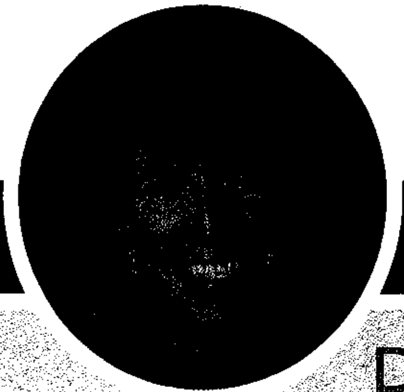
EPA United States Environmental Protection Agency

www.epa.gov/pbt

2001-2002

PBT Program Accomplishments



Pollutants that are persistent, bioaccumulative, and toxic have been linked to numerous adverse effects in humans and animals. The United States has taken extensive action over the years to address these pollutants. But such pollutants not only remain in the environment for years and even decades, they also travel far beyond their initial points of release, posing threats across national and geographic boundaries. Only by addressing the threat of these pollutants on a global scale can we help to meet our goal of leaving America's air cleaner, our water purer, and our land better protected.

— Christine Whitman, EPA Administrator

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CHAPTER 1: **INTRODUCTION**

Chemicals are used to produce many of the items that we depend on in our daily lives. While useful, chemicals are often a cause for concern due to their toxic properties. Toxic chemicals that are also persistent and bioaccumulative, such as mercury, dioxins and furans, polychlorinated biphenyls (PCBs) and some pesticides, deserve special attention. These persistent, bioaccumulative, and toxic (PBT) substances are released into the environment, persist in ecosystems, and often linger there in some form for decades, cycling between land, water, and air. As aquatic and terrestrial organisms repeatedly consume and store PBTs in their body fat, these substances bioaccumulate up the food chain. Most human exposure to PBTs occurs through the consumption of contaminated foods. A range of adverse health effects (e.g., reproductive, developmental, behavioral, neurologic, endocrine, and immunologic) have been linked to PBTs. Because many PBTs can be transported by wind and water, it is possible for PBTs generated in one country to affect people and wildlife far from the source.

In its mission to protect human health and the environment, the U.S. Environmental Protection Agency (EPA) has regulated the use and release of the most harmful PBTs. While these regulations have been effective in controlling industrial and municipal sources of PBTs, runoff, fugitive sources, and background levels of PBTs have proven harder to manage. Therefore, in 1998, EPA created the Persistent, Bioaccumulative, and Toxic (PBT) pollutants Program to address, using an integrated approach, the widespread problems associated with toxic pollutants that persist and bioaccumulate in the environment. EPA also created the Multimedia Pollution Prevention (M2P2) Forum, a group of senior managers representing each of EPA's program offices, to provide guidance to the PBT Program.

The M2P2 Forum deliberates on EPA's PBT policies and also communicates with several partners, including other federal agencies, state representatives, and international organizations, to resolve common concerns regarding PBTs. In collaboration with these partners, the PBT Program had several noteworthy achievements in 2001-2002:

- **Released final National Action Plan for Alkyl-lead.** This document is the first final EPA national action plan for a priority PBT under the Agency-wide PBT Program. The plan lists specific goals and priorities for action for alkyl-lead.
- **Released the PBT Profiler.** The PBT Profiler is a Web-based analytical tool designed to help companies determine whether a chemical might have PBT properties.
- **Expanded membership in the Hospitals for a Healthy Environment (H2E) Program.** This voluntary program calls on hospitals and health care facilities to pledge to eliminate mercury use by 2005. To date, the program has recruited 324 hospitals, 586 clinics, 15 nursing homes, and 29 other facilities.

- **Analyzed data from the National Health and Nutrition Examination Survey (NHANES).** Based on NHANES data from 1999 and 2000, EPA estimates that 8 percent of women of childbearing age have blood mercury concentrations higher than the level that EPA considers safe.
- **Researched trends on atmospheric mercury deposition.** EPA has uncovered new information that implies that all forms of mercury must be controlled to effectively reduce atmospheric deposition.
- **Collected additional data on PBTs through the Toxic Release Inventory (TRI).** The 2002 TRI report contains newly included data on PBTs, giving communities a more complete picture of the sources of chemicals in their environments.

These accomplishments, as well as several others, are described in further detail in subsequent chapters of this report. The report contains the following information:

- **Chapter 2: Strategies for Addressing PBTs.** This chapter provides a synopsis of the PBT Program's priority activities, including its PBT Strategy and national action plans for priority pollutants.
- **Chapter 3: Achieving Pollution Reductions.** This section highlights recent efforts of the PBT Program to coordinate and enhance EPA's mission of decreasing PBT contamination in the environment.
- **Chapter 4: Filling the PBT Data Gaps.** In 2001-2002, EPA initiated or continued projects designed to discover key information about the sources of PBTs, their life cycle in the environment, as well as the levels of PBTs present in humans and wildlife. This research allows EPA and others to determine the most appropriate PBT-related policies and courses of action.

- **Chapter 5: Collaborative Efforts on PBTs with Tribal Partners.** Many tribes, especially those in Alaska and other parts of the Arctic, rely on subsistence diets that include much more fish than the average American eats. Some tribes are also particularly reliant on the consumption of animals that are high on the food chain. Subsistence hunters and fishermen are one of the highest risk groups for PBT exposure, thus fostering partnerships in tribal communities is particularly important.
- **Chapter 6: Collaborative Efforts on PBTs with International Partners.** This chapter describes efforts of the United States and its international partners to reduce the global use and release of PBTs.
- **Appendix A: Resources.** This section provides additional sources of information about many of the projects described in the body of the report.
- **Appendix B: Future Outlook.** This section summarizes future activities planned by the PBT Program.

CHAPTER 2: **STRATEGIES FOR ADDRESSING PBTs**

EPA actions to reduce PBT releases have traditionally been separate regulatory activities aimed at different environmental media (i.e., air, water, or land). The PBT Program helps to coordinate these activities to ensure, for example, that regulations removing a pollutant from the air do not inadvertently result in transferring the pollution to land or water. In November 1998, the PBT Program published its draft *Multimedia Strategy for Addressing Priority PBTs* (the PBT Strategy). EPA revised the PBT Strategy to incorporate public comments and is currently finalizing the document. The PBT Program is also developing national action plans to address specific issues associated with eight priority PBTs or groups of PBTs (see Table 1). Together, the PBT Strategy and national action plans enable the Agency to harness all of its tools—voluntary, regulatory, international, enforcement, compliance, and research—and focus them on a group of substances that have long-term and far-reaching effects on our well-being.

The PBT Strategy

The goal of the PBT Strategy is to reduce risks to human health and the environment from current and future exposure to PBTs. The PBT Strategy identifies general issues that apply to PBTs, such as long-range transport via air deposition and human exposure to PBTs through the food chain. Solving these problems requires action on several fronts:

- Preventing the introduction of new PBTs.
- Reducing the use and release of existing PBTs.
- Improving our understanding of how PBTs cycle in the environment and the routes of human exposure to PBTs.
- Communicating the risks of PBT exposure, especially to sensitive populations.
- Working globally to diminish the long range transport of PBTs.

The projects described in this report use these approaches to address PBTs.

National Action Plans for Priority PBTs

The national action plans look at each priority PBT or group of PBTs in detail, outlining goals and important activities to reduce the negative effects of each substance on human health and the environment. Table 2 describes each priority PBT and the status of its national action plan.

Table 1. Priority PBTs

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Table 2. Description of Priority PBTs and Status of EPA Activities

PBT OR PBT GROUP	DESCRIPTION	HUMAN HEALTH AND ECOLOGICAL EFFECTS	SOURCES AND ROUTES OF HUMAN EXPOSURE	FOCUS OF NATIONAL ACTION PLAN	STATUS OF NATIONAL ACTION PLAN DEVELOPMENT
Alkyl-lead	The vast majority of lead chemical compounds are inorganic. However, lead can be combined with organic chemicals to form lead compounds with very different characteristics from metallic lead. Alkyl-lead is one of the more predominant types of organic lead compounds.	Human health effects: serious toxic effects to the nervous system, with the potential to cause neurological disorders, such as mood shifts and impairment of memory. Children and certain occupational groups may be most at risk. Ecological effects: Alkyl-lead and other organic lead compounds have been found to significantly bioconcentrate in aquatic organisms (e.g., fish and shellfish), although the biomagnification of organic lead compounds has not been shown.	Main Source: fuel additive for racing gasoline and piston-engine aircraft. Human exposure: inhalation of leaded gasoline vapors or dermal exposure to leaded gasoline.	Continued partnership with the National Association for Stock Car Automobile Racing (NASCAR) to permanently remove alkyl-lead from racing fuels. Work with the Federal Aviation Administration (FAA) and appropriate private parties to identify substitutes for alkyl-lead compounds in aviation gasoline.	In July 2002, EPA released the final National Action Plan for Alkyl-lead.
Benzo(a)Pyrene (B(a)P)	B(a)P is a member of a class of compounds known as polycyclic aromatic hydrocarbons (PAHs). PAHs are primarily by-products of incomplete combustion.	Human health effects: probable human carcinogen. Ecological effects: There is evidence of carcinogenicity in animals. Animal studies also suggest that there are developmental and reproductive problems associated with long-term exposure.	Largest sources of B(a)P: forest and agricultural burnings; residential wood combustion; primary aluminum production; mobile sources; and open burning of scrap tires. Main routes of human exposure: inhalation of tobacco smoke; ingestion of smoked or charbroiled food; exposure during work involving coal tar and asphalt.	Research is a high priority since there is little data characterizing the relationship between emission sources and current exposure and risk. EPA is researching the relationship between risk and emission sources such as forest fires, agricultural burning, residential wood and coal combustion, scrap tire management, and industrial boilers. Other federal, state, and local programs address exposure to B(a)P through the inhalation of tobacco smoke, ingestion of smoked or charbroiled food, and occupational exposure.	The draft National Action Plan for B(a)P will be made available to the public for comment before the final version is released.

