Mercury Pollution Prevention in Healthcare

A Prescription for Success

National Wildlife Federation

July 1997

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National Wildlife Federation

Founded in 1936, the National Wildlife Federation (NWF) is the nation's largest conservation education organization. NWF's mission is to educate, inspire and assist individuals and organizations of diverse cultures to conserve wildlife and other natural resources while protecting the earth's environment in order to achieve a peaceful, equitable and sustainable future.

Great Lakes Natural Resource Center

Established in 1982, the Great Lakes Natural Resource Center unites people throughout the eight-state Great Lakes region, the U.S., and Canada to protect the world's greatest freshwater seas, the surrounding ecosystem, and the benefits they provide to people and wildlife.

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Introduction

Included at the end of this report is a resource list, highlights of conference presentations and a sample vendor affidavit.

This guide, *MERCURY POLLUTION PREVENTION IN HEALTHCARE: A PRESCRIPTION FOR SUCCESS,* is intended to offer guidance to hospitals that are striving to become mercury-free. It is intended to help healthcare workers and citizens eliminate mercury from hospitals, doctors' offices and other healthcare facilities. It provides information on:

- ✔mercury and its effects on people and the environment;
- ✔the importance of source reduction;
- ✔the healthcare industry's role in preventing mercury pollution;
- ✔the whys and hows of becoming mercury-free; and,
- ✔success stories.

It also includes a resource list with contacts and materials, which are meant to provide specific information and assistance to anyone interested in developing or furthering mercury pollution prevention strategies and goals.

Background

The National Wildlife Federation's (NWF's) Great Lakes Natural Resource Center (GLNRC) has been working to eliminate pollution from persistent bioaccumulative toxins, such as mercury, since the opening of its office in 1982.

The National Wildlife Federation's (NWF's) Great Lakes Natural Resource Center, located in Ann Arbor, Michigan, has been working to eliminate pollution from persistent bioaccumulative toxins –chemicals like mercury, PCB's, dioxin and DDT– since the opening of the office in 1982. As they travel up the food chain, these toxins become more concentrated in the tissue of aquatic organisms. This becomes problematic since many of these toxins are linked to a series of neurologic and reproductive abnormalities in humans and wildlife. NWF is especially concerned about the effects of these chemicals on human health, wildlife and the environment.

NWF is pursuing the goal of minimizing or eliminating the use of these persistent chemicals by working in cooperation with the United States and Canadian governments to help implement the 1978 Great Lakes Water Quality Agreement. Also, NWF has worked to promote tougher laws to regulate the use of these chemicals and has participated in several successful cooperative projects with representatives from various industries that use or release these toxins into the environment. The success of these projects led NWF to work with hospitals in the Great Lakes region and to start mercury pollution prevention programs.

Staff at NWF and the Michigan Health & Hospital Association (MHA) are working together on mercury pollution prevention and other environmental issues. This working partnership is a great step in demonstrating the value of collaboration on environmental issues; MHA is to be commended for their participation and support. One of the goals of this combined effort is to produce a practical and economical plan for the reduction of mercury use in the healthcare industry.

NWF and the Michigan Health & Hospital Association (MHA) are pooling their efforts to create a practical and economical plan for the reduction of mercury use in the healthcare industry.

This cooperative effort began while both organizations were participating in the Michigan Mercury Pollution Task Force, which concluded its work in April 1996. One subgroup of this Task Force focused specifically on pollution prevention issues in the healthcare industry. This subgroup included representatives from NWF, MHA, the Michigan Department of Environmental Quality (MDEQ), the Detroit Water and Sewerage Department (DWSD) and area hospitals. Because of the success of this subgroup and its willingness to approach the problems of mercury in the environment, NWF sought the support of MHA in sponsoring a conference on mercury pollution prevention targeted at the healthcare industry.

On October 4, 1996, NWF, along with MHA, the U.S. Environmental Protection Agency (EPA) and several supporting organizations, sponsored an educational workshop, *Mercury Pollution Prevention: Healthcare Providers Protecting People and the Great Lakes*, for the healthcare community and interested citizens. This conference was planned in recognition of the nationwide

In response to the high level of nationwide interest on mercury pollution and the healthcare industry's role as a major source of this problem, NWF and other supporting organizations are working to educate the healthcare community and interested citizens.

interest on mercury and, specifically, on the role of the healthcare industry as a source of mercury pollution. Many leaders in the industry have become aware of the need for change in the standard practices of most hospitals when it comes to mercury use and are interested in learning and doing more to reduce their impact on the environment. The positive response from healthcare providers at the conference resulted in the development of this guide, which captures the fundamentals of the various mercury reduction programs presented at the conference. Several case studies of successful pollution prevention efforts are included in this report.

NWF hopes to serve as a catalyst for changing people's consciousness when it comes to the use of toxic chemicals. All sectors of society should embrace a policy of attacking pollution before it starts. In the Pollution Prevention Act of 1990, Congress "declare[d] it to be the national policy of the United States that pollution should be prevented at the source whenever feasible." The best way to accomplish this is to provide people with the information they need in order to change current behaviors. Working partnerships with organizations like MHA help spread the word about mercury pollution prevention, making it easier to change the practices of healthcare professionals.

Working partnerships with groups like MHA help spread information about mercury pollution prevention and the part that the healthcare community can play.

The support of MHA, other organizations and individual hospitals has been crucial in helping to convey the message about mercury's impacts on the environment and the importance of mercury pollution prevention in hospitals. As members of the healthcare community become increasingly aware of the fact that hospitals are a source of toxic pollutants to the environment, these professionals are becoming essential links in the search for solutions. Organizations like Physicians for Social Responsibility, the National Association of Physicians for the Environment and other like-minded groups are working to educate their memberships and the public about the threats that these pollutants pose to the health of people, wildlife and the environment.

Mercury in the Environment

What are the Health Impacts?

Mercury is a bioaccumulative chemical, which in its most dangerous form, methyl mercury, can wreak havoc on the food chain as it becomes increasingly concentrated.

Mercury is an element that occurs naturally in the earth's crust. Most people and wildlife can generally tolerate the extremely low levels of this naturally occuring substance. When mercury enters the body it becomes concentrated in tissue, an effect known as bioaccumulation. Since this element is toxic at very low concentrations, even slight increases in the minute concentrations naturally present in the environment can have serious effects on humans and wildlife.

Once mercury enters the water it can be converted to its most toxic form, methyl mercury, by bacteria or chemical reactions. Methyl mercury is absorbed by tiny aquatic organisms, which are then eaten by small fish. The chemical is stored in the fish tissue and is passed on at increasing concentrations to larger predator fish. People and wildlife at the top of the food chain are consequently exposed to elevated amounts of methyl mercury through the contaminated fish they consume.

The way most people and wildlife become exposed to methyl mercury is by eating contaminated fish.

In at least 37 states, fish consumption advisories exist to inform anglers about the dangers of eating mercury-contaminated sport fish. For example, Michigan warns people not to eat more than one meal a week of walleye, perch, bass and other fish from *any* of the 11,000 inland lakes in the state due to widespread mercury contamination.

Mercury is a neurotoxin in low doses.

Mercury is a neurotoxin in low doses, affecting the functioning and development of the nervous system. Depending on the level of exposure, this toxin can have varied health effects ranging from mental retardation to death. Pregnant women need to be especially concerned about mercury contamination because direct exposure to the developing fetus through the mother's placenta could cause various health effects. Women of childbearing years, pregnant women, nursing mothers and children under the age of 15 should consume limited quantities of contaminated fish and space their fish meals appropriately. In addition, this sensitive population should not eat any swordfish or shark since these predators are known to have high levels of mercury in their tissues.

Incidents of human exposure have confirmed mercury's link to human health problems. In 1972, 6,500 Iraqi adults and children developed neurological problems and 459 people died after they ate grain coated with a fungicide containing methyl mercury. In another example that occurred in Minimata, Japan, 700 people died, 9,000 individuals experienced varying degrees of paralysis and

The detrimental effects that mercury has on human health are well substantiated.

brain damage, and 50,000 individuals experienced at least mild symptoms after being exposed to methyl mercury in seafood they consumed.

Airborne mercury is also a considerable threat to people and other organisms exposed through inhalation or bodily contact. In 1989, two young girls in Michigan were hospitalized and diagnosed with chronic mercury poisoning after being exposed to mercury vapors from a spill that occurred in their home. As a result of the exposure, they experienced weakness, blurred vision and varying degrees of neurological damage, some of which lingered even after therapy.

Workplace exposure to mercury usually occurs through inhalation.

Numerous cases of mercury poisoning, primarily through inhalation of the chemical, have also been documented in the workplace. In a survey conducted by the National Institute for Occupational Safety and Health, it was estimated that 70,000 American workers may be exposed to mercury vapors on the job, including nurses, lab technicians and others working in healthcare facilities (Anne Nadakavukaren, *OUR GLOBAL ENVIRONMENT: A HEALTH PERSPECTIVE* - 1995). In addition, families of these workers were also identified to be at risk for exposure from mercury-contaminated work clothes brought home by workers. Despite these and countless other examples of the dangers of mercury, scientists still disagree about the levels at which this chemical is harmful to human health.

There is ongoing research to determine the effects of mercury on wildlife.

Studies have been conducted to determine the effects of mercury on wildlife that consume fish and other aquatic animals contaminated with the chemical. Current findings suggest that mercury has a neurotoxic effect on loons, eagles and osprey. One study found that loons with high levels of mercury in their brains (2 to 3 parts per million) reproduce less successfully than normal. These same levels could also hinder their speed and coordination, affecting their ability to catch prey and avoid predators.

