located near Baja California or near the southern edge of the North Pacific gyre, respectively. Our results allow for comparisons with two previously reported studies of Albatross blood collected in 1993 – 1995 and 2000 – 2001. Most notable from all these studies are the low levels (median 0.05 ng/mL, range 0 – 0.74 ng/mL) of PBDE congeners 47, 99, and 153, the three main PBDE congeners seen in biota. On the other hand, levels of PCBs (median 26.22 ng/mL, range 7.48 – 83.79 ng/mL) and pesticides (median 38.34 ng/mL, range 5.51 – 162.31 ng/mL) were similar to those previously reported. These results indicate that PBDEs may have not reached the North Pacific gyre yet.

Studying PCBs in Harbor Seals

Harbor seals are a top marine predator. As such, they can provide us with valuable information about toxic contaminants that can build up in wildlife and people. Hydroxy-PCBs (metabolites of PCBs) are potent endocrine disrupters of the thyroid gland. We measured their levels in stranded harbor seals from San Francisco Bay and the Gulf of Maine to explore the metabolic fates of PCBs and to provide scarce exposure data for OH-PCBs in seals, which often carry high PCB levels.

PBDE levels in harbor seals increased 100 times over the 10 year period studied.

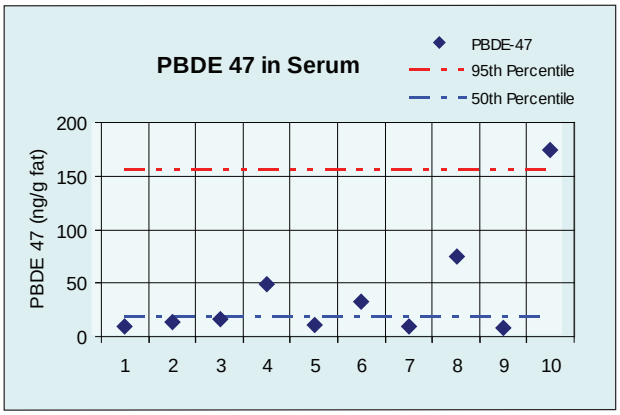
The predominant metabolite was 4-OH-CB107, a finding that raises concern because of its relationship to thyroid dysfunction reported in animal studies. Our results indicate that some of the stranded harbor seals might have suffered PCB-related adverse effects. Because of their endocrine disrupting properties, OH-PCB metabolites should be included in risk assessments for marine mammals.

Are the Same Contaminants Found in Killer Whales and Humans?

Killer whales are at the top of the ocean food chain, much as humans are at the top of the terrestrial food chain. In collaboration with the Ocean Protection Council and the Jean Michel Cousteau Ocean Futures Society, DTSC laboratory scientists collected blood samples from 10 ocean protection/conservation volunteers and analyzed them for PCBs, PBDEs and organochlorine pesticides (OCPs).

The results of the analyses were compared with the ranges of concentrations of these chemicals reported at the national level in the Center for Disease Control and Prevention's Third National Report on Human Exposure to Environmental Chemicals.

All participants in our study had chemical contaminants in their blood. As expected, and consistent with the prevalent use of PBDEs in California, the study participants had higher PBDE levels than is typical for the rest of the United States. The PBDE 47 graph shows the results for the 10 participants: All values were above or near the 50th percentile of the nationwide data, and some even exceeded the 95th percentile.



A PBS television documentary focusing on the impact of chemical contaminants on killer whales and humans – "Call of the Killer Whale" – highlight the Environmental Chemistry Laboratory's findings. The show aired on Earth Day 2009.

Toxics in Products

DTSC Laboratory Scientists Develop Methods for Measuring Phthalates in Plastic Products

Phthalates are commonly added as softeners to make polyvinyl chloride (PVC) flexible. Phthalates are suspected cancer-causing agents and may damage the liver, kidney and reproductive organs. The chemicals are not chemically bonded to PVC and can leach out, exposing young children who put PVC toys in their mouths to phthalates.