PBT OR PBT GROUP	DESCRIPTION	HUMAN HEALTH AND ECOLOGICAL EFFECTS	SOURCES AND ROUTES OF HUMAN EXPOSURE	FOCUS OF NATIONAL ACTION PLAN	STATUS OF NATIONAL ACTION PLAN DEVELOPMENT
Dioxins/Furans	The term "dioxins" refers to a group of 29 chemical compounds that are members of three closely related families: polychlorinated dibenzo-p-dioxins, polychlorinated dibenzofurans, and certain polychlorinated biphenyls (PCBs) called coplanar PCBs.	The most studied dioxin compound, 2,3,7,8-TCDD, has been characterized as a human carcinogen. Other dioxin-like compounds have been characterized as likely human carcinogens. Non-cancer health effects include reproductive and developmental toxicity, immune suppression, endocrine disruption and chloracne. Ecological effects: Effects found in humans are typical in most vertebrates. These adverse effects have been seen in field and laboratory studies in birds and fish. The disruption of fish reproduction is seen as a particularly sensitive ecological endpoint.	Dioxins are unintended byproducts of a number of processes including: chemical manufacture; metals smelting and production; and various forms of combustion, ranging from energy production to backyard trash burning. When dioxins and furans are released to the air they can be carried for long distances. Some of this material is deposited on the leaves of plants that are used as feed for livestock. Consequently the dioxins bioconcentrate in domestic meat and dairy animals. Dioxins can also enter waterways, where they may bioconcentrate in fish. Humans are exposed to dioxins primarily through diet, namely from eating trace levels of dioxins found in the animal fats of beef, pork, poultry, milk, and dairy products.	EPA has developed a three-pronged approach to address remaining dioxin risks in the environment. First, EPA is continuing to complete and implement regulations to reduce and control known dioxin sources into the environment. (When fully implemented over the next couple of years, existing regulations will result in over 90 percent reduction in quantifiable dioxin emissions using 1987 as a baseline.) Second, in cooperation with other federal and state agencies, EPA is continuing its research efforts to identify dioxin sources and routes of exposure. Third, the Agency is developing a strategy to identify opportunities to further reduce exposures to dioxin that will yield efficient and effective risk reductions. EPA will continue to work closely with its other federal partners, including the Department of Health and Human Services (HHS), the U.S. Department of Agriculture (USDA), and other agencies. Dioxins/furans are also listed under the Stockholm Convention on Persistent Organic Pollutants (POPs) and the Long Range Transport of Air Pollution (LRTAP) POPs Protocol. See Chapter 6 for more information.	An EPA Strategy on Dioxin will be released in 2003.

Table 2. continued

PBT OR PBT GROUP	DESCRIPTION	HUMAN HEALTH AND ECOLOGICAL EFFECTS	SOURCES AND ROUTES OF HUMAN EXPOSURE	FOCUS OF NATIONAL ACTION PLAN	STATUS OF NATIONAL ACTION PLAN DEVELOPMENT
Hexachlorobenzene (HCB)	HCB is a highly persistent environmental toxin that was synthesized and used from the 1940s to the late 1970s as a fungicide on grain seeds such as wheat. HCB is no longer produced for distribution in commerce although it may be produced in the United States as a site-limited intermediate under an exemption to the UNEP POPs agreement.	Human health effects: probable human carcinogen. Ecological effects: HCB bioaccumulates in fish, marine animals, birds, lichens, and their predators. HCB has been found in fish and wildlife at various locations throughout the U.S., though the Great Lakes and Gulf coast are areas with elevated concentrations.	HCB is formed as an inadvertent by-product in the production of pesticides, chlorine, and in chlorination processes. Long-range atmospheric transport and deposition from global sources are also thought to contribute to loadings within the United States. Main route of human exposure: ingestion of HCB-contaminated meat, dairy products, poultry, fish, and wildlife. The general population appears to be exposed to very low concentrations of HCB.	EPA's strategic approach with respect to HCB consists of: 1) collecting information to characterize sources and pathways in the lifecycle of HCB; 2) achieving a significant reduction in total air emissions from inventory sources of HCB, using 1993 HCB levels; 3) minimizing controlled and uncontrolled multimedia transfers of HCB; and 4) determining the extent of HCB contamination from long-range transport and working within international frameworks to reduce releases of HCB worldwide. HCB is also listed under the Stockholm Convention on Persistent Organic Pollutants (POPs) and the Long Range Transport of Air Pollution (LRTAP) POPs Protocol. See Chapter 6 for more information	EPA intends to publish the final National Action Plan for Hexachlorobenzene in 2003.

PBT OR PBT GROUP	DESCRIPTION	HUMAN HEALTH AND ECOLOGICAL EFFECTS	SOURCES AND ROUTES OF HUMAN EXPOSURE	FOCUS OF NATIONAL ACTION PLAN	STATUS OF NATIONAL ACTION PLAN DEVELOPMENT
Mercury	Mercury is a naturally occurring element that is usually mobilized and released to the environment as a result of human activities. Just a small amount of mercury can contaminate an entire lake, resulting in mercury levels in fish that exceed recommended limits for human consumption, and endangering predatory wildlife.	Human health effects: Exposure to high levels of mercury can permanently damage the brain and kidneys. Very young children are more sensitive to mercury than adults. Harmful effects that may be passed from the mother to the fetus include brain damage, mental retardation, incoordination, blindness, seizures, and inability to speak. Children poisoned by mercury may develop problems of their nervous and digestive systems, and kidney damage. Ecological effects: Predatory fish and other species, such as mink, river otter, marine mammals, kingfisher, loon, osprey, and bald eagle which are at the top of the food web and consume contaminated aquatic organisms, generally have higher mercury concentrations and subsequently are at an increased risk of adverse effects. Reported effects for these predator species have included neurological damage and reduced reproductive levels.	Largest sources of mercury release to the environment: coal-fired power plants, incinerators. Routes of human exposure: Ingestion of fish or shellfish contaminated with methylmercury; inhalation of mercury vapors from a spill.	EPA is focusing its efforts on the following priority activities: 1) reducing anthropogenic release of mercury; 2) reducing exposure to mercury by improving risk communication; 3) reducing uses of mercury; 4) conducting and reviewing research on disposal of mercury; 5) investigating life-cycle issues associated with mercury as a global commodity. In addition, the United Nations Environment Programme (UNEP) completed in 2002 a global assessment of mercury in collaboration with governments, intergovernmental and non-governmental organizations and the private sector. In February 2003, the UNEP Governing Council accepted the key findings of the assessment and agreed on a program for international action on mercury. The UNEP mercury program will assist all countries, especially developing countries and countries with economies in transition, with capacity building activities to characterize their mercury pollution problems and to develop appropriate strategies to mitigate mercury pollution problems. See Chapter 6 for more information.	EPA intends to re-release the draft National Action Plan for Mercury for public comment in late 2003.

Table 2. continued

PBT OR PBT GROUP	DESCRIPTION	HUMAN HEALTH AND ECOLOGICAL EFFECTS	SOURCES AND ROUTES OF HUMAN EXPOSURE	FOCUS OF NATIONAL ACTION PLAN	STATUS OF NATIONAL ACTION PLAN DEVELOPMENT
Octachlorostyrene (OCS)	EPA's concern about OCS is primarily due to its persistence and bioaccumulation in the environment, and its toxicity to aquatic organisms.	Little is known about the potential human toxicological effects of OCS. Data from animal studies indicate damage to liver, thyroid, and kidneys. Ecological effects: EPA believes that since OCS is structurally similar to HCB, it can reasonably be anticipated to have a similar ecotoxicological profile. Adverse effects on fish have also been predicted by use of chemical structure activity analysis.	OCS is thought to be an inadvertent byproduct in processes that combine carbon and chlorine at high temperatures, such as magnesium production and the commercial production of chlorinated solvents. Potential human exposure pathways: ingestion of contaminated fish, inhalation, absorption through the skin.	EPA's strategic approach for OCS is to develop a better understanding of the chemical's sources, releases, and potential for exposure, and to promote voluntary pollution prevention efforts where appropriate.	EPA intends to release the final National Action Plan for Octachlorostyrene in 2003.
Polychlorinated Biphenyls (PCBs)	PCBs are a group of synthetic organic chemicals that were manufactured in large quantities in the United States from 1929 until the ban of their manufacture in 1977. PCBs are very persistent in the environment, and can be found in aquatic wildlife at concentrations 100 million times greater than the concentration in the surrounding water.	Health effects: liver, thyroid, dermal and ocular changes, immunotoxicity, neuro-developmental changes, reduced birth weight, reproductive toxicity, and cancer. Ecological effects: A large body of laboratory and field studies shows that PCBs are causally linked to adverse health effects in wildlife. Adverse effects include: immunological, neurological, reproductive, and developmental effects and cancer (in laboratory animals). Wildlife affected include: whales, dolphins, seals and sea lions, polar bears, fish-eating birds, and freshwater and marine fish.	The major source of PCB release to the air, land, and water in the United States has been calculated to be the redistribution of the PCBs that are already present in soil, water and, indirectly, sediment. Next in significance as ongoing sources may be certain area sources emitting volatile PCBs – such as PCB transformer storage lots, sludge drying beds, and landfills – that may be emitting PCBs in quantities higher than previously suspected. Main route of human exposure: consumption of PCB-contaminated foods, especially meat, dairy products, poultry, and fish.	Priority activities for PCBs include: 1) promoting the voluntary decommissioning of PCB-containing electrical equipment; 2) remediating PCB-contaminated sites and sediments; 3) gathering data on PCB sources and routes of exposure; 4) enhancing fish and wildlife consumption advisories and communicating to citizens, especially those at high risk, ways to reduce exposure to PCB contamination; 5) building the capacity of other countries to comply with international agreements and improve their management of PCB risks. PCBs are also listed under the Stockholm Convention on Persistent Organic Pollutants (POPs) and the Long Range Transport of Air Pollution (LRTAP) POPs Protocol. See Chapter 6 for more information.	EPA is currently preparing to release its draft National Action Plan for PCBs for public comment.

PBT OR PBT GROUP	DESCRIPTION	HUMAN HEALTH AND ECOLOGICAL EFFECTS	SOURCES AND ROUTES OF HUMAN EXPOSURE	FOCUS OF NATIONAL ACTION PLAN	STATUS OF NATIONAL ACTION PLAN DEVELOPMENT
Pesticides	Aldrin, chlordane, dieldrin, DDT, endrin, heptachlor, mirex, and toxaphene are persistent organic pesticides that were once widely used in large quantities in the United States. EPA cancelled the registration of these pesticides in the U.S. during the 1970s and 1980s after finding evidence that they cause adverse environmental and human health effects.	Human health effects: probable human carcinogen; damage to reproductive, nervous, and digestive systems. Ecological effects: Detectable quantities of these pesticides have been found within a wide variety of animal species, and in some cases, at concentrations that have been known to pose serious risks to wildlife. Adverse effects include: shortened lifespan, reproductive problems, effects on liver function, and changes in appearance or behavior. Wildlife affected include: mammals, birds, fish, and shellfish.	Unused, uncollected stocks in the U.S.; continued use abroad; continued emissions from pesticides built up in soil and sediment. Current human exposure to these pesticides occurs mainly through the food chain, and for the most exposed populations, is probably due to the consumption of contaminated fish.	EPA is focusing on the following priorities for addressing these pesticides: 1) preventing accidental releases of remaining pesticide stocks; 2) facilitating the remediation or containment of non-point and reservoir sources of pesticides; 3) reducing human exposure through risk communication and outreach; 4) working internationally to reduce or phase out production of these substances; and 5) continuing to monitor for pesticides in humans, wildlife, and all relevant environmental media. These pesticides are also listed under the Stockholm Convention on Persistent Organic Pollutants (POPs) and the Long Range Transport of Air Pollution (LRTAP) POPs Protocol. See Chapter 6 for more information.	EPA intends to release the final National Action Plan for the Level I Pesticides in 2003.