Research shows that mercury pollution is a local, regional and global problem.

In another study, researchers found geographical differences in mercury levels within loons. Those tested in eastern North America were found to have higher levels than those in the west. For example, loons in Alaska had low levels, only an average of 0.5 parts per million (ppm), while those in the Great Lakes region had an average of 1.1 ppm. New England loons were found to have an average of 2.3 ppm, and 3.1 ppm was the norm in the Canadian Maritime Provinces. Findings such as these provide evidence that the prevailing westerly winds in North America carry mercury to the east from pollution sources in the Midwest. Its ability to travel great distances once it becomes airborne makes mercury pollution a global issue, as well as a local and regional one.

Where does it Come From?

Human activities such as coal burning increase mercury contamination of air and water.

Mercury is a toxic metal that is of significant concern to the public. Naturally occurring mercury in our environment can be found in soil and rocks, including coal and copper ore. While trace amounts of mercury have always been present in the environment, concentrations of this chemical have been increasing to dangerous levels due to human activities such as coal burning.

The redistribution of mercury to the air and water increases the likelihood of exposure to humans and wildlife.

Many of these activities are also largely responsible for creating local, regional and more widespread areas of contamination by redistributing the mercury found naturally in the environment. This redistribution creates significant potential for human and wildlife exposure. When coal is burned, for example, mercury is released into the air. Once it becomes airborne, it can be carried by winds and deposited locally within a couple of miles or kilometers from its source, or it can be carried for thousands of miles before being deposited on soil and bodies of water. Consequently, mercury that was not readily available to fish in a particular lake prior to redistribution may now be concentrating in their tissue. The likelihood of exposure to humans and wildlife that consume fish from this lake is now increased.

By far, the largest source of mercury to the atmosphere is the combustion of fossil fuels (mostly coal) and waste. Nationally, combustion point sources account for approximately 84.9% of all atmospheric emissions of mercury (See Chart 1).

Human activities that result in the mass transfer of mercury to the atmosphere include:

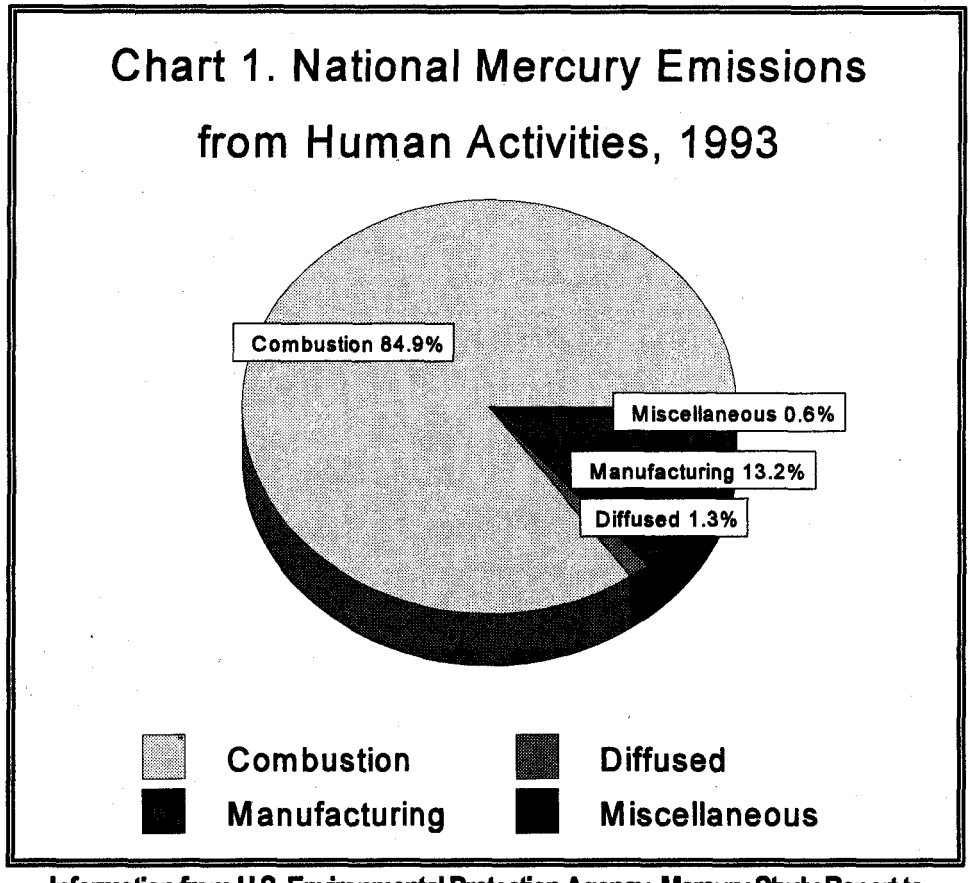
✔combustion point sources like incinerators and coal burning electric utility boilers;

✔manufacturing point sources like battery production and lime manufacturing;

✔diffused point sources, which are numerous and not easily identified, like electric lamp breakage; and,

✔miscellaneous point sources like geothermal power.

Nationally, combustion point sources account for approximately 85% of all human caused mercury emissions.



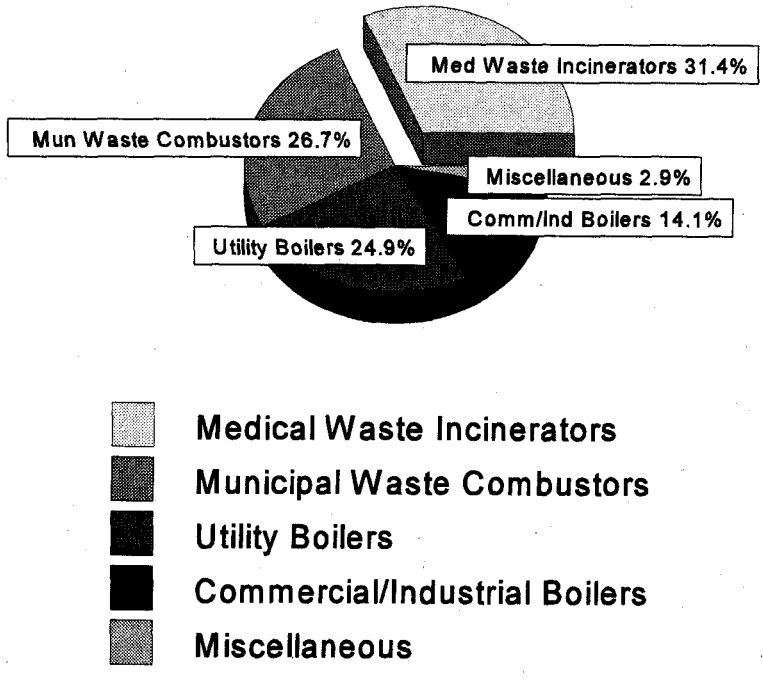
Information from U.S. Environmental Protection Agency, Mercury Study Report to Congress Volume II: An Inventory of Anthropogenic Mercury Emissions in the US, SAB Review Draft - June 1996

Included in the "combustion" category are medical waste incinerators (MWIs), which burn medical waste. Hospitals, medical clinics, medical laboratories, nursing homes, others involved in medical and veterinary care and mortuaries use MWIs to rid biological waste of pathogens and to reduce the amounts of waste being sent to landfills. Mercury is released when debris containing the chemical, which could include anything from thermometers to antiseptics to CAT scan paper, is combusted at high temperatures.

Nationally, over 30% of mercury emitted from combustion point sources comes from MWIs (See Chart 2).

Of the national combustion point sources, medical waste incinerators (MWIs) result in the greatest releases. Approximately 30% of mercury emitted from combustion point sources comes from MWIs.

Chart 2. National Mercury Emissions from Combustion Sources, 1993

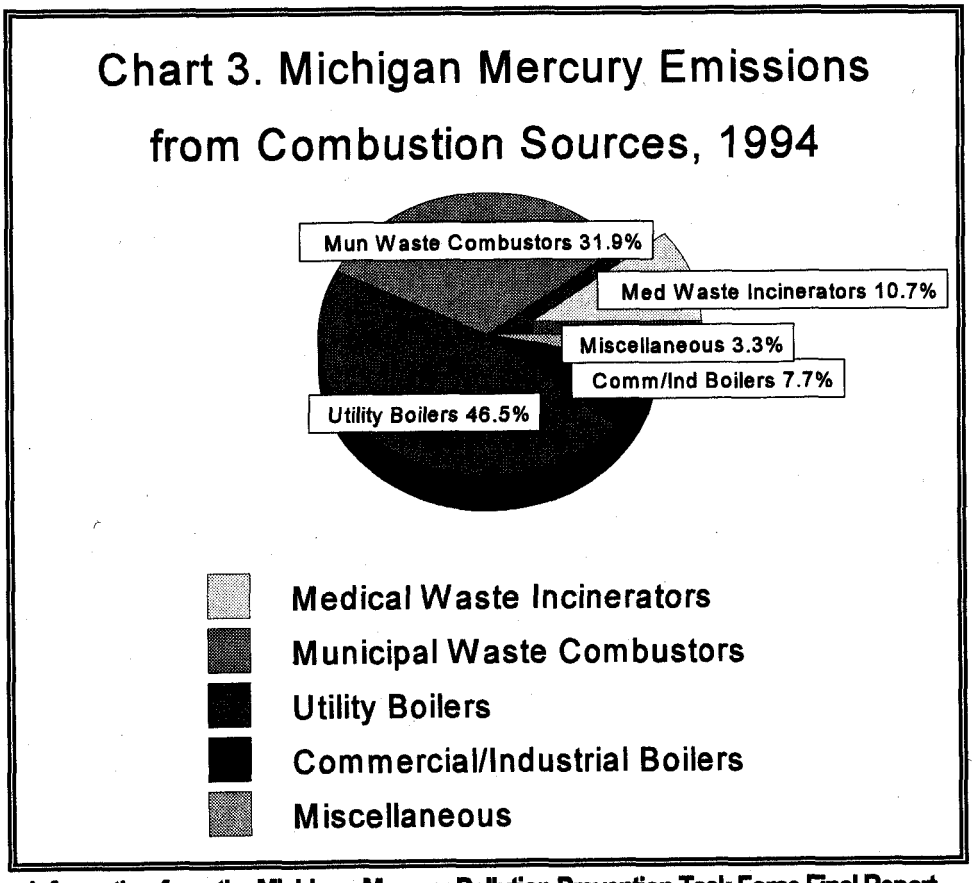


Information from US Environmental Protection Agency, Mercury Study Report to Congress Volume II: An Inventory of Anthropogenic Mercury Emissions in the US, SAB Review Draft - June 1996