Following in the footsteps of the European Union and Japan in restricting the use of certain phthalates, California and the United States passed laws limiting certain phthalates in consumer products to 0.1 percent (1,000 ppm). Under California's Green Chemistry Initiative, DTSC has a central role in addressing toxic chemicals in consumer products.

In support of DTSC's role in protecting consumers from toxic chemicals, ECL has developed faster methods to screen and measure phthalates in plastic products. Analysis of more than 80 plastic toys showed that many exceeded the regulatory limit. Some samples were found to contain more than 50 percent phthalates. These quicker phthalates screening methods will help California companies comply with these new standards.

The DTSC Laboratory Helps Other State Agencies Screen Promotional Items for Toxic Metals

Coffee mugs? Backpacks? Flashlights? State agencies often distribute such common items to highlight and promote their programs. These items may carry agency logos and slogans and contain useful information for the public. Sometimes they contain toxic chemicals as well.

In 2007, after it was discovered that lunchboxes distributed to thousands of California children were made of material (PVC) inadvertently containing high levels of lead, the Governor's Office asked DTSC to screen the promotional items distributed by every state agency. What made the work even more challenging was that each item needed to be disassembled into distinct components and each component tested for lead and cadmium, two toxic metals. To efficiently address the overwhelming number of samples submitted in just a few weeks (219 items with almost 1,000 individual components to be measured), DTSC laboratory scientists devised a triage approach: All items and their components were first screened using X-ray fluorescence machinery to identify the presence of lead and cadmium. Based on the screening results, 105 components were further analyzed, and 35 types of products were found to contain lead or cadmium above threshold levels. DTSC laboratory scientists immediately reported the results.

This experience alerted state agencies, their suppliers and manufacturers to be more vigilant and to ensure that no toxic products are distributed to the public.

DTSC Laboratory Provides Data for New Standards for Managing Treated Wood Waste

Pressure-treated lumber is widely used in construction and landscaping. Toxicity concerns have led to arsenic-based wood preservatives being replaced by copper-based treatments, such as Copper Azole (CA) and Alkaline Copper Quaternary (ACQ). Creosote, a coal-tar derivative, is another wood preservative,

commonly used on utility poles and railroad ties. Creosote is a complex mixture of organic compounds that includes toxic polyaromatic hydrocarbons (PAHs) and cresols (methyl phenols).

Laboratory scientists analyzed copper- and creosote-treated wood to help DTSC develop standards for managing treated wood waste. The results were presented at an industry workshop at Cal/EPA headquarters in September 2008, and incorporated into the department's draft report: *www.dtsc.ca.gov/HazardousWaste/upload/TWSampling_Study_edition5v25.pdf*

This study evaluated the toxicity characteristics of copper and creosote-treated wood using laboratory methods prescribed in Title 22 for waste classification. Representative samples of new CA- and ACQ-treated lumber and untreated controls were collected statewide. Used creosote-treated railroad ties were selected from a collection site in Nevada, where they are processed for cogeneration facilities in California. The study required the development of novel sample preparation and analytical procedures to ensure representative samples and accurate data. Sample collection and field preparation were done by the University of California, Berkeley, Cooperative Extension.

All of the copper-treated wood exceeded the Title 22 toxicity criteria for total and soluble copper. Creosote-treated Douglas fir railroad ties exceeded the Title 22 regulatory limit for aquatic bioassay, but creosote-treated oak ties did not. These laboratory findings will be key to DTSC's efforts to manage treated wood waste and protect public health and the environment.

Creosote treated railroad ties

Wood samples prepared for analysis

Lead in Jewelry

Lead is a persistent and toxic metal. Exposure to it can cause a host of health troubles ranging from behavioral problems and learning disabilities to organ failure and even death. Children six years old and under are most at risk because their bodies are growing quickly. California's Lead-Containing Jewelry Law, which took effect in 2007 and has since been expanded, limits the amount of lead in jewelry designed for children and adults, as well as restricts the amount in body-piercing jewelry, watches, detachable clothing and shoe ornaments. Lead-containing children's jewelry poses a particular concern because kids are prone to placing jewelry in their mouths, which can result in lead absorption at dangerous levels.