CHAPTER 3: **ACHIEVING POLLUTION REDUCTIONS**

The main function of the PBT Program is to coordinate and enhance EPA's efforts to decrease PBT contamination in the environment. PBT substances are used in and released by many different sectors of our economy. The PBT Program seeks to encourage the development of products, processes, technologies, and other tools that prevent the emission and release of new and existing PBTs into the environment. It also recognizes the necessity of using control technologies to curb PBT releases where PBTs are inadvertently generated and implementing sound practices for the recycling and disposal of PBTs.

Pollution Prevention

Pollution Prevention (P2) practices can improve a business's bottom line through reduced raw material and energy costs, treatment and disposal expenses, and associated labor costs. Many P2 strategies, such as substituting toxic materials with safer alternatives, are simple and inexpensive. Key P2 benefits include enhanced public image, increased productivity and efficiency, reduced regulatory burden, decreased liability, and improved environmental and health quality.

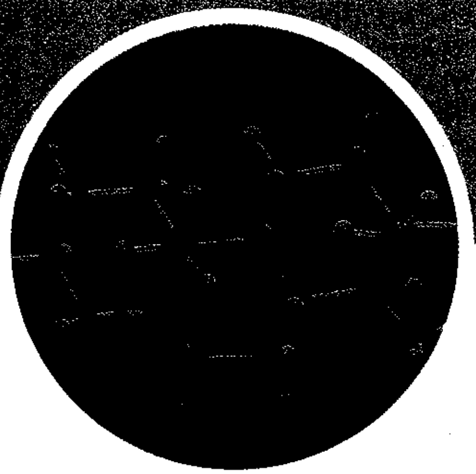
P2 methods can help reduce the air, water, and land pollution that results from waste generation, treatment, and disposal; reduce worker and resident health risks and the environmental risks associated with pollutant emissions; and conserve natural resources and landfill space.

Preventing Introduction of New PBTs

Preventing new PBTs from entering the economy and the environment whenever possible is extremely important. Pre-manufacture notices for new chemicals and the newly released PBT Profiler are two efforts that are helping EPA prevent the introduction of new PBTs. EPA is also developing a policy to strengthen the process by which it screens new pesticides.

Pre-Manufacture Notices for New Chemicals

Under the Toxic Substances Control Act (TSCA), chemical manufacturers must submit pre-manufacture notifications (PMNs) to EPA for new chemicals that they plan to manufacture domestically or import into the United States.[2] Using a combination of computer modeling tools and available test data on the proposed new chemical, EPA evaluates each chemical's characteristics to ascertain whether it may present an unreasonable risk to human health or the environment. In 1999, EPA issued a PBT policy statement (64 FR 60194) that adopted certain specific identification criteria and an associated process for use in evaluating new PBT chemical substances. The policy established a screen that identifies PMNs that possess PBT characteristics. These are then given special review. Based on these reviews, control action under TSCA section 5(e) may be needed in varying degrees, based upon the level of risk concern. EPA can stop the production of these chemicals until their prospective manufacturers can demonstrate that they would not be expected to pose an unreasonable risk if released into the environment, either by conducting certain testing specified in the 1999 policy statement or by controlling environmental releases of the chemical.



During the period covered by this report, EPA identified and took action on 65 potential PBTs out of the 1,372 total PMNs it received. Actions ranged from banning production of a chemical pending testing to allowing commercial manufacture with control of environmental releases.

The PBT Profiler

In September 2002, EPA released the PBT Profiler—a unique, Web-based analytical tool designed to help companies evaluate PBT characteristics associated with new chemicals. The PBT Profiler enables chemical product developers to estimate PBT potential of chemicals and help prioritize chemicals for possible testing. The PBT Profiler can be accessed at: <www.pbtprofiler.net >.

The goals of the PBT Profiler include:

- Providing industry with a quick, easy-to-use prioritization tool that estimates information that may not be otherwise available.
- Helping to inform industry's decision-making in new chemical product and process development.
- Promoting the design, development, and application of chemicals and processes that are safer for the environment.

The PBT Profiler uses established screening models to estimate PBT characteristics based on chemical structure and physical and chemical properties. It predicts environmental persistence, bioaccumulation potential, chronic toxicity in fish, and half-life time spans in different environmental media. The model also compares these PBT predictions to EPA's regulatory criteria for PBT-related action under the PMN Program and under the Toxic Chemical Release Inventory (TRI) reporting thresholds.

The PBT Profiler is a joint collaboration between EPA and partnering stakeholders from the chemical industry, trade associations, and a leading environmental group.

Preventing the Use and Release of Priority PBTs

Consumers are learning that high-quality, cost-effective substitutes exist for PBT-containing products. Also, businesses are beginning to understand the value in replacing PBT-containing equipment and materials and adjusting processes to prevent PBT releases. The PBT Program supports programs implemented by state and local government, industry associations, and other organizations that encourage the phase-out of the remaining uses of PBTs in products, processes, and equipment.

Legislative Solutions to Mercury Reduction

Eight Northeastern states introduced or passed provisions in 2001 based on the Northeast Waste Management Officials' Association's (NEWMOA's) Mercury Education and Reduction Model Legislation. NEWMOA created the model legislation in cooperation with the Eastern Canadian Premiers to provide a comprehensive framework to help states and provinces develop more consistent approaches to managing mercury-containing wastes. Rhode Island has passed 16 of the provisions, including public education and outreach, phase-outs and/or bans on several types of mercury-containing products, and notification by manufacturers, distributors, and importers of their products' mercury content. New Hampshire and Maine have also made significant progress toward enacting this legislation.

With the support of EPA, NEWMOA is planning to develop an interstate clearinghouse to help states implement the requirements of the mercury legislation. This effort, called the Interstate Mercury Education and Reduction Clearinghouse (IMERC), will help to collect data on mercury in products, develop public education and outreach programs, make information on mercury-added products and legislation available to the public, and provide technical assistance.

Hospital Partnership

EPA collaborated with the American Hospital Association, Health Care Without Harm, and the American Nurses Association to create a voluntary program called Hospitals for a Healthy Environment (H2E). As H2E participants, hospitals and health care facilities pledge to eliminate mercury use by 2005 and reduce overall hospital waste by 50 percent by 2010. Further, participants commit to reducing all PBT releases from their facilities.

H2E made the following major strides in further involving the health care sector in 2001 - 2002:

- Completed its first award program, which recognized nearly 50 health care institutions nationwide for their environmental improvements.

- Recruited 314 partners representing 324 hospitals, 586 clinics, 15 nursing homes, and 29 other types of facilities. Also recruited 31 champions representing several major health care networks, group purchasing organizations, and hospital associations. One healthcare network champion, Kaiser Permanente, recruited all of its facilities across the United States, including 29 hospitals and 423 clinics.
- Continued to update its Web site, located at <www.h2e-online.org>, to increase the information resources that are available.

The success of the H2E Program comes from the commitment of its partners, who understand both the environmental and financial benefits of minimizing waste and using mercury-free products. The program serves as a model for other sector-based efforts—the health care industry, like many others, can have an important influence on its upstream "suppliers" as well as its downstream "customers." By demanding mercury-free, environmentally preferable equipment and products, health care providers encourage producers of hospital supplies to also become more environmentally responsible. Heath care providers also play a key role in educating the public, especially children and pregnant women, about the risk of exposure to mercury and other PBTs.

Industrial Boilers Partnership

EPA supported a voluntary partnership between the Delta Institute and the Council of Industrial Boiler Owners (CIBO) to achieve emission reductions of PBTs from industrial boilers in the Great Lakes Region through the implementation of selected energy efficiency technologies and methods. Industrial (non-utility) boilers, internal combustion engines, and gas-fired turbines producing thermal and/or electric energy are the second-largest source of mercury, the fifth-largest source of PCBs, and the seventh-largest source of dioxins and furans in the United States.

Nearly 40 percent of U.S. industrial boilers and heaters are located in the Great Lakes Region. The project hypothesized that energy efficiency measures offer significant opportunities to reduce both energy consumption and PBT emissions from industrial boilers.

To test this hypothesis, the Delta Institute performed boiler audits at eight private and public facilities in the state of Wisconsin. The Delta Institute then conducted an aggregation analysis based on the energy efficient improvement recommendations from the boiler assessments and on data provided by EPA. The study found that optimizing energy needs can result in reductions of PBTs and other pollutants. For example, achieving a 10 percent energy efficiency improvement for all industrial boilers would decrease mercury emissions in the United States by 1 percent. Comparatively, the Industrial/ Commercial/ Institution Boiler MACT rules (See box below for a general discussion of MACT standards) are expected to achieve a 10 percent reduction of mercury through control technologies. While mercury reductions from MACT implementation are greater than for energy efficiency measures, the benefits from implementing energy efficiency measures—such as reduced fuel usage and cost savings—will not necessarily be realized through MACT implementation.

Maximum Achievable Control Technology (MACT)

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Chlorine Industry Partnership

In 1996, the Chlorine Institute and a number of member companies that operate mercury-cell chlor-alkali factories announced a goal of voluntarily reducing industrial consumption and air emissions of mercury by 50 percent within a decade. In 2000, the industry achieved this goal. Through 2001, mercury consumption has been cut 75 percent, on a capacity-normalized basis. In addition, the Chlorine Institute published guidance for factories worldwide on how to prevent fugitive air emissions. This guidance is available at <www.cl2.com/AM2001>. Practical factors that might explain progress by this sector include:

- Allowing equipment to cool down prior to invasive maintenance.
- Invention of a UV-light to allow workers to see vapor leaks.
- Capital investments in new decomposer units, pumps, elongated cells, and computer controls.
- Improved purification of brine.
- Closure of four factories that did not recycle wastes.

Reducing Open Burning of Household Trash

One of the largest sources of dioxin emissions is the backyard burning of household waste (hereafter called open burning). In addition to accounting for 52 percent of the total known dioxin emissions, open burning largely occurs in rural, agricultural areas where it readily enters the food chain pathway. With grant assistance from EPA, the Western Lake Superior Sanitary District is continuing a project to educate residents about the harmful effects of burning trash. The three elements found to influence a person's decision to burn their waste on-site—education, infrastructure, and enforcement—are being examined at the level of local governmental units such as municipalities, townships, tribal units and counties.

A survey of decision makers and local government officials was conducted in October 2002. The survey sought answers to questions about the respondents' understanding of issues about open burning, availability of commercial garbage service and recycling, local enforcement practices, and willingness to participate in a workshop to examine these issues from a decision maker's standpoint. Of the 720 addressees, 109 responded.