According to the Michigan Department of Environmental Quality (MDEQ), the largest single source of mercury to Michigan's environment is the burning of coal, mostly by electrical utilities, which is estimated to contribute 4,920 pounds to the air annually. In addition, the incineration of hospital waste in Michigan contributes 980 pounds of mercury to the atmosphere annually, making MWIs the third largest combustion point source of mercury in the state (See Chart 3).

The MDEQ also estimates that 3,800 pounds of mercury are discarded into Michigan's municipal and commercial solid waste stream. In addition, approximately 200 to 1,800 pounds of mercury are discharged to municipal wastewater treatment plants or directly into Michigan waters annually.

In Michigan, MWIs contribute substantial amounts of mercury to the air. They are the third largest combustion point source of mercury to the atmosphere.



Information from the Michigan Mercury Pollution Prevention Task Force Final Report - April 1996

Why Source Reduction

Products containing mercury are found throughout hospitals and other healthcare facilities, increasing the likelihood that the chemical will find its way outside into the environment.

Hospitals and other healthcare facilities use a variety of products that contain mercury, such as thermometers, blood pressure cuffs, fluorescent bulbs, batteries, laboratory chemicals and many cleaning products. The use of these mercury-containing items creates many pathways by which mercury may be released into the environment. The following are the three primary pathways:

- ✔releases of mercury into the air by medical waste incinerators burning medical waste containing the chemical;
- ✔the landfilling of mercury-containing medical waste; and,
- ✔releases of the chemical into the wastewater stream.

Mercury use within hospitals creates disposal problems that cannot be solved with traditional disposal methods nor with current pollution control devices.

Improper handling and disposal of mercury are common occurrences within hospitals. Once mercury is spilled, disposed of as solid waste or discharged to the receiving wastewater plant, the avenues into the environment are opened. Mercury is very mobile and persistent; it can easily make its way into the atmosphere, soil, groundwater and surface waters of local, regional and more distant areas. As a result, traditional methods of waste disposal are inadequate to deal with the problems associated with mercury use. Even mercury "captured" by costly air pollution control devices can make its way back to the atmosphere. Consequently, there is a need for a different approach when it comes to dealing with mercury and other deadly toxins.

In 1990, Congress passed the Pollution Prevention Act. This marked the beginning of source reduction as a national policy. In passing the Act, Congress recognized the benefits of source reduction versus waste treatment and disposal. The preamble to the Act states:

> *There are significant opportunities for industry to reduce or prevent pollution at the source through cost-effective changes in production, operation, and raw materials use. Such changes offer industry substantial savings in reduced raw materials, pollution control, liability costs as well as help protect the environment and reduce risks to worker health and safety* (42 U.S.C.A. Sec. 13101 (a)(2)).

According to the Pollution Prevention Act, pollution prevention is any practice that reduces the use or generation of hazardous substances prior to recycling, storage, treatment or control. While recycling is a form of waste minimization that can

Pollution prevention, or source reduction, is any practice that reduces the use or generation of hazardous substances prior to recycling, storage, treatment or control.

reduce the volume of waste requiring disposal, it is *not* source reduction. Source reduction reduces and eliminates toxic substances such as mercury at the source. This approach is much better than addressing problems after they have been created through spills, improper transport handling and inadequate disposal and pollution control methods. It also allows hospitals to avoid the costs associated with expensive pollution control equipment, regulatory fines and potential legal battles.

The benefits of source reduction have become apparent to many of the industries targeted by this legislation, including the healthcare sector. The success stories highlighted in this report bear testament to the fact that pollution prevention is a logical, cost-effective and feasible approach to eliminating mercury pollution from healthcare sources.

There are many success stories that bear testament to the fact that pollution prevention is a logical, cost effective and feasible approach for hospitals and other healthcare facilities.

In the Pollution Prevention Act, Congress identifies the following five source reduction methods:

1) Substitution of raw materials

2) Reformulation or design of products

3) Equipment or technology modifications

4) Process or procedure modifications

5) Improvements in housekeeping, maintenance, training, or inventory control (operational changes)

Hospitals can employ most of these methods to reduce the amounts of mercury used in their facilities. Examples include the following:

✔creating and enforcing agreements with vendors to supply only mercury-free products as a means of controlling inventory and being environmentally responsible at the same time;

✔using mercury-free thermometers as an equipment change that lowers the risk of mercury entering the environment;

✔encouraging the use of mercury-free lab reagents as a process change that can bring the same diagnostic results yet be safer for the environment; and,

✔using mercury-free cleaning products and checking lab coats and other work clothes for instruments or items containing mercury prior to washing as housekeeping improvements and operational changes that allow all staff to participate in keeping their facilities mercury-free.

Pollution prevention is a sound alternative to traditional methods of waste treatment.

Pollution prevention is a sound alternative to other forms of waste treatment and disposal, which are inadequate to deal with the problems associated with mercury use. Besides the obvious benefits highlighted, source reduction also goes a step further. It produces significant changes in behavior that often precede similarly significant changes in attitude. Once administrators and staff become involved in mercury pollution prevention, the importance of keeping mercury and other toxins out of their facilities and, consequently, the environment will become reinforced. In the future, instead of approaching the problem of pollution reactively, they will be inspired to take a proactive stance to new challenges.

Hospitals as Part of the Solution

What are the Benefits of Becoming Mercury-Free?

Many hospitals have been motivated by an ethical obligation to their patients, staff and people of the community to eliminate mercury from their facilities.

The leading reason for a healthcare facility to become mercury-free is an ethical motivation to protect people and the environment. Hospitals' mission statements often include the goal of assessing and improving community health. As significant users of products containing mercury, hospitals have an opportunity to play a key role in protecting public health and the environment by minimizing their use of these products. When hospitals reduce their use of mercury they are positively influencing community health by eliminating a known health hazard. They also set a higher standard for other businesses in the community.

Another benefit to becoming mercury-free is that it allows healthcare facilities to avoid the costs of storing and disposing of hazardous wastes and the costs of meeting mercury emission regulation standards. Many local wastewater treatment plants are identifying hospitals as industrial pollution sources. As a result, strict wastewater mercury concentration limits are being imposed. In this case, eliminating or reducing mercury will not only lower the cost of compliance, but it will also allow facilities to avoid the costs of fines and possible legal battles in instances of non-compliance.

Eliminating mercury from hospitals can lead to substantial savings in waste treatment, disposal and other costs associated with regulatory compliance.

Due to upcoming federal regulations, hospitals that operate their own incinerators are also likely to experience tighter limits on the amounts of mercury that they can release. Since most of these proposed rules will result in the need for more monitoring and pollution control equipment, instituting stringent policies to eliminate mercury in the hospital waste stream will help hospitals comply with these standards and will eliminate added costs.

In addition, mercury elimination or reduction can eliminate the costs incurred by expensive spill cleanups and the costs associated with personnel training on the proper identification and use of this widely distributed hazardous substance.

Helping Hospitals Become Mercury-Free

The task of becoming a mercury-free facility is a formidable one, yet much information is already available to those hospitals interested in pursuing this goal.

It is crucial to the success of any mercury pollution prevention plan that those individuals involved in the process use the information and expertise already available to them. Identifying all the sources of mercury within a healthcare facility, for example, is a formidable task, but one that has already been undertaken by various hospitals. The Massachusetts Water Resources Authority (MWRA)/Medical Academic and Scientific Community Organization (MASCO) Hospital Mercury Work Group, which is highlighted later in this report, has identified and tested over 5,000 chemicals to determine their mercury content. Information on this and other findings is readily available via the Internet on the MASCO homepage (http://www.masco.org).

In addition, there is a substantial amount of information already collected on mercury-containing products, the hospital departments in which they are found and their mercury-free alternatives. Table 2 provides a brief summary of this information. For more detailed analyses, refer to the materials listed in the Resource List later in this report.

Federal, state and local government agencies, such as the U.S. Environmental Protection Agency and state compliance assistance departments, can also provide information, materials and expertise on mercury pollution prevention. In many cases, information and materials can be distributed, facilities and experts provided, and meetings and conference calls arranged.