As part of DTSC's enforcement of the law, the Environmental Chemistry Laboratory was responsible for analyzing a wide variety of necklaces, bracelets, earrings, rings and bangles made of colored beads of different colors, metal and plastic components. One challenge was that most of the items consisted of several components that had to be separated before analysis. The DTSC laboratory evaluated a range of methods and techniques to ensure that lead was measured accurately in all the different types of materials – metal, plastic, ceramic, glass. High content of lead was found in many of the items, especially in inexpensive children's jewelry. In addition to the detailed lab work, DTSC laboratory scientists validated methods for rapid screening of jewelry items using portable X-ray fluorescence instruments.

Automobile Dismantlers, Autoshredders, Auto Body and Paint Shops

Many of the industrial chemical products used in auto body and paint shops may contain toxic chemicals that have the potential to release pollutants into the environment. Automobile salvage yards are primarily engaged in assembling, breaking up, sorting and wholesale distribution of scrap and waste materials. Disassembling the vehicles and draining fluids from vehicles have the potential for environmental contamination during various stages of the work, while the illegal disposal of items such as unused paint, polymer resins or contaminated spent containers can cause a host of other problems. DTSC inspectors investigating auto dismantlers, auto body and paint shops bring samples (soil, water, solids, liquids and other material) to the laboratory for analysis of automobile-related contaminants (gasoline, diesel, motor oil, ethylene glycol, lead and mercury).

Autoshredder wastes consist of shredded plastic components, upholstery, insulation, glass and cables, material left behind after ferrous and non-ferrous metals are recovered from automobiles and major appliances (refrigerators, ovens, etc.). When below regulatory thresholds for metals and PCBs, the wastes generated by autoshredders are applied as alternative daily cover in California landfills. The laboratory supports DTSC's investigations of autoshredder facilities by measuring regulated elements and PCBs. In addition, DTSC laboratory scientists measure the still un-regulated PBDEs in autoshredder waste.