Planning is underway for a workshop, tentatively scheduled for mid-May 2003. The workshop will bring together decision makers who responded positively to a question about willingness to participate, as well as local science and environmental educators and expert resources. Two goals of the workshop are to develop models for local anti-open burning campaigns, including legal and enforcement issues, and to develop curriculum models for environmental science teachers. Ideally, these two efforts would work together at the community level to promote awareness of the somewhat complex issues surrounding open burning practices. A similar strategy worked in the early stages of the recycling effort, where students carried the "Reduce, Reuse, Recycle" message and practices into their homes.

Controlling PBT Releases to the Environment

In addition to promoting pollution prevention, the PBT Program supports efforts to control PBT releases to the environment through emissions control technologies, recycling, treatment, and disposal.

Controlling PBT Emissions

Certain PBTs are inadvertently generated and released during combustion. For example, mercury contained in the coal used to produce electricity can be released during combustion. Mercury, dioxins and furans, and other PBTs can be released during waste incineration if proper conditions for burning are not met. The PBT Program supports projects that complement EPA's regulatory efforts in this area.

Electric Utilities

EPA is developing MACT regulations aimed at reducing toxic air emissions, including mercury, from electric utilities. Through the PBT program, EPA is doing analytical work that enhances its rulemaking efforts.

In 2002, EPA used a sophisticated economic model called the Integrated Planning Model (IPM) to initially analyze different regulatory options. The model projects the effects that these different options would have on emissions, both from a national perspective and for various regions of the country. It also projects the national costs of different regulatory options, as well as the effects these options have on the mix of fuels used to generate electricity and the control technology used. Modeling results were presented to the Utility MACT Working Group, which is under the guidance of a subcommittee of the Clean Air Act Advisory Committee (CAAAC). The model will be upgraded based on results from these initial runs and comments received from stakeholder discussions. Future analyses will include deposition modeling using the emissions output from the IPM.

In any regulatory program, demonstration of compliance is important. EPA is now field-testing continuous emission monitors for mercury at several U.S. sites. Commercially available monitors have an application history in Europe on certain sources, including electrical power plants that co-fire coal and sewage sludge. However, monitor evaluations specific to U.S.-based power plants are important because the control technologies and monitor calibration techniques employed in Europe are different from those used in the United States. In the EPA program, mercury monitors were first installed on the type of electric power plant configuration most common in the United States,[3] to determine certain monitor performance characteristics. Tests were conducted at this site beginning in fall 2001 and continued through fall 2002. In 2003, EPA is first working on a pilot scale coal combustor project to resolve certain monitor performance issues before the next series of full scale evaluations, which is to begin in mid-2003 and continue through fall 2003. At least two power plants that employ extensive particulate and sulfur dioxide control technology will be employed in this work.

[3] A bituminous coal-fired utility with a cold-side electrostatic precipitator.

Coal Combustion Residues

EPA is analyzing the potential rates at which mercury and other metals are released to the environment when the residue from coal combustion (e.g., fly ash from coal-fired power plants) is used in commercial products, like cement and wallboard. Cement and wallboard products are manufactured in high temperature processes, which could potentially release mercury and other metals to the environment. In addition, EPA is studying the potential for releases of mercury and other metals from the products during their use and disposal. In 2002, EPA reached agreement with interested parties, including the Department of Energy (DOE) and the Electric Power Research Institute on the procedures and methods to be used; completed the laboratory set-up; and began the analyses. Results are expected in 2003.

In conjunction with this project, EPA is evaluating the fate of mercury and other metals from land disposal of residue from coal combustion in landfills, surface impoundments, mine reclamations, and use in highway construction. The results from this effort will be used in a life-cycle evaluation of any potential multimedia and multi-pollutant effects associated with implementation of mercury control technologies at coal-fired power plants.

Waste Combustors

Consistent with Section 129 of the Clean Air Act, large municipal waste combustors (MWCs) completed control retrofits representative of MACT in December 2000. During 2001, EPA collected stack test reports from all 167 large MWC units, located at 66 plants in 24 states, and used the data to calculate post-MACT emissions for 2000. Performance of the MACT retrofits has been outstanding for all Section 129 pollutants, including dioxins/furans and mercury. Since 1990 (pre-MACT conditions), dioxin/furan emissions have been reduced by more than 99 percent, and mercury emissions have been reduced by more than 95 percent. Annual dioxin/furan emissions for large MWCs were estimated to be greater than 8,000 grams TEQ[4] in 1987 and were 12 grams TEQ/year in 2000. Mercury emissions have been reduced to 2.2 tons/year.

Section 129 MACT standards for small MWCs were adopted in December 2000 and retrofits are required by December 2005. These standards address all Section 129 pollutants including dioxins/furans and mercury. State plans implementing the small MWC standards were due in December 2001 and a back-up federal plan was promulgated final in December 2002. The federal plan is being implemented at this time and all small MWCs must complete control retrofit by December 2005. Together, the state and federal plans will result in retrofits at all 84 small MWC units, located at 39 plants in 23 states by December 2005. Current projections are that dioxin/furan emissions will be reduced by more than 99 percent, and mercury emissions will be reduced by more than 96 percent from 1990 (pre-MACT) levels. Dioxin/furan emissions for small MWCs nationally are projected to be 1.8 grams TEQ/year and mercury emissions are projected to be 0.4 tons/year by December 2005 (post-MACT retrofit). MACT standards have also been issued for medical waste inciner-

[4] TEQ means toxic equivalent quantity, using 1989 NATO toxicity factors.

ators and cement kilns burning hazardous waste. Before regulation, medical waste incinerators were the second largest known source of dioxins in the United States. Dioxin emissions from medical waste incinerators are estimated to have been greater than 2,500 grams TEQ/year in 1987. Actions by state governments and voluntary measures by hospitals successfully reduced these emissions to about 500 grams TEQ/year in 1995. EPA's MACT standard for medical waste incinerators is expected to further reduce emissions to around 7 grams TEQ/year. Cement kilns burning hazardous waste were estimated to emit more than 150 grams TEQ/year in1995, but under EPA regulations these emissions are expected to be reduced to less than 8 grams TEQ/year.

Gold Mines

Imagine 4 million household fever thermometers. That's the equivalent amount of mercury emissions that will be reduced by an innovative voluntary reduction program launched by EPA's regional office in San Francisco, the Nevada Department of Environmental Protection (NDEP), and four Nevada gold mines. Under the new Toxic Release Inventory rules (see Chapter 4), the mines reported more than 13,000 pounds of mercury emissions to air in 1998, making them the sixth largest source of mercury emissions in the country. EPA, NDEP and the mines worked for more than a year to craft a voluntary program to get immediate, permanent reductions in these emissions without the costs associated with new regulations. Under the program, the mines agreed to implement new emissions control equipment or process changes to achieve at least 50 percent reductions in emissions by 2005. In exchange, EPA and NDEP agreed to defer development of a new regulation pending results from the program. The mines also agreed to recruit other companies into the program. The program is already a success: between 1998 and 2000, the mines cut emissions by more than 3,000 pounds of mercury—almost 30 percent—and several are on track to achieve reductions of more than 75 percent.

RECYCLING AND DISPOSAL OF MERCURY-CONTAINING PRODUCTS

EPA encourages the removal of mercury-containing products from homes, schools, and workplaces to prevent the occurrences of mercury spills and resulting illnesses due to the inhalation of mercury vapors. Since mercury is a commodity in the world market, the ultimate disposition of mercury collected in United States recycling programs currently depends on the world demand for mercury. As world demand declines, more recycled mercury may need to be put into long-term storage. Disposal options for mercury are currently limited, EPA is researching various treatments for mercury waste and elemental mercury.

Schools

Mercury can be found in many different places in schools, such as science labs and nurses' offices. Children exposed to mercury from a spill are especially susceptible to health problems, so many state and local environmental programs focus on collecting mercury-containing equipment from schools. EPA's regional office in Dallas completed a pilot project that collected 500 pounds of equipment containing over 45 pounds of liquid mercury from 27 school districts in a lower income area along the Texas-New Mexico border. The pilot project also promoted increased awareness about the hazards of mercury by distributing brochures in Spanish and English. EPA is hoping to expand the program to other low-income school districts in the area. This program is particularly important because it addresses the concern that low-income populations bear a disproportionate amount of adverse health and environmental effects.

In addition to protecting children from health threats, focusing on mercury in schools provides another opportunity to educate the public about the dangers that mercury and other PBTs can cause when released into the environment. In 2001, EPA nationalized a project begun by its regional office in Chicago to communicate to teachers, school administrators, students, and parents the importance of reducing mercury in schools and the community. The national project features regional workshops and online training courses for teachers, as well as an expanded curriculum package that contains information and activities on health issues, cultural uses, mercury in schools, mercury at home, mercury in the community, environmental effects, and the history of mercury use. Another important aspect of the project is the Mercury in Schools Web site, <www.mercuryinschools.uwex.edu>, which includes case studies, ideas for taking action, and state-specific information resources.

Natural Gas Lines

The PBT Program is supporting an effort by the New York State Department of Environmental Conservation (DEC) to promote the replacement of mercury-containing manometers—gauges used by plumbers to measure the pressure in natural gas lines—with gauges that do not contain the toxic substance. Mercury gauges have been the traditional choice of many plumbers, but are very easily broken. If the gauges are not used or handled correctly, the mercury can be released into the environment and evaporate into the air. The safer mercury-free gauges available today offer the same precision as traditional gauges, without the risks mercury gauges can pose to plumbers and their clients. With EPA funding, DEC is conducting an extensive outreach project to plumbers statewide to reduce the use of mercury manometers and ensure they are disposed of properly. This project includes:

- Providing educational outreach to plumbers about the potential hazards of mercury.
- Working with gas utility companies to develop take-back programs for mercury manometers and with local governments to collect them on hazardous waste collection days.
- Identifying municipalities in New York State that require plumbers to use mercury gauges and drafting model municipal code language that they can use to bring about the replacement of mercury gauges.

Federal Facilities

EPA's regional office in Boston worked with NEWMOA and the Massachusetts Department of Environmental Protection to develop a methodology to assist federal facilities in identifying and reducing uses of mercury. The project team produced four case studies based on visits to various types of facilities, such as military installations and laboratories. During the site visits, the team identified mercury materials, observed purchasing and management practices, and provided information about alternatives to mercury products. The case studies, available at <www.newmoa.org>, include recommendations made and subsequent actions taken at each facility.

Information Sharing on Mercury Recycling and Disposal

In May 2002, EPA cosponsored a conference entitled, "Breaking the Mercury Cycle," with Environment Canada, the Commission for Environmental Cooperation, the Environmental Council of the States, NEWMOA, and others. The conference focused on policies, technologies, and techniques used to address environmentally sound management and treatment of excess mercury supplies and stockpiles and mercury-bearing wastes. It provided an opportunity for participants to learn about the current policy framework, mercury materials flow, research underway on different treatment and storage technologies, and other long-term options for management of surplus and recycled mercury and mercury-bearing waste.