Hospitals should call on their local, state and federal agencies and on their local wastewater treatment plants (POTWs) for assistance in meeting their pollution prevention goals.

Local wastewater treatment plants are also sources of information and materials on mercury pollution prevention. It is in their interest to assist hospitals in complying with the mercury discharge limits established in their permits. By reducing the amounts of mercury entering these facilities, treatment plants can more easily meet the mercury discharge limits imposed on them by National Pollution Discharge Elimination System (NPDES) permits.

Extensive research has already been done within hospitals to identify existing products that contain mercury and their mercury-free alternatives. (For more detailed lists of mercury-containing and mercury-free products and the departments in which they can be found refer to the Resource List at the end of this report.)

Table 2. Mercury Sources and Alternatives

Departments	Typical Use	Alternative Action
Laboratories	stains, fixatives, reagents, and calibration solutions in the form of mercury chlorides and thimerosal*	chemical changes such as zinc formalin; process changes such as using poly vinyl alcohol for B5/Fixatives
Maintenance	fluorescent lights; thermostats and leveling devices; electrical relays; and batteries	digital technology; energy efficient lighting; mercury-free batteries; and recycling of lights and batteries
Housekeeping	bleach solution containing sodium hypochlorite and thimerosal additives; caustic drain cleaners*	thimerosal-free products; organic oils and compounds
Surgery	esophageal dilator	silicone-filled dilator; tungsten-filled dilator
Patient Care Units	blood pressure units; thermometers	aneroid blood pressure units; digital thermometers

Information from Terrene Institute Publication - 1995 and personal communication

*Material Safety Data Sheets (MSDS) for these products will not list mercury if it comprises less than 1% of the material.

Becoming a Mercury-Free Facility

Making a successful conversion to a mercury-free facility requires some essential steps. First, a firm commitment must be made to eliminate or reduce the use of mercury within the facility. Second, a preliminary assessment must be conducted, which will provide a clear baseline or starting point from which to measure progress. Third, a plan of action must be created, which reflects an uncompromising commitment to becoming mercury-free. Finally, the. plan must be seen through to the end, ensuring that it is properly implemented, assessed and, if needed, modified regularly.

A firm commitment by all those involved, including administration and staff, is essential.

Making a Commitment

To begin, policies on pollution prevention and product substitution must be established, which will guide product evaluation committees. The hospital's Board of Directors should also adopt a policy statement that reinforces the hospital's commitment to becoming mercury-free. The goals of this statement should be communicated to and understood by all hospital staff and departments so that they are aware of their roles in setting up and carrying out pollution prevention procedures.

A thorough preliminary assessment of current uses of mercury and practices involving mercury use is an indispensable tool for creating a well-designed and effective pollution prevention plan.

Conducting a Preliminary Assessment

To get the program off to a good start, it is important to perform a preliminary assessment of the current conditions within the hospital as they relate to mercury use. An inventory of mercury-containing products currently in use or in storage within the facility is a good place to begin. When conducting this assessment, it is important to keep in mind that some items will be less obvious than others. Some cleaning products, for example, may be responsible for contributing a substantial amount of mercury to a facility's waste stream yet not be targeted for removal by individuals focusing on more obvious culprits. In addition, special note should be taken of products with an increased likelihood of spillage, such as wheeled or wall mounted blood pressure units.

The current or most recent water sample results and other information regarding the facility's environmental performance should also be included in this report. In addition, the staff's knowledge or awareness of the hazards of mercury, mercury-containing substances, spill management techniques and any existing hospital policies on hazardous chemicals and their management should all be assessed.

Establishing a hazardous materials and waste committee, taking regular wastewater samples and conducting a hospital-wide survey of current practices involving mercury use will all help create a thorough preliminary assessment for the facility. Once completed, this report will be a valuable tool for building a plan of action, setting goals and monitoring progress.

Building a Plan of Action

Hospitals that have achieved mercury-free status have written comprehensive plans for mercury reduction. Many of these examples are described in the case studies later in this report. In forming these plans, consideration was given to the following goals:

Support for the plan and the planning process must come from as many departments as possible and include staff and administrators from all levels.

- ✔acknowledging the ethical and economic advantages of becoming environmental stewards in the community;
- ✔striving to make hospitals leaders in pollution prevention;
- ✔working with state and local regulators to receive technical assistance;
- ✔building training and continuing education programs for staff and administrators; and,
- ✔auditing progress regularly and instituting incentive programs for these procedures.

Plan designs will vary depending on the structure of the hospital and on who is responsible for developing the plan. In some hospitals the responsibility for pollution prevention procedures lies in the safety, engineering or housekeeping departments. In others, it lies with the purchasing department. Regardless of who is responsible, the goal is to involve as many departments as possible and to build support for the process throughout the facility. Communications with the Board of Directors should include quarterly reports, which focus on accomplishments, upcoming actions and expected outcomes. It is essential that top administrators display a commitment to the success of any planning process and its implementation.

A typical plan might include the elimination of equipment that uses elemental mercury, such as thermometers, blood pressure cuffs and esophageal dilators (See Table 2). Working with suppliers to develop purchasing agreements that include mercury-free products is a step in the right direction. This is where communication with vendors is critical. Vendors and suppliers must know that alternative products that do not contain mercury are required. The hospital needs to communicate its

Communications with vendors is critical since they must know that alternatives to mercury-containing products are required.

message effectively. One method of reinforcing its commitment is by approaching vendors with an affidavit, which verifies that their product is mercury-free (see Appendix B). If an incoming product has mercury, the hospital assumes greater responsibility for environmental protection or cleanup. The affidavit might stipulate that the manufacturer bear these costs if the product is not mercury-free.

Staff education and commitment are other key components of a mercury-free plan. These employees play a vital role in identifying sources, possible substitutes and proper disposal methods of mercury. Hospital staff should review labels of chemicals before use to determine the mercury content. If a hospital chooses to keep a product that contains mercury, then proper waste stream segregation procedures are necessary to separate mercury and other waste to ensure that it is handled properly.

Staff education is a vital component of any pollution prevention plan.

Implementing a Mercury-Free Plan

Several steps are necessary for the successful implementation of a mercury-free plan. One of the most important steps is to select a team to handle the primary responsibility of plan development and its coordination and implementation. This group should include special staff within the hospital who have the authority to make the necessary changes to support the plan's recommendations.

It is crucial to the success of the plan that those charged with its implementation have the necessary authority to make any changes required for its success.

The existing hospital committee structure should be considered to identify those individuals and groups that are directly involved in hazardous material policy-making and enforcement within the facility. The purchasing department, which can act as a critical link in preventing mercury from entering the hospital, should also be directly involved in the planning process. "Product Selection Committees," for example, are often chaired by the purchasing department and have the authority to ban or curtail the purchase of particular items.

Once this team is established, its mandate must be spelled out. It should include the following:

- ✔building support throughout the hospital for going mercury-free;
- ✔determining all users or sources of mercury department by department;
- ✔identifying areas of opportunity for mercury source reduction, including replacement strategies for equipment, chemicals, etc.;
- ✔planning for staff training and education, including determining which methods need instruction and identifying the most important topics;
- ✔developing a communication plan that contains formal reports, updates on efforts, progress and results of the project to date; and,
- ✔planning ongoing efforts and assessments, which should include continuing education for staff, media and community outreach.

Assessing and Modifying the Plan Regularly

Regular assessment and modification of the plan are essential to its continuing progress and success. All parts of the plan should be assessed regularly to determine their effectiveness, and modified when needed. During these reviews, consideration should be given to the following:

- ✔working with local regulators to identify areas in the facility that may need improvement;
- ✔maintaining vigilance during periodic changes such as during construction;
- ✔informing outside contractors and new personnel of policies and spill management techniques; and,
- ✔staying aware of new product introductions.

Successfully reducing or eliminating mercury from a hospital or other healthcare facility is a long term process that requires careful and thorough planning and patience.

The identification of products that contain mercury and their mercury-free substitutes should be thought of as an ongoing journey. Staff education should be extensive, even for smaller hospitals, and should be approached in a structured manner. Four to six months should be expected just to collect the necessary information, develop goals, review financial costs, articulate the policy statement and build a consensus among key players. Most hospitals should plan on two-and-a-half to three years for successful implementation of their plan. The payoff for these efforts, such as a staff with an improved sense of community and ownership in the process, will be well worth the time committed.

Some Success Stories

Some local wastewater treatment plants have been very involved with hospitals in attempting to reduce the amounts of mercury entering their treatment facilities.

As industries become aware of the effects of mercury on the environment, many are beginning to assess the options for eliminating or reducing their use of the chemical. In many locales, the education regarding mercury pollution prevention is being conducted by the local publicly-owned treatment works (POTW). These local agencies are responsible for regulating the wastewater discharge from hospitals and other large facilities. Some cities that have POTWs working with area hospitals on mercury pollution prevention programs include Detroit, Michigan, Duluth, Minnesota and Boston, Massachusetts.

Detroit Water & Sewerage Department (DWSD)

Detroit Water & Sewerage Department (DWSD) has been working with area hospitals to institute pollution prevention measures at their facilities.

As part of the DWSD National Pollution Discharge Elimination System (NPDES) permit application, a new mercury minimization plan has been instituted. One major part of the plan requires DWSD to work with local hospitals to identify sources of mercury and institute in-house plans to eliminate mercury use. Some of the hospitals that have participated in these efforts include Henry Ford Hospital, Holy Cross Hospital, St. Joseph's Mercy Hospital and St. Mary's Hospital.