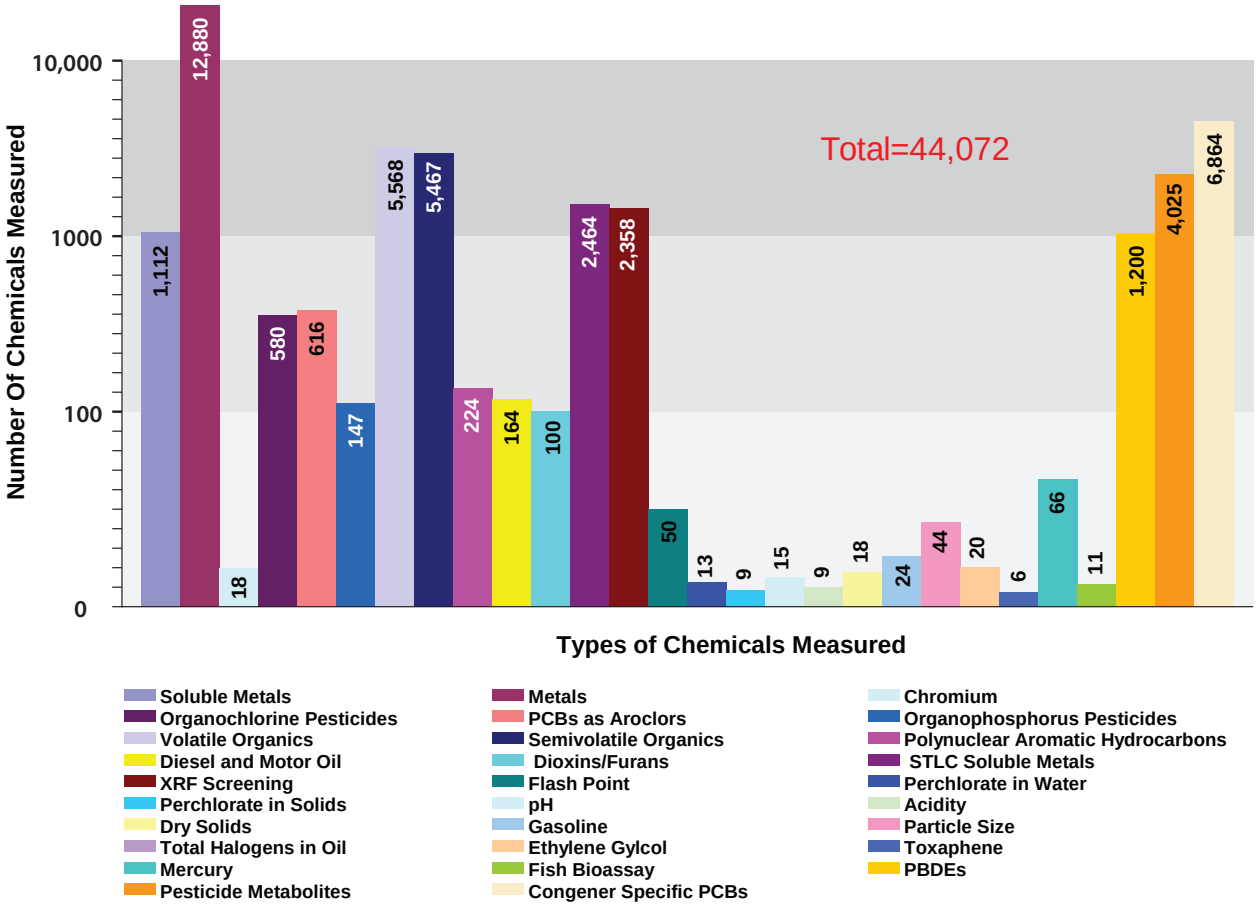
Setting the Standard for Excellence

Environmental samples (soils, liquids, sludge and other material) are submitted to the laboratory by inspectors from many DTSC programs, including Criminal Investigations, Emergency Response, CUPA, Brownfields and Site Clean-up. Samples from special projects, such as Biomonitoring (analyses of blood and urine) and Toxics-in-Consumer Products) (analyses of lead in jewelry, toxic chemicals in packaging, and phthalates in toys) are also analyzed. Using state-of-the-art equipment, DTSC laboratory scientists perform analyses for more than 2,000 individual chemicals.