Mercury Treatment

Several of the existing land disposal restrictions (LDR) treatment standards for hazardous wastes containing high levels of mercury require either retorting[5] or incineration, depending on whether organic constituents are present in the waste. Over the past couple of years, EPA has been researching alternative options for managing mercury wastes and bulk elemental mercury. This research sought technologies to effectively lock mercury into a solid matrix from which it would not easily escape (i.e., technologies

[5] Mercury retorting is the thermal recovery of mercury. In a retorting unit, the mercury waste is heated, causing the mercury to volatilize. This volatilized mercury is then condensed and captured as elemental mercury. The elemental mercury is often distilled to increase its purity.

that would "stabilize" mercury). It was a collaborative effort shared by EPA and DOE.

In late 2001, EPA concluded its treatability study research. The draft final report summarizing the results of the study was peer reviewed in 2002 and then was published in the *Federal Register* on January 29, 2003 as part of a Notice of Data Availability (NODA). The information will be useful to many stakeholders, including the Department of Defense, which is currently preparing an environmental impact statement describing its plans for long-term management of its mercury stockpile, and chlor-alkali facilities that have closed or stopped using the mercury cell process.

Recycling and Disposal of PCB-Containing Products

Certain uses of PCBs, including those involving PCBs sealed in electrical transformers, are still allowed under U.S. law. Other uses, as well as the manufacturing, processing, and distribution of PCBs, were banned in the United States in 1977. Since the mid-1990s, EPA has been strongly encouraging owners of PCB transformers and capacitors to voluntarily take them out of service and dispose of them responsibly. This decommissioning message reflects the U.S. concern, shared with the neighboring and global communities, that continued use of PCB equipment creates opportunities for increasing exposures as the equipment ages.

The federal government is the largest single owner of PCB-containing equipment. The PBT Program has identified the specific federal facilities that contain this equipment and EPA is contacting the owners of these facilities to encourage them to decommission the remaining equipment.

EPA has also begun a national outreach effort to trade associations and major national businesses to seek the voluntary reduction of PCB-containing electrical equipment. EPA has developed a list of individual businesses and trade associations that it will contact. In addition, EPA has prepared brochures for distribution to trade associations and companies on its PCB transformer registration database and developed an advertisement for publication in trade association journals and newsletters.

Other projects of the PBT Program to encourage voluntary decommissioning include:

Utility Industry Partnership

In 2001-2002, six utilities contacted by EPA's regional office in Chicago committed to continue to remove any PCBs they have or find. Two of those six utilities stated that they had already removed all high concentration PCBs of which they were aware. EPA will encourage the remaining utilities in the region to do the same.

Mining Equipment

EPA's regional office in Denver began an outreach effort to the mining industry to encourage voluntary removal and disposal of PCB-containing electrical equipment in underground and surface mines. It placed advertisements in three major mining journals, informing the domestic mining industry about PCBs and the problems they cause, and seeking the voluntary disposal of the PCBs. EPA received approximately 25 domestic and 37 international inquiries regarding the advertisements. The Agency responded to the inquiries with further information on the problems with PCBs and how to identify and dispose of PCB-containing equipment.

Recycling and Disposal of Pesticides

Over the past 20 years, states have been actively promoting environmental protection and pollution prevention by conducting collections of agricultural pesticides. EPA published a report in November 2001 that compiles state data on collections of unwanted agricultural pesticides into a single document. Many states refer to these as "Clean Sweep" programs. From 1988 through 2001, Clean Sweep programs collected more than 24 million pounds of old pesticides and ensured the proper management and disposal of these materials. EPA's goals in publishing this report are to recognize the proactive efforts of the state and local governments, document the history and achievements of Clean Sweep programs, and establish a baseline of information in a standard, updatable format as a resource for those who wish to initiate or improve programs. The Clean Sweep Report 2001 can be found at: <www.epa.gov/oppfead1/cb/csb_page/updates/cleansweep.pdf >.

CHAPTER 4: **FILLING THE PBT DATA GAPS**

New information about the sources of PBTs and their life cycle in the environment, as well as the levels of PBTs present in humans and wildlife, allows EPA and others to determine the most appropriate PBT-related policies and courses of action.

The PBT Program is sponsoring the development of a Routine Monitoring Strategy for PBTs that will feature recommendations for integrating and augmenting key PBT monitoring programs within and outside of EPA. It will also encourage partnerships and facilitate a process of continuing information-sharing on all levels. The strategy will guide the development of a national monitoring network and assessment program that will provide information to:

- Discern long-term trends in various media.
- Assess the effectiveness of risk management actions undertaken by EPA and others.

In addition, the strategy will provide information to help effectively target future risk management actions. EPA plans to complete the strategy and implementation plan in 2003.

Sources and Environmental Cycle of PBTs

During 2001-2002, EPA made some significant discoveries about how PBTs, especially mercury, cycle in the environment. EPA also continued to add to its understanding of the sources that release PBTs into the environment.

MULTIPLE PBTs

Lowering Reporting Thresholds Under TRI

The 2000 TRI Public Data Release (published May 2002) includes newly-reported data on PBTs, giving communities a more complete picture of the sources of chemicals in the environment. The newly-reported data result from an October 1999 rulemaking in which EPA lowered the reporting threshold for the 13 PBTs already reported under TRI and also added reporting requirements for 5 new chemicals that are also PBTs, including dioxin and dioxin-like compounds. In January 2001, EPA issued another rule to reduce the reporting threshold for lead and lead compounds effective for the 2001 reporting year.

EPA and the general public now have more data on the levels of PBTs released into the environment. For example, EPA now has baseline information on the amount of dioxin and dioxin-like compounds released. In 2000, approximately 100,000 grams of dioxin and dioxin-like compounds were reported. In addition, the lower reporting thresholds for other PBTs give EPA and the public information about releases associated with small users of PBT compounds. These releases make up a significant portion of total PBT releases. Another important finding in the 2000 TRI data is the reduction in releases of elemental mercury, which may be the result of efforts to reduce the use of elemental mercury in products.

Table 3. Reporting Thresholds and Releases for TRI PBT Chemicals

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Investigating the Chemical Behavior of Mercury in the Atmosphere

Through the PBT Program, EPA has uncovered new information that challenges EPA's traditional understanding of atmospheric mercury deposition. This information indicates that the lifetime of gaseous elemental mercury in the atmosphere is shorter than was previously thought. In the upper atmosphere over the open oceans, mercury is converted into forms that are more water-soluble. The implication of this information is that we need to control releases of all forms of mercury, including elemental mercury, in order to effectively reduce atmospheric deposition.

Several different forms of mercury reach our shores in air currents and are deposited on land and in the water. Most problematic are the chemically reactive gaseous and particulate forms that more readily dissolve in water. The elemental form of mercury, by contrast, is much less soluble and reactive. EPA has recently established automated mercury monitoring sites in Coral Springs, Florida; Cheeka Peak, Washington; Barrow, Alaska; and Mauna Loa, Hawaii. In addition, EPA has conducted more than thirty mercury research aircraft sorties off Florida's Atlantic coast and in Barrow, Alaska. At each site or study, specific sets of measurements have contributed to EPA's overall understanding of the way elemental mercury transforms into reactive gaseous mercury (RGM) and particulate phase mercury. Understanding this transformation mechanism is necessary to accurately estimate the transport and fate of mercury emissions.

EPA and the Florida Department of Environmental Protection (FL-DEP) supported a study that has been useful in making improvements to atmospheric models of transport and fate of mercury. The study, finalized in April 2002, provided refined information on reaction rates of mercury, and production of RGM under ambient atmospheric conditions. This study has also helped EPA to understand recent fieldwork on mercury reactions in the air at the automated mercury monitoring sites mentioned above. The study also contributes to continuing research and modeling related to the influence that marine halides (bromine and chlorine species) can have on mercury deposition in southeastern coastal states and elsewhere. Scientists from EPA and FL-DEP intend to use the study and the improved models in additional work on mercury during the coming year.

Advancing Scientific Knowledge About the Relationship Between Mercury Air Emissions and Water Quality

EPA is continuing to work with the states of Wisconsin and Florida to study the relationship between mercury air emissions and water quality, and to examine air and water modeling tools that could be used to support Total Maximum Daily Loads (TMDLs) (see box on next page) for waters polluted by atmospheric mercury. A report on the Florida pilot project will soon be released showing the relationship between reductions in atmospheric deposition and fish tissue levels of mercury, including the time for fish mercury levels to decrease following reductions in mercury deposition. The model for the Wisconsin pilot project is currently being validated to reflect area deposition rates. Follow-on work is beginning to develop tools and approaches for regional-scale TMDLs that could assist with broad-based strategies to lower mercury emissions.

Determining the Routes by Which Mercury Pollutes the Everglades

EPA and the Florida Department of Environmental Protection are collaborating on a pilot study to identify and evaluate the sources and transport mechanisms that bring mercury into the Everglades. Preliminary findings include the importance of local sources to mercury deposition, and the projected reductions in the ecosystem's mercury burden as deposition decreases. In addition, several intensive field studies on dry deposition of mercury (and earlier intensive work on wet deposition) have been completed in South Florida. Currently, two highly instrumented research sites on atmospheric mercury continue to produce new information. A comprehensive report on developing, evaluating, and applying a model for atmospheric transport and fate of mercury was completed in December 2001.

These completed and on-going field studies are being incorporated in improvements to general atmospheric models made subsequent to the model runs for the pilot study for the Everglades TMDLs. EPA scientists developing the Models-3/CMAQ module for mercury in the atmosphere continue to use the research results from the field and laboratory studies, and advances made in other models.

PBT Levels in Humans and Wildlife

The PBT Program is able to measure progress towards its ultimate goal of reducing risks to human health and the environment by continuing to support research to measure PBT levels in humans and wildlife. The following activities have given EPA a better understanding of PBT levels and trends.

Total Maximum Daily Loads

Monitoring PBT Levels in Humans with NHANES Survey Data

The National Health and Nutrition Examination Survey (NHANES) is the first national collection of measurements for mercury in humans. NHANES is conducted by the Centers for Disease Control with technical and financial support from EPA and other federal agencies. Based on combined NHANES data from 1999 and 2000, EPA estimates that 8 percent of U.S. women of childbearing age have blood mercury concentrations higher than the level which EPA considers safe. These NHANES data are representative of the U.S. population as a whole when using appropriate statistical procedures. A manuscript describing these findings has recently been published in the *Journal of the American Medical Association*. In addition, EPA is analyzing the dietary data collected in NHANES 1999 and 2000 to estimate consumption of methylmercury based on recorded fish consumption.

NHANES also provided invaluable data on body burden levels of many other PBTs including dioxins, HCB, PCBs and many pesticides. CDC has completed laboratory analysis of 1999 blood samples for dioxins and has begun analysis of 2000 samples. These data will provide the first statistically based sampling of human body burdens for these compounds.