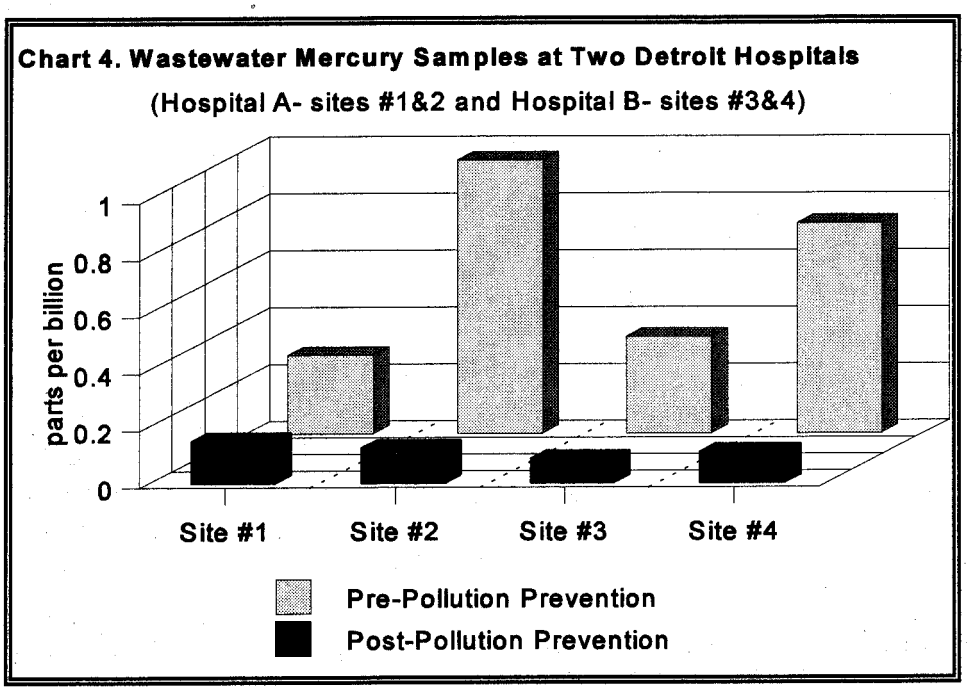
These hospitals approached the problem of mercury use within their facilities by following some basic steps, including:

- ✔conducting inventories to identify sources of mercury within their facilities;
- ✔making recommendations to existing hazardous waste and safety committees and the administration for reducing or eliminating these sources;
- ✔instituting immediate steps for mercury reduction; and,
- ✔devising long-term goals for the virtual elimination of mercury from their facilities.

During the past several years, DWSD has also conducted sampling at two major Detroit hospitals that have instituted mercury pollution prevention plans (see Chart 4).

After pollution prevention plans were instituted, substantial reductions in the amounts of mercury being discharged into hospital wastewater were seen at all four test sites.

- ✔site #1– 46% reduction
- ✔site #2– 86% reduction
- ✔site #3– 74% reduction
- ✔site #4– 85% reduction



Detroit Water & Sewerage Department (1991-1995)

Sampling began in January 1993 for the first hospital (sites #1 and #2) and continued through October 1995. Before the mercury pollution prevention program, which began in April 1994, measures at these sites were on the average of 0.28 parts per billion (ppb) and 0.96 ppb, respectively. After the program was instituted, these figures dropped to 0.15 ppb and 0.13 ppb, respectively. At the second hospital (sites #3 and #4), the sampling that took place between May 1991 and November 1995 showed similarly encouraging results. Pre-pollution prevention figures averaged 0.34 ppb and 0.74 ppb, respectively, while samples taken after the program was instituted averaged 0.09 ppb and 0.11 ppb, respectively.

The mercury pollution prevention plans instituted at these two hospitals, which include the purchasing of alternative products and the ongoing phaseout of

mercury-containing items, have resulted in substantial decreases in the amounts of mercury being discharged to DWSD.

Western Lake Superior Sanitary District (Duluth, Minnesota)

Mercury pollution prevention plans were devised for Duluth hospitals after new mercury limits were imposed on the Western Lake Superior Sanitary District (WLSSD).

The Western Lake Superior Sanitary District (WLSSD) provides wastewater treatment and solid waste services to the Duluth metropolitan area. WLSSD has been engaged in a mercury pollution prevention project for the past two years. This project has included work with hospitals and other industries in the Duluth area, such as paper manufacturers, which are also contributors of mercury to the environment.

WLSSD began its project, in part, to ensure that it could meet new mercury limits being imposed on its plant. Water discharged from its facility into the St. Louis River and then Lake Superior, could no longer exceed .03 parts per billion of mercury. The project was also begun in hopes of finding the source(s) of mercury that had contaminated local fish.

The hospital that worked most closely with WLSSD was St. Mary's Medical Center. This facility is a 326-bed hospital located in Duluth. The staff at St. Mary's worked with WLSSD to complete a survey of mercury use, to develop a wastewater monitoring plan and to investigate sources of mercury indicated by sampling data. Together they instituted a series of actions that included eliminating the use of equipment containing mercury and halting the practice of sending home mercury thermometers with new parents. They also implemented a mercury-free purchasing policy with vendors.

MWRA / MASCO Hospital Mercury Work Group

The Massachusetts Water Resources Authority (MWRA), the Medical Academic & Scientific Community Organization (MASCO) and Boston area hospitals have been participating in a Hospital Mercury Work Group.

In the fall of 1994, the Massachusetts Water Resources Authority (MWRA) formed a Mercury Products Work Group. The Work Group's mission is to examine and develop strategies to reduce the amount of mercury being discharged into the wastewater stream. Hospital participation in this process was coordinated through the Medical Academic and Scientific Community Organization (MASCO) and involved the active participation of 28 hospitals in the greater Boston area.

The Hospital Mercury Work Group has reduced the amount of mercury entering the MWRA wastewater system by more than 70%.

The Hospital Mercury Work Group approached the problem of high levels of mercury in the waste stream from three directions, including:

- ✔identifying sources of mercury contamination and developing recommendations for their control;
- ✔developing guidelines for the removal of residual mercury from hospital wastewater systems; and,
- ✔identifying and evaluating the pretreatment systems.

To date, the Hospital Mercury Work Group has reduced the average concentration of mercury in hospital wastewater from 22.7 ppb to less than 13 ppb. In addition, based on the analysis of the hospitals participating in the Hospital Mercury Work Group, MWRA concludes that it has reduced the amount of mercury entering its system by more than 70%.

Some hospitals are already implementing the mercury pollution prevention measures described in this report. While certain measures are required under federal and state laws, such as training on spill prevention and management, some healthcare institutions have developed additional responses to the problem of mercury pollution. The following summary of mercury pollution prevention case studies chronicles three of these efforts.

Spectrum Health

Spectrum Health has instituted a purchasing department policy, which calls for the elimination of all mercury-containing products that have suitable mercury-free alternatives.

Spectrum Health in Grand Rapids, Michigan has made a commitment to reach mercury-free status and is attempting to reach that goal by instituting a purchasing department policy. This policy states that unless no suitable mercury-free alternative exists, no mercury-containing devices are to be purchased. Examples of such products include thermometers, blood pressure gauges, esophageal dilators, and batteries. Hospital administrators have approved a proposal to replace all blood pressure gauges containing mercury with aneroid devices, their mercury-free alternative. In addition, Spectrum Health has agreed to stop sending mercury-containing devices, such as old blood pressure gauges, overseas in their humanitarian projects. The obstetrics department has also ceased sending mercury thermometers home with new mothers.

Spectrum Health also hired a local environmental consultant to devise a disposal plan for mercury that would be safe and economical for the entire hospital. The consultant, Stock Environmental, developed a spill response plan in accordance with guidelines from the Occupational Safety and Health Administration and the Joint Commission for the Accreditation of Healthcare Organizations. They also offered training on spill response, prevention and management. Educational materials about mercury, specifically the Terrene Institute publication, *THE CASE AGAINST MERCURY: RX FOR POLLUTION PREVENTION* (See Resource List), have

been distributed to all hospital departments, administrative personnel and regional facilities.

The Spectrum Health system has embarked on a mercury-free status for all other entities in the system, such as numerous free-standing medical centers, several clinics and nursing homes, and several affiliated rural hospitals. Administrative groups managing two new buildings opened by Spectrum Health, for example, have committed themselves to making the facilities mercury-free. Applying the Spectrum Health purchasing policy to these buildings has been challenging, though, because of private doctors who rent office space at these facilities. These doctors must each be individually convinced to apply the purchasing policy.

Riverside Hospital has developed both short- and long-term goals for reducing the amount of mercury within their facility.

Riverside Osteopathic Hospital

Riverside Osteopathic Hospital in Trenton, Michigan is in the process of adopting a mercury minimization plan, which has most recently cleared the hospital's Safety Committee. The plan incorporates identifying sources of mercury, developing a spill management procedure, providing educational material to staff and developing an action plan with a timetable for carrying out mercury pollution prevention activities.

Riverside Hospital started by identifying some mercury sources like thimerosal and mercuric chloride and finding mercury-free alternatives. The hospital has eliminated caustic drain cleaners and switched to the alternative organic oils and compounds that are not as harmful to the environment. Riverside has informally instituted a policy allowing only mercury-free devices to be used in the hospital, including thermometers, thermostats and blood pressure units. Mercury-containing batteries are no longer used and esophageal dilator tubes have been replaced with those containing water compounds. Riverside is also investing in T-8 fluorescent lamps with electronic ballasts. These lamps contain 20% less mercury than those previously used in the hospital. Furthermore, a mercury spill kit was purchased for cleanups.