Number of Chemicals Measured in 2008 and 2009

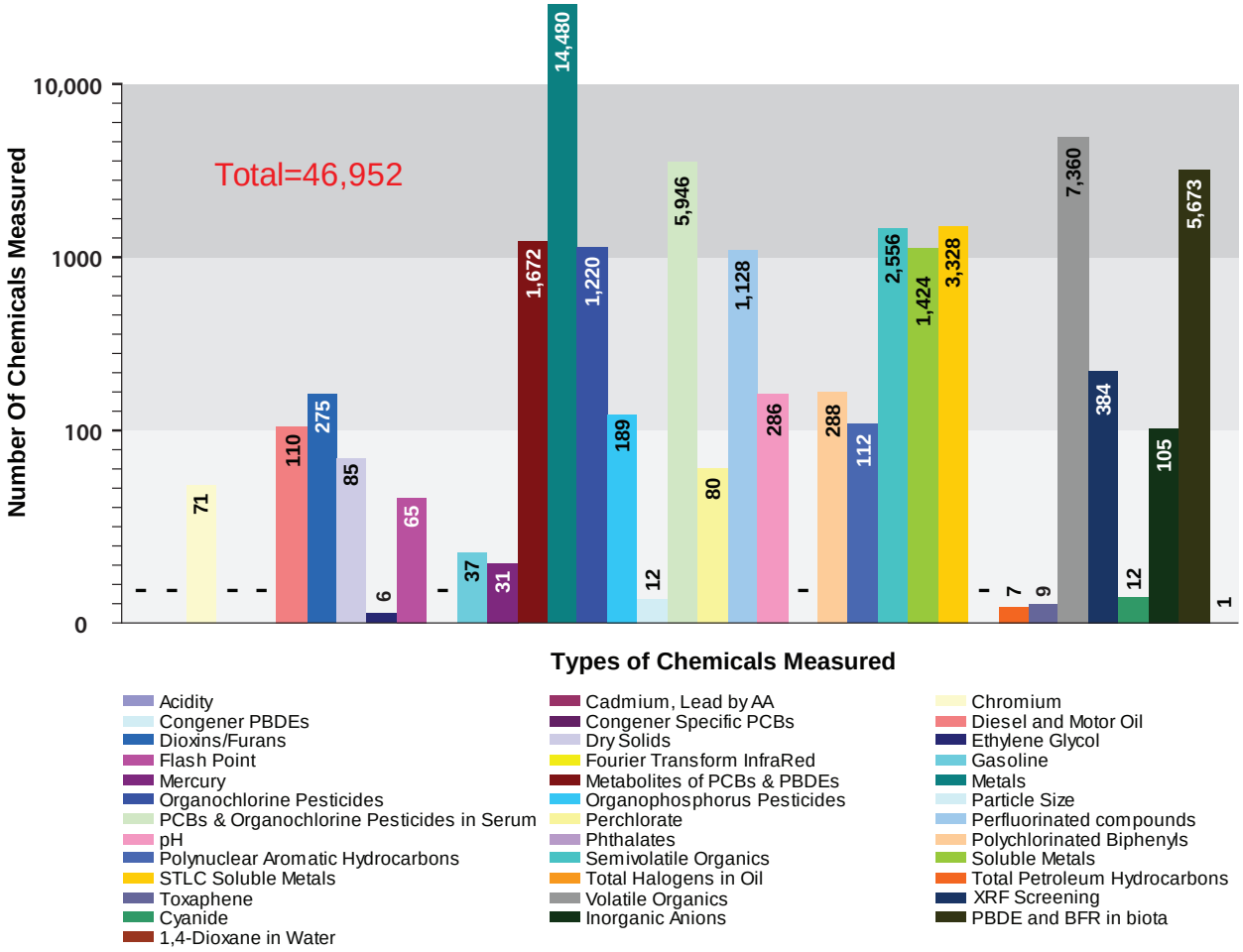
The following charts represent the number of chemicals analyzed by DTSC laboratory scientists in 2008 and 2009. Capturing the total number of individual chemicals in each type of material provides insight into the procedural complexity required to analyze each sample.