Measuring Heavy Metals and POPs Levels in Fetal Cord Blood Samples Taken from Indigenous Peoples in Alaska, Northern Russia, and the Russian Far East

This is a cooperative project with participation of the U.S. Indian Health Service (IHS), the Alaska Native Regional Health Corporations, the Centers for Disease Control (CDC), the Alaska Native Health Board (ANHB), Canadian-Quebec Center for Public Health, University of Tromso in Norway, Russian and Alaskan Aleut communities and local Russian authorities.

The basic elements of the pilot project include a dietary survey for each woman in the cohort being sampled, blood samples adequate for POPs and heavy metal assessments, and basic demographic information.

Current study results, based on increased sampling in Central and Northern Alaska, indicate that a strong relationship exists between high concentrations of PCB congeners in the mother's blood and chronic infections in newborns during the first two years. The study will continue in 2003 and has already been expanded to collect and analyze additional data from mother/neonate cord blood sampling pairs from indigenous people living in the Eastern and Western Aleutian, Komandor, and Pribilof Island villages. The types and amounts of traditional foods consumed in each of these areas vary greatly.

Collecting National Data on PBT Levels in Fish Tissue

EPA's Office of Water continued to collect and analyze samples for the National Fish Tissue Study, a 4-year freshwater fish contamination study that began sample collection in 2000. The study is expected to produce a wealth of data about the largest group of PBT chemicals studied in fish to date. The data set includes all of the priority PBT chemicals except alkyl-lead. This is the first fish tissue study to use a random sampling design on a national level; its data will allow EPA to develop national estimates of the mean levels of individual PBT chemicals in fish tissue. The study also addresses critical data gaps by defining background levels for PBT chemicals in fish and by characterizing the prevalence of these chemicals in fish on a national scale. To date, participating states and EPA regions have collected fish from 261 lakes in 44 states, and EPA has completed chemical analysis of the 288 first-year fish samples. The first-year data sets will be released on request.

Checking for PBTs in the U.S. Dairy Supply

EPA conducted a study to detect the presence of 37 PBTs in the U.S. dairy supply. Because milk fat is likely to be among the highest dietary sources of exposure to PBTs, understanding PBT levels in milk is important. In addition, milk, unlike other animal fats, is produced and distributed regionally. Understanding regional variability can offer clues to sources that release these compounds and the processes by which they enter our food supply.

The study involved the collection of milk samples in July 2000 and again in January 2001, from 45 large dairy plants located across the country and collectively estimated to represent about 20 percent of the nation's milk supply. Out of the 37 chemicals studied, 16 chemicals, including mercury, could not be quantified due to analytical difficulties. The levels of all chemicals in the chlorobenzene, pesticide, and other halogenated organic groups were determined to be below their detection limits in all samples. Contaminants found to be above their detection levels include: dioxins/furans and dioxin-like PCBs, cadmium, alkyl-lead, and six polycyclic aromatic hydrocarbons (PAHs). The PAHs showed the strongest seasonal/geographic differences, with higher levels in the winter than in summer, in the North than in the South, and in the East than in the West. Alkyl-lead concentrations were consistently higher than those of cadmium for both sampling intervals. Higher levels of alkyl-lead were observed in the South than the North, but the seasonal difference was relatively small.

Comparing national average dioxins/furans and co-planar PCB TEQ concentrations to those found in an earlier national survey of dioxin-like compounds in the U.S. milk supply conducted in 1996[6] suggests that these concentrations have declined by about 50 percent. If this difference is truly indicative of declining levels in milk, and assuming exposure levels from non-dairy pathways have remained the same over this time period, this would result in an overall decrease in adult background dioxin exposure of 14 percent. Several factors could account for these apparent changes in dioxin levels in milk, including uncertainties in the approach of the study, reduced emissions, and changes in agricultural practices.

[6] Lorber MN, Winters DL, Griggs J, Cook R, Baker S, Ferrario J, Byrne C, Dupuy A, and Schaum J. A national survey of dioxin-like compounds in the United States milk supply. Presented at Dioxin '98, the 18th International Symposium on Chlorinated Dioxins and Related Compounds, held August 17-21 at Stockholm, Sweden. Short paper in *Organohalogen Compounds*, 1998: Volume 38:125-129.

Linking PBT Sources to Human Exposure

Dioxin Exposure Initiative

The Dioxin Exposure Initiative (DEI) is EPA's research program to *quantitatively link dioxin sources to general population exposure.* The current state of understanding regarding dioxin sources, dioxin environmental transport and fate, and the introduction of dioxin into the human food supply is insufficient to support this quantitative linkage. Having the data and analytical tools needed to make these quantitative linkages is central to EPA's ability to establish risk management priorities based on exposure reduction potential. Development of this capability under the DEI is being accomplished by pursuing two simultaneous lines of inquiry. One approach is to start with human body burdens and work backwards through the process of bioaccumulation and uptake. The second focus is on identifying sources of dioxin-like compounds and working forward along their pathways of transport and deposition. As these two lines of inquiry merge, they should provide an adequate understanding to enable EPA to target future exposure reduction efforts to those sources and pathways that most significantly contribute to human risk.

An additional goal of the initiative is to document *dioxin environmental trends* as a way of evaluating program effectiveness and to identify *new opportunities for exposure reduction through pathway intervention*. The DEI is currently composed of over 50 discreet project areas with 19 individual projects completed and 19 currently underway. Of the 19 current projects, 7 involve other federal agencies. As results from these projects become available, additional projects will be identified and designed as warranted. A summary of the current scope of DEI projects follows:

Exposure Backward Approach

Major gains have been made through the DEI in quantifying general population exposure as a result of EPA lead surveys of beef, pork, poultry, and milk. This initial effort has been followed up by an expanded program of dioxin food analysis by the Food and Drug Administration and the Department of Agriculture. The DEI has shifted much of its EPA food-related analytical efforts to measuring dioxin in animal feeds. This work, conducted jointly with the Center of Veterinary Medicine and the Agricultural Research Service, identifies the pathways leading to contamination of the human food supply and opportunities for pathway intervention. This work on animal feed will either confirm or modify the hypothesis that air deposition to crops is the primary pathway for exposure for domestic meat and dairy animals. Continued sampling of food and feed provide the most direct measure of identifying and tracking near-term changes in human exposure.

Sources Forward Approach

<u>Source Characterization</u>

Major industrial scale waste combustion sources are under stringent regulation; confirming projected emissions reductions from these sources remains a high priority as does incorporation of new source data into revised national emission estimates. A 2000 Dioxin Inventory is under development with further revisions planned for 2002 and 2005. To move more poorly characterized sources into the inventory, additional source testing is also being pursued. Due to the high cost of testing, emphasis is placed on testing those sources that have the greatest potential for significant release. These include uncontrolled combustion sources, landfill fugitive emissions, and urban area sources. Candidates for future source testing include secondary steel electric arc furnaces, and ferrous and nonferrous foundries. Identification and characterization of reservoir sources will continue to be a high priority.

Air Transport and Fate

Air transport is the principal vehicle that links dioxin sources to the food supply. It is critical for EPA to have a clear understanding of the presence and behavior of dioxin in air if we are to link sources to exposure. Based upon recommendations from a panel of international experts, EPA has made major investments through the DEI to establish a National Dioxin Air Monitoring Network (NDAMN). NDAMN provides the most direct empirical measure of the cumulative impact of air source reductions and air trends. To link sources to ambient air concentrations, the DEI is relying on multiple air transport models. The DEI has worked to put in place all of the parts necessary to operate and test the three long-range air transport models best suited for dioxins. The 2000 emission inventory and the NDAMN transboundary air monitoring stations will provide the source terms needed for modeling. The DEI has already supported the modification of EPA's RELMAP model to handle dioxin chemistry and deposition, and the National Oceanic and Atmospheric Administration has adapted its HYSPLITT model to handle dioxin. EPA has been developing a new generation transport model (model 3) which will also be included in the exercise. The NDAMN monitoring data for the year 2000 will provide an empirically based metric against which each of these models can be evaluated. It is expected that this multi-model integration will not only provide the fundamental confidence needed in air transport model predictions, but will help to identify sources missing from the inventory and improve NDAMN monitor placement.

Program Integration

Up to now the DEI has used development of the EPA Dioxin Reassessment as the principal vehicle for integrating DEI findings and identifying priority research needs. As we move to a post reassessment mode, two vehicles will be used to maintain program integration and to synthesize results. First will be periodic updates of the exposure portions of the reassessment as new source and exposure data result in revised inventory and exposure estimates. The second will be the development and operation of an integrated modeling framework that will combine source inventory, air transport modeling, food chain uptake and human exposure to provide the quantitative linking of sources to exposure.

CHAPTER 5: **COLLABORATIVE EFFORTS ON PBTS WITH TRIBAL PARTNERS**

Subsistence hunters and fishermen are one of the highest risk groups for PBT exposure. Native American tribes are increasingly concerned about the safety of their subsistence resources. Tribes need information that allows them to make choices that balance caution in eating certain subsistence foods with the cultural and spiritual value of these foods. EPA acknowledges the necessity of having tribes participate in decisions about risk communication. Involving Alaskan native villages in determining how to use PBT risk information is important because up to a third of their diet consists of subsistence foods. The Alaskan Arctic (and other parts of the Arctic) serves as an environmental sink for PBT contamination, yet the United States has less PBT monitoring data for Alaska than it has for the lower 48 States.

In addition to furthering partnerships with tribes in order to undertake the tribal risk assessment and risk communication efforts described below, the PBT Program has continued to support activities that communicate risks of PBT exposure to the general population.

For example, as part of an effort to transition into a new, topic-based approach to environmental protection, EPA is conducting a thorough review of the mercury information currently on its Web sites. Mercury information will be clearer and easier to find, with access through a central mercury Web portal. In addition, this process of organizing mercury-related information will be used as a model for communicating important messages about other priority PBTs. During 2001-2002, EPA also continued to work with states to publicize fish consumption advisories and develop guidance on risk communication messages.

Developing Different Approaches to Help Tribal Officials Better Safeguard Tribal Traditional Lifeways

EPA established the National Tribal Subsistence Summit/ Tribal Traditional Lifeways Project to increase the ability of tribes to assess environmental threats from toxic chemicals and pesticides, including PBTs and radionuclides, which can be in foods and other materials important to tribal cultures. Tribes are in the best position to successfully evaluate and develop an appropriate course of action to address their concerns.

This project will create different approaches to help tribes prioritize, assess, and address these issues as appropriate under EPA's programs. In spring 2003, the National Tribal Environmental Council and the Alaska Native Science Commission will convene a preliminary technical meeting of tribal scientists, environmental directors, and risk assessors to identify lifeways issues and concerns, potential resources, and gaps in data to be used to identify next steps. The approach selected will make maximum use of tribal traditional knowledge so that the overall assessment is cost-effective and culturally appropriate.