The University of Michigan Health System is commited to replacing mercury-containing products throughout all the facilities in its system.

University of Michigan Health System

Two years ago, a mercury reduction program was begun at the University of Michigan (U of M) Health System in Ann Arbor, Michigan. Some elements of this program are being performed as a Supplemental Environmental Project (SEP) in settlement of an enforcement action brought by the Michigan Department of Environmental Quality.

The program calls for replacement of mercury sphygmomanometers with aneroid gauges, including in newly acquired physicians' practices and offsite clinics. The same holds true for mercury thermometers, which are being replaced by their digital counterparts in all areas. An informal policy currently exists in the

Laboratories within the University of Michigan Health System are also looking into substituting mercury-containing compounds and procedures with mercury-free alternatives.

institution allowing only mercury-free items to be purchased. This covers items such as blood pressure devices, thermometers and batteries. The pharmacy has also been successful at eliminating mercury from the items they dispense.

In addition, laboratories within the U of M Health System are investigating whether or not laboratory procedures that contain mercury can be substituted with those that are mercury-free. However, some professionals believe that the best results are often obtained using mercury-containing stains, and some laboratories are hesitant to switch to procedures where the same effectiveness is not guaranteed. Currently, these laboratories treat mercury waste as hazardous material, as do dental facilities still using amalgam.

U of M Health System has also implemented a fluorescent light tube recycling project, which reduces the likelihood that mercury-containing calcium phosphate powder will enter the environment. It is estimated that 40,000 fluorescent light tubes will be recycled annually.

As part of an educational focus, the Terrene Institute publication, *THE CASE AGAINST MERCURY: RX FOR POLLUTION PREVENTION*, was distributed to individuals within the U of M Health System responsible for disposing of and dispensing mercury-containing items. In addition, U of M offers training on spill prevention and management to its employees.

Cooperative ventures have also been undertaken by hospitals and other organizations interested in mercury pollution prevention. The following is an account of work being done in Canada by the environmental organization Pollution Probe and area hospitals.

Environmental advocacy organizations like Pollution Probe can play an important role in helping hospitals institute mercury pollution prevention plans.

Ontario Mercury Health Care Steering Committee

Over the past two years, Pollution Probe, a Canadian environmental advocacy organization, has focused its research on the Mercury Elimination and Reduction Challenge (MERC) project. Their report, *MERCURY IN ONTARIO: AN INVENTORY OF SOURCES, USES, AND RELEASES* (See Resource List), and other studies have identified hospitals, dental clinics and the pharmaceutical industry as sources of mercury to the environment. As part of the MERC project, a pollution prevention Memorandum of Understanding (MOU) to voluntarily reduce and eliminate the use of mercury in hospitals was signed in April 1996 by three major hospitals in Toronto (Centenary Health Centre, Hospital for Sick Children, and The Toronto Hospital), Environment Canada, the Ontario Ministry of Environment and Energy, the Health Care Environment Network and Pollution Probe.

Pollution Probe has published a report identifying mercury-free products and their cost saving potential (See Resource List).

These signatories formed the Ontario Mercury Health Care Steering Committee to encourage information sharing and to promote the elimination and reduction of mercury-containing products in the healthcare sector. The Steering Committee and project continue to expand as hospitals from across Ontario and in other provinces become involved. Pollution Probe has also prepared *MERCURY IN THE HEALTH CARE SECTOR: THE COST OF ALTERNATIVE PRODUCTS* (See Resource List) to assist hospitals in the process of reducing mercury use and to provide them with some cost information. The report demonstrates that replacing mercury-containing products in hospitals can actually save these facilities money.

Recommendations

Pollution prevention is a practical and cost effective means for achieving mercury reduction.

Pollution prevention is an important issue that warrants serious consideration by hospitals and other healthcare facilities that contribute mercury to the environment. There are many ethical, scientific and economic reasons for converting to a mercury-free operation, and several hospitals have demonstrated this to be achievable and cost-effective.

Individuals interested in instituting mercury pollution prevention measures at their hospitals can ensure success by focusing on some basic yet important steps. The following steps are common to most successful mercury reduction and elimination plans:

Some common steps taken by hospitals that have instituted successful mercury pollution prevention plans have been identified.

- ✔spelling out the importance of mercury pollution prevention and highlighting the various cost and safety benefits associated with its implementation;
- ✔making an institutional commitment and extending it to all administrators and staff, especially key decision-makers within the facility;
- ✔keeping in mind the importance of planning, including the development of short- and long-term goals;
- ✔ensuring that staff in *all* departments are aware of the program, its goals and their responsibilities;
- ✔taking advantage of information that already exists and calling on local, state and federal regulators for materials and information assistance;
- ✔making manufacturers and vendors of healthcare products aware of their role in providing mercury-free products;
- ✔designing plans with evaluation and measurement of results in mind, including tracking and communication strategies to ensure acknowledgment of successes; and,
- ✔being patient and aware that a successful mercury pollution prevention program is a long-term undertaking.

Hospitals display a strong concern for people's health and the environment through their mercury pollution prevention efforts.

By approaching mercury pollution prevention with these steps in mind, all parties involved can rest assured that they are playing an important role in protecting the health of local residents, the community and the environment.

Resource List

The following is a list of contacts and materials that can serve as resources for those interested in reducing or eliminating mercury at their facilities:

HOSPITALS AND AGENCIES

Spectrum Health
Dan Stickles, Director
Environmental Services Dept.
100 Michigan Street, NE
Grand Rapids, MI 49503
(616) 391-1732
dstickles@bw.brhn.org

Genesys Health System (Flint)
Scott Cruzen, Exec. Director
3021 South Dort Highway
Suite C
Flint, MI 48507
(810) 742-7700

Henry Ford Hospital
Mark Dittman, Environmental
Safety Officer
Office of Safety
2799 West Grand Blvd.
Detroit, MI 48202
(313) 876-7042

Holy Cross Hospital
Scott Berkseth
Safety Officer
4777 East Outer Dr.
Detroit, MI 48234-3281
(313) 369-5812

Medical Academic & Scientific
Community Organization
(MASCO)
David Eppstein, Director of Policy
and Special Projects
375 Longwood Ave.
Boston, MA 02215-5328
(617) 632-2860
david@MASCO2.harvard.edu

Michigan Department of
Environmental Quality
Steve Kratzer
Environmental Assistance Division
P.O. Box 30457
Lansing, MI 48909
(517) 373-0939
kratzers@deq.state.mi.us

Michigan Department of
Environmental Quality
Joy Taylor
Air Quality Division/Toxics Unit
530 W. Allegan St.
Lansing, MI 48933
(517) 335-6974
taylorj1@deq.state.mi.us

Pollution Probe
Bruce Lourie
12 Madison Ave.
Toronto, ONT
M5R 2S1
CANADA
(416) 922-9038

Quest Diagnostics, Inc.
Neil Findley
2740 28th St., SW
Grand Rapids, MI 40509
(616) 249-1161

St. Joseph Mercy Health Care
System
Pierre Gonyon
Safety Department
5301 E. Huron River Dr.
P.O. Box 995
Ann Arbor, MI 48106
Phone: (734) 712-3315
Fax: (734) 712-1284
plgonyon@mercyhealth.com

University of Michigan Health
System
Trixie Dietrich, Manager
Department of Facilities
MPB D4101/0718
Ann Arbor, MI 48109-0718
(734) 764-4427
trixied@umich.edu

Western Lake Superior Sanitary
District
Jamie Harvie
2626 Courtland St.
Duluth, MN 55860-1894
(218)722-3336

MATERIALS AND PUBLICATIONS

BLUEPRINT FOR MERCURY ELIMINATION: MERCURY REDUCTION PROJECT GUIDANCE FOR WASTEWATER TREATMENT PLANTS
Western Lake Superior Sanitary District
2626 Courtland St.
Duluth, Minnesota 55806-1894
Phone: (218)722-3336
Fax: (218)727-7471

*THE CASE AGAINST MERCURY: RX FOR POLLUTION PREVENTION**
Terrene Institute
4 Herbert Street
Alexandria, VA 22305
(703) 548-5473

FIRST, DO NO HARM: REDUCING THE MEDICAL WASTE THREAT TO PUBLIC HEALTH AND THE ENVIRONMENT
Environmental Working Group
Health Care Without Harm
c/o CCHW
P.O. Box 6806
Falls Church, VA 22040
(703) 237-2249
noharm@iatp.org

*MERCURY IN ONTARIO: AN INVENTORY OF SOURCES, USES AND RELEASES**
Pollution Probe
12 Madison Ave.
Toronto, ONT
M5R 2S1
CANADA
Phone: (416) 926-1907
Fax: (416) 926-1601

*MERCURY IN THE HEALTH CARE SECTOR: THE COST OF ALTERNATIVE PRODUCTS**
Pollution Probe
12 Madison Ave.
Toronto, ONT
M5R 2S1
CANADA
Phone: (416) 926-1907
Fax: (416) 926-1601

*MERCURY POLLUTION PREVENTION IN MICHIGAN: SUMMARY OF CURRENT EFFORTS AND RECOMMENDATIONS FOR FUTURE ACTIVITIES**
A Report by the Michigan Mercury Pollution Prevention Task Force
Joy Taylor
Michigan Department of Environmental Quality
Air Quality Division/Toxics Unit
530 W. Allegan St.
Lansing, MI 48933
(517) 335-6974