Environmental Chemistry Laboratory
Number of Chemicals Measured Jan - Dec 2008



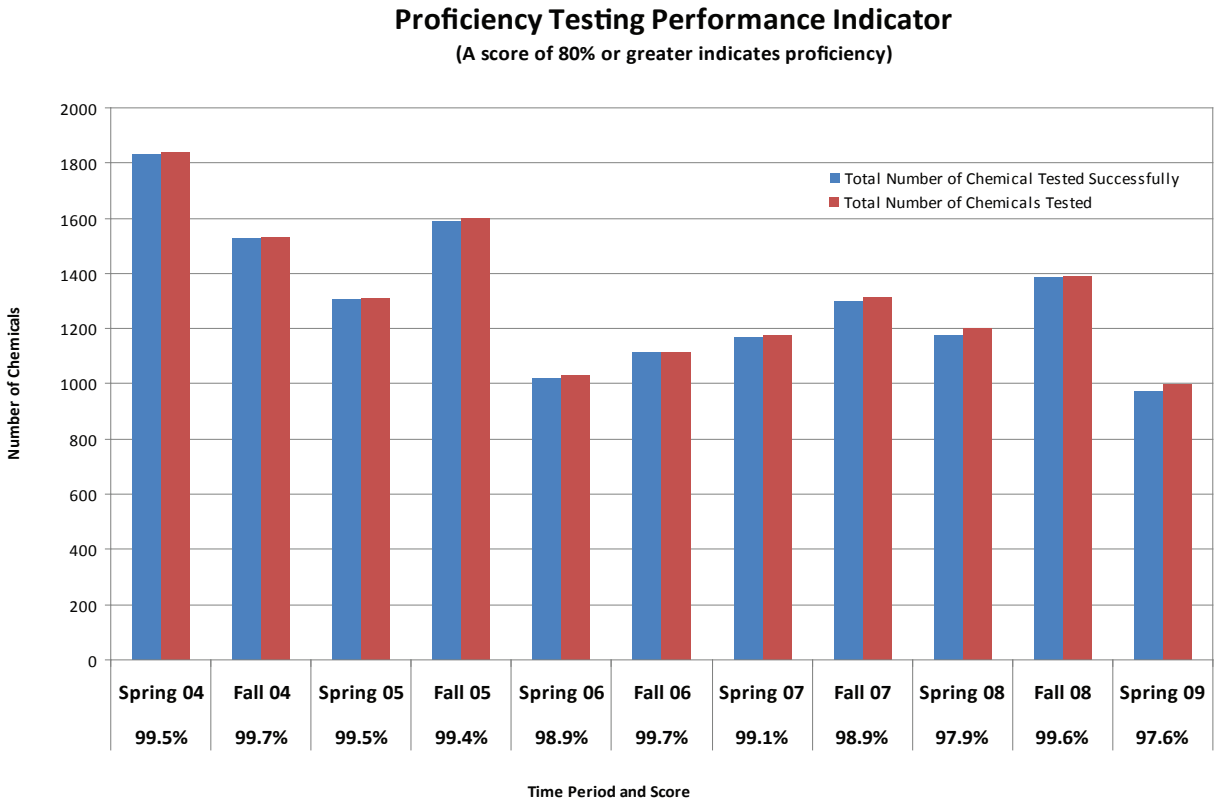
Environmental Chemistry Laboratory

Number of Chemicals Measured Jan - Dec 2009



The DTSC Laboratory Continues to Get High Scores on Proficiency Testing

To function as a reference laboratory, the DTSC laboratory needs to continuously demonstrate accuracy and precision in performing all types of measurements. As a reference laboratory for California's Environmental Laboratory Accreditation Program, the laboratory participates in two single-blind Performance Evaluation studies each year. Tracking our performance is one of the ways in which we evaluate and document the quality of the data we generate. We compare our results with the study's acceptance criteria, with other previous studies and with the results of other laboratories that participated in the study. It's essential that accurate and precise results be reported from the laboratory for decision-making by all DTSC programs. In addition, the National Environmental Laboratory Accreditation Program requires that laboratories pass two out of the latest three single blind, single-concentration proficiency testing studies for each field of testing (program-matrix-analytes) per year. Laboratories are considered proficient if they score 80 percent or above. DTSC's Environmental Chemistry Laboratory consistently achieves scores above 99 percent.



Work Performed By DTSC Laboratory Scientists Is Often Published In Scientific Journals

Since the mid-1980s, ECL scientists have published more than 170 scientific papers, averaging six to seven papers per year. As of December 2009, these papers have been cited in 2365 other publications, an indication of the significance and relevance of ECL's research work. The following papers were published in 2008 and 2009:

2008 Publications

1. Holden A, Park, JS, Chin T, Choi G, Chu V, Kim M, Patel P, Rhee A, Shi Y, Linthicum J, Walton, Hooper K. Congener Patterns of Higher Brominated PBDEs in Biotic and Abiotic Matrices: Evidence for BDE-209 Debromination. Organohalogen Compounds 70, 1036-1039, 2008.
2. Park JS, Holden A, Wang Y, Chang J, Heckly S, McKeown K, Jewell N, Hooper K.. Metabolic Fate of Polybrominated Diphenyl Ethers (PBDEs) in California Kestrel Blood. Organohalogen Compounds 70, 1566-1569, 2008.
3. Park JS, Holden A, Wang Y, Chang J, Heckly S, McKeown K, Jewell N, Hooper K Hydroxylated Metabolites of Polychlorinated Biphenyls (PCBs) in California Wild Birds. Organohalogen Compounds 70, 157-160, 2008.
4. Petreas, M, Brown FR, Goldberg D, Hurley S, Nelson D, Reynolds P. PBDEs and PCBs in breast adipose tissue of California women. Organohalogen Compounds, 70, 1888-1891, 2008.
5. Park JS, Bergman Å, Linderholm L, Hertz-Picciotto I, et al. Placental Transfer of Polychlorinated

Biphenyls and Halogenated Phenolic Compounds (OH-PCBs, PCP) in a Birth Cohort in Eastern Slovakia. Chemosphere. 70(9), 1676-1684, 2008.