Analyzing the PBT Content in Traditional Native Alaskan Foods

During 2001-2002, the PBT Program continued to support a partnership with Alaskan native villages to test and analyze the foods that Native Americans obtain from the wild in Alaska. Members of five Native American communities collected herring gull eggs according to a quality assurance project plan developed by the tribes and approved by EPA. EPA also developed a screening tool to help Alaskan tribes predict, based on a statistical model, the presence or absence of PBTs in gull eggs within Southeast, South Central, and Northwest Alaska. Preliminary analysis of the samples indicates that risk exposure levels for heavy metals, organochlorines/pesticides, and dioxins/furans are minimal. The Alaska Sea Otter and Stellar Sea Lion Commission and Community Field Collectors will hold community meetings to describe the study and explain the risk levels associated with the contaminants analyzed in the gull eggs.

Expanding Assessment Tools to Cover the Exposure Risks Specific to Tribal Cultures

In May 2002, EPA's Office of Pesticide Programs began an effort to modify LifeLine, one of its primary software risk assessment tools, to enable it to capture unique exposure risks that may accompany the practice of traditional tribal cultures and ways of life. In its first year, the tribal LifeLine pilot project will modify existing LifeLine software to allow it to evaluate risks to tribes in two biogeographical areas (BGAs) of the country, one in Alaska and the other in the contiguous 48 states. At the conclusion of this initial phase of the project, EPA risk assessors, tribes, and others will have access to state-of-the-art software that will allow them to assess potentially significant risks from toxic chemical exposures to tribal populations in the two chosen BGAs.

CHAPTER 6: COLLABORATIVE EFFORTS ON PBTs WITH INTERNATIONAL PARTNERS

The long-range atmospheric transport of PBTs has become a pervasive and global problem, one that requires the cooperation of the international community. The United States continues to work with its international partners to resolve problems posed by PBTs locally, regionally, and globally. The following are examples of EPA's collaborative efforts with international partners on PBT issues in 2001-2002:

Signing the Stockholm Convention on Persistent Organic Pollutants

EPA Administrator Whitman, along with the members of the European Union and 90 other countries, signed the Stockholm Convention on Persistent Organic Pollutants (POPs) on May 23, 2001. This groundbreaking treaty includes measures to reduce and/or eliminate the production, use, and/or release of 12 POPs (see Table 4). The Convention will enter into force once it is ratified by at least 50 countries.

On April 11, 2002, Administrator Whitman submitted the Administration's legislative proposal to Congress to implement the POPs Convention. The package also included provisions to implement the Rotterdam Convention on Prior Informed Consent (PIC) and the Long Range Transport of Air Pollution (LRTAP) POPs Protocol. The Administration is working with the U.S. Congress to ensure approval of the legislation in order for the U.S. to become parties to these important international Conventions as soon as possible to further protection of human health and the environment domestically and globally.

In the spring of 2002, the PBT Program sponsored the publication of a brochure and a technical support document to communicate information to United States audiences regarding the POPs treaty. The brochure, entitled *Persistent Organic Pollutants: A Global Issue, A Global Response*, is a collaborative effort between EPA and major stakeholders, including other federal agencies and groups in Alaska and the Great Lakes. Targeted to the general public, the brochure provides basic information about POPs and the POPs treaty. It also describes global and domestic actions taken by the United States to control POPs and region-specific POP issues.

The technical support document, entitled *The Foundation for Global Action on Persistent Organic Pollutants: A United States Perspective*, was published to inform decision-makers, academia, and the general public about the POPs treaty's scientific foundation and relevance to the United States. This report summarizes data available in the peer-reviewed literature on the 12 POPs

Table 4. Persistent Organic Pollutants

[illegible]

and provides an overview of the risks posed to United States ecosystems and the public.

Assessing Mercury Contamination on a Global Scale

Based on the suggestion of EPA and the Department of State, the United Nations Environment Programme (UNEP) Governing Council decided in February 2001 to conduct a global assessment of mercury. The assessment was completed in collaboration with governments, intergovernmental and non-governmental organizations and the private sector in 2002 and addressed the following:

- Sources, emissions inventories, long-range transport, chemical transformations, and fate of mercury.
- Production and use patterns of mercury as a global commodity.
- Prevention and control technologies and practices, with associated costs and effectiveness.
- Exposures and effects on humans and ecosystems.
- Ongoing actions and plans for controlling releases and limiting use and exposures.
- Options for international action.

In February 2003, the UNEP Governing Council accepted the key findings of the Global Mercury Assessment and agreed on a program for international action on mercury. The UNEP mercury program will assist all countries, especially developing countries and countries with economies in transition, with capacity building activities to characterize their mercury pollution problems and to develop appropriate strategies to mitigate mercury pollution problems.

PBT Reductions in the Russian Federation

Demonstrating That SO_2 Reduction Policies Also Reduce Mercury Emissions

EPA is supporting a demonstration project to document mercury reduction as a co-benefit of sulfur dioxide (SO_2) emission control at a small coal-fired power plant outside of Moscow, Russia. In this project, an electrostatic precipitator, which is primarily a particulate matter control device, will be retrofitted with an atomization system through which lime slurry can be injected for SO_2 control. This technology, originally directed solely at SO_2 reduction, will be evaluated for mercury capture and is expected to be a low-cost option with at least 50 percent reduction effectiveness. Speciated mercury measurements will be taken at the stack and in the ambient environment around the plant as a baseline and following operation of the control technology, which will begin in spring 2003. Efforts are also underway to analyze mercury in Russian coal in support of an emissions inventory.

PERSISTENT ORGANIC POLLUTION REDUCTIONS IN THE RUSSIAN FEDERATION

The three projects discussed below are implemented under the international Arctic Council Action Plan (ACAP) Program to reduce/eliminate Persistent Organic Pollutants (POPs) in the Arctic. These projects are currently implemented in Russia, but they can be expanded to other countries. They are part of an integrated program to assist Russia to meet the requirements of both the Stockholm Convention and the POPs Protocol of the Long Range Transboundary Air Pollution (LRTAP) Convention.

Phase Out of PCBs in the Russian Federation

The United States, along with seven other Arctic countries and the United Nations Environment Programme (UNEP) Chemicals, are working to help the Russian Federation expedite PCB phase-out and develop sound PCB management and disposal practices in the Russian Arctic.

This project consists of three phases. The first phase, development of a PCB Inventory for the Russian Federation, was completed in October 2000 and is openly available. The second phase was a Feasibility Study to evaluate alternatives to PCBs, as well as PCB decontamination and destruction technologies. This phase was completed in October 2002. Currently, work has started on Phase 3 to develop a prototype demonstration for destruction of up to 200 tonnes of PCB liquids from electrical transformers and capacitors in Russia.

Reduction of Dioxins and Furans Releases in the Russian Federation

This is a cooperative project with Sweden, Russia and UNEP Chemicals. The primary objective is the reduction of dioxins/furans releases to the Arctic from key industrial sectors with particular focus on the pulp and paper industry and landfill incinerators.

Initial activities completed include: translation into Russian of the UNEP Chemicals "Standardized Toolkit for Identification and Quantification of Dioxins and Furans Releases"; development of a draft Dioxins/Furans Fact Sheet for use in Russia; and a Workshop on

Harmonization of Laboratory Methods between Russia and Western countries.

The project consists of three phases: Phase I—Identify and verify sources of dioxins and furans in Russia, verify emissions and refine emission factor estimates, and modernize and harmonize Russian sampling and analytical techniques; Phase II—feasibility studies for technological improvements in the pulp and paper industry and industrial incineration; Phase III—pilot demonstration project(s).

Environmentally Safe Management of Obsolete Pesticides Stockpiles in the Russian Federation

This multilateral project under the Arctic Council Action Plan (ACAP) will assist Russia with management of its extensive stockpiles of Soviet Era pesticides, many of which are migrating into the Arctic. This is a cooperative project with Canada, Finland, Norway, Russia, Sweden, and UNEP Chemicals.

The project consists of three phases: Phase 1—developing the inventory of obsolete pesticide stockpiles in the nineteen priority Russian regions impacting the Arctic; Phase 2—developing a strategy for safe interim storage and stabilization of stockpiles; this will include performing risk assessments for highest contaminated areas, evaluating destruction technologies, and designing a prototype storage facility that can be used throughout Russia; and Phase 3—implementing a prototype demonstration for environmentally safe destruction of those pesticides stocks of greatest risk to the Arctic, including Alaska, and construction of a prototype storage facility.

Helping Caribbean Nations Inventory PCB-Contaminated Equipment

In 2001, EPA began a project to assist selected countries in the Caribbean in addressing targeted PCB sources. In 2002, an inventory of PCBs in the Caribbean was completed and the Bahamas was identified as a country with large quantities of PCB-containing equipment. The Caribbean PCB management project will initially involve assisting the Bahamas with a more comprehensive inventory of PCB-containing equipment. Thereafter, a strategy will be developed for the safe disposal, storage, and/or destruction of PCB-containing equipment. This strategy will be developed to be applicable to the Bahamas as well as other Caribbean countries.

APPENDIX A: **RESOURCES**

Resource Topic	**Location/Contact***
EPA's PBT Program and Priority PBTs	
EPA's PBT Web Site	www.epa.gov/pbt
Dioxins/Furans	
Dioxin and Related Compounds	www.epa.gov/ncea/dioxin.htm
Enviro Web's Dioxin Home Page	www.ejnet.org/dioxin
National Center for Environmental Assessment's Dioxin and Related Compounds	www.epa.gov/ncea/dioxin.htm
Mercury	
EPA's Mercury Web Site	www.epa.gov/mercury
EPA's Mercury Research Strategy	www.epa.gov/ORD/NRMRL/mercury
Northeast Waste Management Officials' Association (NEWMOA) Mercury Program	www.newmoa.org/Newmoa/htdocs/prevention/mercury/
UNEP Global Mercury Assessment and Decision	www.chem.unep.ch/mercury/default.htm
Binational Toxics Strategy Mercury Work Group (EPA Region 5)	www.epa.gov/region5/air/mercury/mercury.html
Florida Department of Environmental Protection's Mercury Web site	www.dep.state.fl.us/air/pollutants/mercury.htm
PCBs	
EPA's Office of Pollution Prevention and Toxics (OPPT) PCB Home Page	www.epa.gov/oppt/pcb
Polychlorinated Biphenyls (PCBs) Databases and Forms	www.epa.gov/opptintr/pcb/data.html

* This is only a partial listing of available resources. The listing of non-EPA Web sites does not constitute an endorsement by EPA or its partners.