*MERCURY POLLUTION PREVENTION IN MEDICAL FACILITIES***
Karen Reshkin
77 West Jackson Blvd. P-19J
Chicago, IL 60604-3590
reshkin.karen@epamail.epa.gov

REDUCING MERCURY USE IN HEALTH CARE, PROMOTING A HEALTHIER ENVIRONMENT, A HOW-TO MANUAL
Monroe County, New York
Department of Health
(716) 292-3935

REDUCING MERCURY USE IN HEALTH CARE: PROMOTING A HEALTHIER ENVIRONMENT
U.S. EPA Binational Toxics Strategy Workgroup
www.epa.gov/glnpo/bns/merchealth

POLLUTION PREVENTION FOR HOSPITALS AND MEDICAL FACILITIES AND BEST MANAGEMENT PRACTICES FOR HOSPITALS AND MEDICAL FACILITIES
City of Palo Alto Regional Water Quality Control Plant
2501 Embarcadero Way
Palo Alto, CA 94303
(415) 329-2598

MERCURY AND THE HEALTHCARE PROFESSIONAL
(17 minute video)
Minnesota Office of Environmental Assistance and the US EPA, Region5
Emily Moore
Minnesota Office of Environmental Assistance
520 Lafayette Road N., 2nd Floor
St. Paul, MN 55155-4100
(612) 215-0201

*These materials contain detailed information on products containing mercury and their alternatives.
** This material is downloadable from http://www.epa.gov/seahome/mercury.html

Appendix A

Highlights from the October 4, 1996 Conference, *MERCURY POLLUTION PREVENTION: HEALTHCARE PROVIDERS PROTECTING PEOPLE AND THE GREAT LAKES.*

INTRODUCTORY REMARKS

Tim Eder- ***Great Lakes Natural Resource Center, National Wildlife Federation***

For the past 15 years the National Wildlife Federation has operated a field office in Ann Arbor, Michigan, which has directed its attention and efforts at the Great Lakes. The Great Lakes Natural Resource Center has focused on many aspects of Great Lakes protection, particularly pollution of the lakes from toxic chemicals. Of highest priority is contamination by bioaccumulative chemicals of concern (BCCs), like mercury, PCBs, dioxin and DDT. These toxins do not readily break down. They persist in the environment and build up in the tissue of fish and wildlife and, especially, people.

The Great Lakes are the greatest bodies of freshwater on the planet, comprising about 20% of all surface freshwater. They supply the 36 million people who live in the region, both within the US and Canada, not only with drinking water, but also provide a source of recreation, transportation, hydroelectric power and a high quality of life. Despite these contributions and their prominence as a world resource, these natural treasures have not always been cared for properly.

Some progress has been made in protecting and cleaning up the lakes. An international treaty between the US and Canada has been established, which sets out a policy goal of zero discharge for the most persistent and deadly bioaccumulative toxins. In addition, laws and rules like the Clean Water Act and the Great Lakes Water Quality Initiative, and the spending of literally billions of dollars, primarily directed at industries and the waste that comes from their discharge pipes, have all led to considerable improvements in water quality. The result is that the Great Lakes are cleaner than in the seventies, but they are far from being clean enough.

Fish advisories exist for various species within each of the Great Lakes. In Michigan, every inland lake still has an advisory because of mercury contamination, with similar situations in the surrounding areas of Wisconsin, Minnesota and the Province of Ontario. On Lake Huron, the evidence suggests that dioxin levels may be increasing. The number of advisories about the safety of eating fish is certainly on the rise. There is also evidence that wildlife is being affected. Just a couple of years ago, bald eagles were born on the shores of Lake Erie with twisted beaks and other deformities associated with PCBs and other toxic chemicals in their food supply. Evidence also exists, and will be presented further into the program, that the human population is seriously affected by these toxins.

Environmental protection has entered a new era. This is why the National Wildlife Federation has chosen to participate in this project. In the past, the focus was on point source discharges like industry and city pipes. But taking another step is now crucial. This conference incorporates three important aspects of the new era. First is the idea that all pathways must be considered when looking at pollution sources, not just the discharge pipe. Those in the environmental protection business, particularly those within the Great Lakes region, have come to realize that the primary source of pollution is often the atmosphere. The Great Lakes are especially susceptible to atmospheric pollution because they have a huge surface area that acts as a receptacle receiving atmospheric fallout.

The healthcare industry is a large source of many pollutants. For example, the Michigan Mercury Pollution Task Force found that in Michigan about 10% of the mercury being released into the atmosphere comes from hospitals and medical waste incinerators. U.S. Environmental Protection Agency information suggests that mercury releases from medical waste incinerators approximate 30% of all national combustion sources. Some studies have also suggested that hospitals and the healthcare industry are possibly the largest single source of dioxin.

The Clean Air Act and its regulations will control and reduce many chemicals currently being emitted from these sources. Many of them are even installing new control technologies or closing down. This leads to the second point, which is that

prevention, or not using the hazardous materials in the first place, is obviously the best solution. Prevention through source reduction rather than control technologies is the best method of reducing and ultimately eliminating hazardous wastes. The US federal policy contained in the National Pollution Prevention Act defines pollution prevention as the reduction or prevention of pollution at the source from any hazardous substance or pollutant entering the waste stream before recycling, treatment or disposal. Recycling is essential, but an even better solution is not to use the hazardous material in the first place.

Finally, this conference highlights a third point that has become considerably more important in dealing with the challenges faced today in protecting the environment. At the National Wildlife Federation, it has become apparent that working cooperatively and collaboratively with other groups, like the Michigan Health and Hospital Association, hospitals and others in the healthcare industry, is an essential part of the pollution prevention strategy. It is in the actual hospitals and within the healthcare industry that the hands-on trench work to find ways to prevent pollution from mercury occurs. It is this kind of commitment to the Great Lakes, the region and the environment that makes pollution prevention feasible.

Christine Urban- ***Environmental Engineer, U.S. Environmental Protection Agency***

Mercury pollution prevention is a big priority for Region Five and includes working with industry to assist them in achieving compliance with pollution prevention measures. Efforts have been aimed at getting people into the habit of focusing on pollution prevention before the proposed rule on medical waste incinerators takes effect. The successes in this area are proof that those individuals and groups working on pollution prevention in the healthcare industry are ready for the challenge.

If pollution prevention in hospitals and other healthcare facilities is to succeed, some concerns must be addressed. First, all the good work being done in hospitals and other healthcare facilities must be tracked and communicated to other hospitals interested in doing pollution prevention. During a hospital assessment with the Wisconsin Extension Service, recently, it was wonderful to see all the great work being done. The staff was up to date, knew what was going on with pollution prevention, and everyone was doing their part. Even in the printing room they had put together notepads from recycled paper. They were confronting many of the challenges posed by mercury pollution prevention, such as working with supplier companies to make alternatives to mercury work.

Tracking and communicating all these great challenges, efforts and successes is something that the EPA has been working on with area hospitals. For example, a computer software program is currently being developed, which has information on pollution prevention in hospitals. It will include a virtual hospital with examples of areas within facilities that can be targeted for mercury prevention. This is only one example of how the EPA is helping hospitals in tracking and reaching their pollution prevention goals.

The EPA is also helping hospitals and those within the healthcare industry to communicate their ideas about mercury and its alternatives, the savings garnered from preventing pollution as opposed to waste disposal and other aspects of pollution prevention. The challenge is to keep an exchange of ideas flowing between people and between hospitals. The agency has been willing to organize conference calls, provide facilities for meetings, send out materials to help hospitals comply with regulations, and sponsor meetings like this one to bring people from different hospitals and other organizations together to work on mercury pollution prevention.

Finally, all the work being done by hospitals and the EPA to reduce and eliminate the use of mercury within the healthcare industry serves as a positive example of the kind of efforts needed to solve other problems that hospitals face. Here, part of the challenge lies in expanding current efforts to meet these other needs. It is the EPA's belief that with a measurable index of challenges, efforts and successes and with an open exchange of ideas all readily available there is tremendous potential for hospitals and the agency to work together to tackle many other concerns that the healthcare industry faces. It is up to all these organizations to work together to meet these challenges.

Don Pietruck- ***Director of Regulatory Affairs and Advocacy Division, Michigan Health and Hospital Association***

When the word health was added to the Michigan Health and Hospital Association (MHA)and many new members were added that were not hospitals, like HMO's, nursing homes and individual physicians, many became concerned that all these events would result in a lack of focus on hospitals. A new challenge was created to show that the word health does have meaning and that it can serve as a focus for all members of the organization, including hospitals.

When the National Wildlife Federation (NWF) approached a consulting policy group that both NWF and the MHA utilized and requested a meeting between the two organizations, there was much uncertainty on the part of the MHA. It was unclear what these two groups could possibly gain from such a meeting. As it turned out, not only was it a very positive interaction, but it resulted in an ongoing dialogue between both organizations. Projects, such as this conference and another project involving surveying Medical Waste Incinerators and determining how much they are actually being utilized and their contribution to pollution, arose out of these collaborations. It became clear that rather than going at each other in a regulatory realm both organizations could work together to solve the problems of pollution to which medical facilities contribute.