6. She J, Holden A, Adelsbach TL, Tanner M, Schwarzbach SE, Yee JL, Hooper K. Concentrations and Time Trends of Polybrominated Diphenyl Ethers (PBDEs) and Polychlorinated biphenyls (PCBs) in Aquatic Bird Eggs from San Francisco Bay, CA 2000 – 2003. Chemosphere. 73, 201-209, 2008.

2009 Publications

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3. Park J-S, Holden A, Chu V, Newsome SD, Henry RW, Wang M, Kim M, Rhee A, Patel P, Fong A, Linthicum J, Hooper K. Exposure of California Peregrine Falcon (Falco peregrinus) to new alternative Brominated Flame retardants, replacement of PBDEs. Organohalogen Compounds, 71: 820-823, 2009.
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11. Petreas M and Oros D. PBDEs in California Wastestreams. Chemosphere 74:997-1001, 2009

For a complete list of ECL publications visit:
www.dtsc.ca.gov/AssessingRisk/ECL/upload/ECL_LIST_Publications-3.pdf

The DTSC Laboratory Hosts Seminars Series on Emerging Chemical Issues

The DTSC laboratory has been hosting biweekly seminars in Berkeley with simultaneous broadcasting to other DTSC regional offices. These seminars are open to other researchers and to the public. Both in-house work and the work of guest speakers is presented and discussed.

Environmental Chemistry Laboratory
2008 Seminar Series Speakers

Date	Speaker/Affiliation	Topic of Discussion
January 9	Lois Courchaine - Central Contra Costa Solid Waste Authority	Extended Producer Responsibility Through the California Product Stewardship Council
January 15	Pete Palmer, Ph.D. SFSU, and Richard Jacobs, FDA	XRF-Based Detection and Quantitation of Toxic Elements for FDA Lab and Field Investigations
January 23	William Draper, Ph.D., CDPH	LC-MS-MS Determination of Microcystins in Water
January 28	Yu-Chen Chang, Ph.D	Use of LC/MS/MS in Sports Doping Control and Environmental Endocrine Disruptor Studies
February 5	Wang-Hsien Ding, Ph.D., Stanford University	Determination of selected emerging contaminants by GC/MS and LC/MS
February 11	Prof. Nik van Larebeke, Ghent University, Belgium	The Flemish Biomonitoring Project: Followup at 36 Months
February 27	Kristin Robrock, UC Berkeley	Biodegradation of PBDEs
March 12	Myrto Petreas, Ph.D., ECL	ECL's Role in CA Biomonitoring: Challenges and Opportunities
March 26	KC Ting, Ph.D., ECL	XRF Evaluation and Application
April 9	Susan Klosterhaus, Ph.D., SFEI	The bioavailability of PBDEs from urban estuarine sediments to deposit-feeding invertebrates
April 23	Weihong Guo, Public Health Institute/ECL	Chromosome Changes in Benzene Exposed Workers and Controls
May 14	Julia Quint, Ph.D., DPH (retired)	Emerging Contaminants in California's Workplaces: Dry-Cleaning and Decamethylcyclopentasiloxane (D5)
May 28	Martin Snider, ECL	Waste Classification Analysis of Treated Wood