Achieving Pollution Reductions

Pollution Prevention

TSCA Chemical Substance Inventory	www.epa.gov/opptintr/newchems/invntory.htm
PBT Profiler	www.pbtprofiler.net/
Mercury Education and Reduction Model Act	www.newmoa.org/prevention/mercury/final_model_legislation.htm
Hospitals for a Healthy Environment	www.h2e-online.org
Sector-Based Pollution Prevention: Toxic Reductions through Energy Efficiency and Conservation Among Industrial Boilers	delta-institute.org/publications/boilers/Sector-Based_Pollution%20Prevention_-_Toxic_Reductions_through_Energy_Efficiency_and_Conservation_Among_Industrial_Boilers.pdf
2001 Chlorine Institute Annual Meeting Presentations	www.cl2.com/AM2001/
Chlorine Institute's 4th annual report to EPA	www.epa.gov/region5/air/mercury/4thcl2report.html
Reducing Open Burning of Household Trash	Douglas Fairchild at 218 722-3336, Ext. 334, doug.fairchild@wlssd.duluth.mn.us

Controlling PBT Releases to the Environment

Taking Toxics Out of the Air: Progress in Setting "Maximum Achievable Control Technology" Standards Under the Clean Air Act	www.epa.gov/oar/oaqps/takingtoxics
Reducing Mercury from Power Plants: Integrated Planning Model	Maryjo Krolewski at 202 564-9847, krolewski.maryjo@epa.gov or www.epa.gov/airmarkets/epa-ipm/index.html
Field Testing of Continuous Emission Monitors	Bill Grimley at 919 541-1065, grimley.william@epa.gov
Coal Combustion Residues – Mercury in Fly Ash	Susan Thorneloe at 919 541-2709, thorneloe.susan@epa.gov
Results of analysis of MACT retrofits on large municipal waste combustors, EPA Docket A-90-45, under Section VIII-B.	www.epa.gov/oar/docket.html or 202 566-1742
Rules for Municipal Waste Combustors	Walt Stevenson at 919 541-5264, stevenson.walt@epa.gov
Rules for Medical Waste Incinerators	Fred Porter at 919 541-5251 or porter.fred@epa.gov
Rules for Cement Kilns Burning Hazardous Waste	www.epa.gov/hwcmact
Technology Transfer Network Air Toxics Website	www.epa.gov/ttn/atw
Mercury in Schools	www.mercuryinschools.uwex.edu/
Pressure Gauge Safety for Plumbers	www.dec.state.ny.us/website/ppu/p2plumbr.html
Mercury in Federal Facilities	www.newmoa.org
Breaking the Mercury Cycle: Long Term Management of Surplus & Recycled Mercury & Mercury-bearing Waste	www.epa.gov/ttbnrmrl/mercuryretire.htm

Alternative Treatments for Mercury Waste	Mary Cunningham at 703 308-8453, cunningham.mary@epa.gov
Partnering with Industry to Eliminate PCBs	Tony Martig at 312 353-2291, martig.anton@epa.gov
Phaseout of PCBs Electrical Equipment in Mines	Dan Bench at 303 312-6027, bench.dan@epa.gov
Removing Pesticides From the Environment	www.epa.gov/pesticides
The Clean Sweep Report	www.epa.gov/oppfead1/cb/csb_page/updates/cleansweep.pdf
Filling the PBT Data Gaps	
EPA's Toxic Release Inventory home page	www.epa.gov/tri
Persistent, Bioaccumulative, and Toxic (PBT) Chemicals Rules	www.epa.gov/tri/lawsandregs/pbt/pbtrule.htm
Atmospheric Mercury Research	Matthew Landis at 919 541-4841, landis.matthew@epa.gov
Addressing the Relationship Between Mercury Air Emissions and Water Quality	Ruth Chemerys at 202 566-1216, chemerys.ruth@epa.gov or Randy Waite at 919 541-5447, waite.randy@epa.gov
Determining the Routes by Which Mercury Pollutes the Everglades	John Ackermann at 404 562-9063 or ackermann.john@epa.gov
Total Maximum Daily Loads	www/epa/gov/owow/tmdl
Blood and Hair Mercury Levels in Young Children and Women of Childbearing Age— United States, 1999	www.cdc.gov/mmwr/preview/mmwrhtml/mm5008a2.htm
National Health and Nutrition Examination Survey	www.cdc.gov/nchs/nhanes.htm
Measuring Heavy Metals and POPs Levels in Fetal Cord Blood Samples Taken from Indigenous Peoples in Alaska, Northern Russia and the Russian Far East	Ella Barnes at 202 564-6473, barnes.eleonora@epa.gov Bob Dyer at 202 564-6113, dyer.bob@epa.gov Cathy Allen at 202 564-6115, Catherine.Allen@epa.gov
National Fish Tissue Study	Leanne Stahl at 202 566-0404, stahl.leanne@epa.gov
PBTs in the U.S. Dairy Supply	John Schaum at 202 564-3237 or schaum.john@epa.gov
Dioxin Exposure Initiative	Dwain Winters at 202 566-1977 or winters.dwain@epa.gov
Collaborative Efforts on PBTs with Tribal Partners	
National Tribal Subsistence Summit Project	Darlene Harrod at 202 564-8814, harrod.darlene@epa.gov
Tribal LifeLine Risk Assessment Project	Karen Rudek at 703 305-6005, rudek.karen@epa.gov
Analyzing the PBT Content in Traditional Foods of Native Alaskans: The Alaska Sea Otter and Stellar Sea Lion Commission	Lianna Jack at 800 474-6342, asoc@alaska.net
Measuring Heavy Metals and POPs Levels in Fetal Cord Blood Samples Taken from Indigenous Peoples in Alaska, Northern Russia and the Russian Far East	Ella Barnes at 202 564-6473, barnes.eleonora@epa.gov Bob Dyer at 202 564-6113, dyer.bob@epa.gov Cathy Allen at 202 564-6115, Catherine.Allen@epa.gov

Collaborative Efforts on PBTs with International Partners

The Foundation for Global Action on Persistent Organic Pollutants: A United States Perspective	http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=51746
United Nations Environmental Programme Chemicals	www.chem.unep.ch/pops and www.chem.unep.ch/mercury
Persistent Organic Pollutants	www.epa.gov/international/toxics/pop.pdf
Stockholm Convention on POPs	www.chem.unep.ch/sc/
Mercury/SO_2 Co-Benefit Project	Marilyn Engle at 202 564-6472 or engle.marilyn@epa.gov
Russian Phase-out of PCBs	Bob Dyer at 202 564-6113, dyer.bob@epa.gov Ella Barnes at 202 564-6473, barnes.eleonora@epa.gov Seth Low at 703 603-9087, low.seth@epa.gov
Reductions of Dioxins/Furans Releases in Russia	Ella Barnes at 202 564-6473, barnes.eleonora@epa.gov Bob Dyer at 202 564-6113, dyer.bob@epa.gov Seth Low at 703 603-9087, low.seth@epa.gov
Environmentally Safe Management of Obsolete Pesticide Stockpiles in the Russian Federation	Bob Dyer at 202 564-6113, dyer.bob@epa.gov Ella Barnes at 202 564-6473, barnes.eleonora@epa.gov
Carribean Inventory of PCBs	Angela Bandemehr at 202 564-1427, bandemehr.angela@epa.gov

APPENDIX B: **FUTURE OUTLOOK**

Future activities that build on projects disclosed in this report include:

Developing Strategies for Addressing PBTs

- Completing the Multimedia Strategy for Addressing Priority PBTs.
- Releasing the draft National Action Plans for Mercury, PCBs, and Benzo(a)Pyrene.
- Releasing an EPA Strategy on Dioxin.
- Publishing the final National Action Plans for Pesticides, Hexachlorobenzene, and Octachlorostyrene.

Achieving Pollution Reductions

- Developing a policy to strengthen the process by which EPA screens new pesticides prior to their production and introduction to the marketplace.
- Working with the National Association for Stock Car Automobile Racing (NASCAR), the FAA, and others to identify substitutes for alkyl-lead compounds in fuels.
- Holding a workshop in the Western Lake Superior Sanitary District to develop models for local anti-open burning campaigns, including legal and enforcement issues, and to develop curriculum models for environmental science teachers.
- Continuing to evaluate continuous emission monitors for mercury on power plants. At least two power plants that employ extensive particulate and sulfur dioxide control technology will be employed in this work.
- Upgrading the Integrated Planning Model (IPM)—used to analyze regulatory options for reducing mercury emissions from power plants—based on initial results and stakeholder comments. EPA will also continue to field test continuous emission monitors for mercury at power plants.
- Analyzing the potential rates at which mercury and other metals are released to the environment when the residue from coal combustion is used in commercial products, like cement and wallboard. EPA will also study the potential for releases of mercury and other metals from the products during their use and disposal.
- Implementing standards for PBT emissions from small municipal waste combustors by December 2005.
- Encouraging federal owners of PCB-containing electrical equipment to voluntarily decommission this equipment.
- Expanding the PCB partnership with utilities to include additional facilities within the Great Lakes region. The partnership seeks voluntary commitments from utilities to decommission their remaining PCB electrical equipment.

Filling the PBT Data Gaps

- Completing the Routine Monitoring Strategy for PBTs.
- Releasing findings from studies in Wisconsin and Florida on the relationship between mercury air emissions and water quality.
- Continuing to measure heavy metals and POPs levels in fetal cord blood samples taken from indigenous peoples in Alaska, Northern Russia and the Russian Far East.
- Continuing the National Fish Tissue Study. The 4-year goal for the study is to sample a total of 500 lakes. Once the study is completed, the data will be made available to the public through EPA's Storage and Retrieval (STORET) database system.
- Continuing the Dioxin Exposure Initiative.

Collaborating with Tribal Partners

- Developing different approaches to increase the ability of tribes to assess environmental threats from toxic chemicals and pesticides.
- Holding meetings in Alaskan tribal communities to describe the tribal herring gull eggs study and explain the risk levels associated with the contaminants analyzed in the gull eggs.
- Modifying existing LifeLine software to allow it to capture risks to tribes in two biogeographical areas (BGAs) of the country, one in Alaska and the other in the contiguous 48 states. This will allow EPA risk assessors, tribes, and others to assess potentially significant risks from toxic chemical exposures to tribal populations in the two chosen BGAs.

Collaborating with International Partners

- Working with UNEP to help implement the February 2003 Governing Council Decision on Mercury.
- Testing control technology that could lead to reductions in both mercury and SO_2 at a coal-fired power plant in Russia.
- Developing a prototype demonstration for destruction of up to 200 tonnes of PCB liquids from electrical transformers and capacitors in Russia.
- Working to reduce dioxins/furans releases to the Arctic from key industrial sectors in the Russian Federation, with particular focus on the pulp and paper industry and landfill incinerators.
- Assisting Russia with the management of its obsolete pesticides stockpiles.
- Assisting the Bahamas with a more comprehensive inventory of PCB-containing equipment and developing a strategy for the safe disposal, storage, and/or destruction of PCB-containing equipment, which can be applicable to other Caribbean countries.