Date	Speaker/Affiliation	Topic of Discussion
June 18	Prof. Lennart Hardell, MD, Ph.D. Orebro University Hospital, Sweden	Persistent Organic Pollutants (POPs) and Cancer
June 25	Susan Heckley, Lindsay Wildlife Museum	Urban Wildlife and Emerging Contaminants: Sentinels for Human Health?
July 9	Bill Henry, UCSC Long Marine Lab	Tracking the top of the Pelagic Food Chain: Animals as ocean samplers
July 23	Arthur Holden, ECL	"Deca" (BDE-209), the largest PBDE Flame Retardant
August 13	Ann Blake, Ph.D.	Implementing Chemicals Policy Reform: Case Studies
August 27	Gale Filter, DTSC, E&ER	Science and Environmental Prosecutions: It Ain't CSI
September 10	Dennis Shusterman, MD, Occupational Health, DPH	Significance of Indoor Air Chemistry to 'Sick Building Syndrome'
September 24	June-Soo Park, Ph.D., ECL	Current Levels of POPs in CA Wildlife and Humans
October 8	Don Patterson, Ph.D., Centers for Disease Control (retired)	The Use of Biomonitoring to Assess Human Exposure to Environmental Chemicals
October 22	Susan Klosterhaus, Ph.D., San Francisco Estuary Institute	Alternative Brominated Flame Retardants in the San Francisco Bay: New Chemicals of Emerging Concern
November 12	Miaomiao Wang, Ph.D., ECL	The formation of Peptide Nucleic Acid and DNA duplexes; The interaction of small molecules with these duplexes, and application in DNA diagnostics
December 10	K.C. Ting, Ph.D., ECL	GC/MSD Method for Phthalates in Children's Toys

Environmental Chemistry Laboratory
2009 Seminar Series Speakers

Date	Speaker/Affiliation	Topic of Discussion
January 14	Thu Quach, Northern California Cancer Center	Breast Cancer Risks in California Nail Salon Workers
January 28	Suhash Harwani, Ph.D. DTSC- ECL	Complexation of Cations, Anions, and Organic Substrates using Modified Cyclodextrins
February 11	Claudia Polsky, DTSC-Pollution Prevention	Detoxifying California: What's our Plan?
February 25	Ki Chang Ahn, Ph.D. Immunochemist and Agricultural Chemist, UC-Davis	Immunoassay for Monitoring Human and Environmental Exposure to Personal Care Products and Brominated Flame Retardants
March 25	Simon Jones, Agilent Technologies	Techniques for Making Your GC Analysis More Repeatable and Robust
April 8	Arlene Blum Ph.D., Green Science Policy Institute	Fire Retardant Dilemma
April 22	John Karachewski, PhD, PG, CHG, DTSC	Geology of the San Francisco Bay Region
May 13	Claudio Sorrentino, DTSC	AB289: Looking for Answers: The case of TBPH, an "alternative" flame retardant
May 27	June-So Park, Ph.D., DTSC-ECL	Exposure of California Peregrine Falcon (Falco Peregrinus) to PBDEs and New Alternative BFRs: Different profiles between coastal and big city falcons
June 10	Mary Ann Shen - LC/MS Product Specialist, Agilent Technologies	LC/MS Analysis of Emerging Environmental Toxics and Contaminants
June 24	Dr. Sissy Petropoulou, CDC	Emerging chemicals and related analytical procedures for their determination in biological samples
July 8	Myrto Petreas, Ph.D., DTSC-ECL	POPs in California Women: From the 1960s to the Present

Date	Speaker/Affiliation	Topic of Discussion
July 22	Isabel Faria, U.C. Davis - Agricultural and Environmental Chemistry	Competitive Sorption of Hydrophobic Organic Chemicals in Soil
August 12	John Johnson, Ahura Scientific, Inc.	Smaller, Smarter, Tougher: Advances in Spectroscopic Analysis
August 26	Richard Jack, Ph.D.	A review of US EPA methods for water analysis developed by Dionex
September 9	Bruce Kaiser, Ph.D., Bruker AXS	The Fundamental Art of X-Ray Probing Materials
September 23	Dave Mickunas, U.S. EPA	Trace Atmospheric Gas Analyzer (TAGA) Laboratories
October 14	Ami Zota, ScD, Harvard School of Public Health	The PBDE Burden in California - Sources, Exposures, and Potential Health Effects
November 3	Linda Linderholm, Ph.D. Candidate, Stockholm University	Human Exposure to Persistent Organic Pollutants in West Africa: An Individual Specific Temporal Trend Study from Guinea-Bissau
December 1	Eddy Y. Zeng, Ph.D., Guangzhou Institute of Geochemistry, Chinese Academy of Sciences	The Occurrence and Fate of Persistent Halogenated Compounds in the Environment of the Pearl River Delta, South China

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