Out of these interactions with NWF, the USEPA and others involved in protecting the environment came the answer to the question of how the word health fits into the mission of the MHA. Health encompasses a much broader array of concern than the traditional definition. It includes the environment, individual lifestyle concerns, prevention, immunization of children and a host of other considerations that must be tackled by those in the healthcare industry. Among these concerns are mercury and other pollutants entering the environment and endangering the health of people and wildlife. It is up to hospitals and others involved in healthcare to help find solutions to these problems, and many have already begun to make a serious commitment to their communities and to the environment by working on reducing mercury in their facilities.

The MHA would like to see the positive message that these hospitals are sending out fostered in a more public environment. This conference is a step in that direction, giving those in healthcare a chance to learn how to actually do mercury pollution prevention and how to facilitate programs in their buildings that work. The MHA is here to encourage hospitals to continue down this road. It will also continue to work with NWF on problems that together they can help solve.

HUMAN HEALTH PERSPECTIVE

Bev-Nii Anderson- ***Organizer, Indigenous Environmental Network***

The Indigenous Environmental Network (IEN) was established in 1990 to address environmental issues that affect indigenous populations. It now reaches across the country and includes chapters in South America and sponsors an annual meeting called "Protect the Earth." Mercury pollution is a major concern for the organization because many indigenous cultures include fish as a major food source in their diets. Mercury pollution prevention is a very big job, and there is a need for more publicity regarding mercury exposure through eating contaminated fish. Currently, IEN is compiling data on fish consumption advisories and other state and federal data in order to create advisories for reservations. The proposed title of the report is *A NATIVE AMERICAN GUIDE FOR EATING CONTAMINATED FISH.*

Thomas Moore's new book, *CARE OF THE SOUL*, has some interesting things to say about incorporating the world – the earth, the animals and the water– into the care of ourselves and our bodies. This is a pertinent lesson for hospitals and others in the healthcare industry who are partly responsible for mercury entering the atmosphere and the water.

Ross Hume Hall- ***Prof. Emeritus of Biochemistry, McMaster University***

The Japanese experience in Minamata Bay was 50 years ago, yet the damage claims have just recently been settled. Two chemical plants used mercury in their processes, and it was thought to settle to the bottom of the bay harmlessly. It is now known that microorganisms convert metallic mercury to methyl mercury, which is ingested by shell fish and, in turn, eaten by local people and animals. Its tendency to bioaccumulate in the food chain makes mercury especially deadly to those at the top. The sickness and death that resulted in Minamata Bay was one of the first major tragedies to call attention to mercury poisoning.

Mercury is mobile in the body. In pregnant women, for example, both mercury and methyl mercury move freely across the placenta, contaminating both the mother and fetus. Once mercury is in the body, it moves into all tissues, concentrating in the brain, liver and kidneys. Due to its bioaccumulative tendencies, concentrations within these organs can easily reach dangerous levels. For example, mercury is concentrated at a 3 to 10 million fold increase in fish compared with their surrounding water. This is especially troubling considering that the major source of exposure for humans is through eating contaminated fish.

More recent studies have also concluded that mercury is a global problem. A research study of women's breast milk discovered that women from the arctic regions had mercury levels in their breast milk that were ten times the level of women in Quebec City. There are two primary reasons for this. The first is that metallic mercury is volatile and easily dispersed over long distances. Secondly, the conversion of mercury to methyl mercury allows it to be transported by living organisms, making it biologically mobile.

The acute toxic effects of mercury are tremors, irritability, decreased motor function and renal collapse. These symptoms are the same for both people and animals. The real problem with mercury contamination, though, lies in its long term or lifetime exposure effects.

When animals are exposed to mercury from the moment of conception right through their entire lives there are subtle changes that occur, which can only be seen through close inspection. In a fish population, for example, each fish has an individual genetic makeup. When exposed to mercury on a long term basis, there is a shift in the genetic makeup of the species. In some cases, the sex ratio of the species is affected. In mosquito fish, for example, the normal ratio is one to one, males to females. In populations exposed to mercury, the ratio shifts to three to one, females to males. The individuals may be healthy, but the long range effects of such changes are unknown.

In humans, exposure to mercury and other bioaccumulative chemicals that persist in the environment can have detrimental and lasting effects. Persistent toxic chemicals such as PCBs, dioxin, DDT and a variety of other substances have very long resident times in the environment of decades, centuries and longer and toxic profiles that, in many cases, are very similar to mercury. For example, research has found that mercury and PCBs are the two largest contaminants of Inuit women. Most of these toxic chemicals, including mercury and methyl mercury, are endocrine disrupters that have the capacity to upset the normal balance of sex hormones. This is particularly critical in the early stages of life when the development of the individual is controlled by these hormones.

The Jacobsens at Wayne State University have been studying a cohort of children born in 1980. Those children who were born to mothers eating a high level of fish suffer a diminishment of intellectual capacity, lower IQ, shortened attention spans and short term memory losses. These children are not reaching their genetic potential. Other human studies and animal data support the findings of the Jacobsens that the capacity to endure mental stress is quite diminished in children exposed to mercury during fetal development.

In the case of mercury and other persistent and bioaccumulative toxins, the entire population is affected. In the real world of multi-pollutants, it is like the Aesop fable about the straw that broke the camel's back. Which straw was it? The question, of course, is ridiculous. By the same token, it is ridiculous to ask which pollutant causes a particular health problem; each contributes. Our concern here is the mercury contribution. The only answer for dealing with mercury is to eliminate it at the source. The only thing that can be done is to stop using mercury.

Dan Stickles- ***Director of Environmental Services, Spectrum Health***

As an industry, healthcare facilities have always done a good job of managing their waste streams, yet there is room for improvement. Federal regulations have prompted facilities to take a closer look at their practices, and it has become obvious that there are plenty of opportunities for waste reduction. Developing recycling and waste minimization programs have prepared many healthcare facilities for the mercury issue.

Prior to any formal procedures on mercury, there were some incidents involving mercury spills at Spectrum Health. In one case, there was a broken blood pressure monitor in a carpeted room that had to be handled by an environmental spill firm chosen from the phone book. This incident cost the hospital $2,000 for a cleanup. In another case, there was a spill in a

carpeted room and the staff used a commercial vacuum cleaner on the area. It was becoming quite clear that Butterworth would have to initiate some procedures that would provide the opportunity to save on the expenses associated with mercury spills and other waste issues.

Taking a 500-bed hospital as a benchmark, there is no reason that eight to nine tons of office paper, five to six tons of cardboard, or two to three tons of glass, metals and plastics couldn't be recycled per month, and two to three tons of batteries removed from the waste stream annually. In addition, about 200 pounds of mercury could be harvested with a mercury elimination project.

Spectrum Health has been a leader in this area and encourages other hospitals to do the same in their communities. Goals should be set. Smaller hospitals may question their immediate ability to go mercury-free, but they should at the very least make a commitment to the long term. Meanwhile, a commitment should be made to have safe and prudent handling practices for any mercury devices that do exist. There are different levels of commitment that can be made over a one, two or three-year period. The key is to take advantage of the experts and organizations like the National Wildlife Federation and the US EPA who are eager and willing to help hospitals go mercury-free.

Bruce Lourie- ***Pollution Probe's Update on the Canadian Mercury Elimination and Reduction Challenge Project***

This past spring Pollution Probe hosted an event in Toronto, which provided hospitals in Ontario with information on mercury pollution prevention. At the event, a Memorandum of Understanding was signed by three of the largest hospitals in Ontario, the federal and provincial governments and Pollution Probe to reduce mercury in their facilities. Since this time, that number has grown to include twelve hospitals. In addition, Pollution Probe has also completed an inventory report on sources and releases of mercury, which includes a comprehensive summary of how mercury is entering the environment.

A study on the cost effectiveness of alternatives to mercury in the hospital sector has also been prepared by Pollution Probe. Often, there is a high level of genuine concern by hospital staff over mercury pollution, but the administration must still be sold on the value of this work. This is where costs come into play and often make or break projects.

A large spring event that will focus on mercury is also being planned for the spring of 1997. It is crucial for those working on mercury pollution prevention that the dangers posed by mercury and alternatives to its use become high profile issues both within healthcare and outside in the communities.

REGULATORY PERSPECTIVE

Joy Taylor- ***Environmental Quality Specialist, Michigan Department of Environmental Quality***

Michigan has had statewide fish consumption advisories since 1988. In 1989, an assessment of possible pathways of mercury exposure showed potentially high levels of mercury deposited in local lakes. This has the potential to cause a problem for both people and wildlife who rely on fish from these lakes for part or most of their diets. Mercury has adverse effects on wildlife at levels that are measured in parts per million (ppm). For example, mammals are affected at $\geq$ 1 ppm, and birds are affected at $\geq$0.5 ppm. Effects of mercury exposure include reduced reproduction, weight loss, nervous system damage and behavioral changes in offspring.

In response to the high levels of mercury found in Michigan waters, Governor Engler formed a group in 1991 to develop a statewide mercury reduction strategy. A series of reports was issued by the initial group and, subsequently, by the Michigan Environmental Science Board (MESB). Michigan's Mercury Action Plan, endorsed by the Department of Natural Resources, the Public Health Department and the Public Service Commission, included a recommendation for establishing a special task force to address opportunities for mercury pollution prevention. This group, the Mercury Pollution Task Force, was established in 1994, and its final report and recommendations were released in April 1996.

The Michigan Mercury Task Force has been involved in several efforts to encourage widespread adoption of pollution prevention activities. Some of these efforts include the following: producing a mercury concern brochure; holding and

promoting pollution prevention at workshops; and developing information for the healthcare industry on typical sources of mercury and alternatives for those applications.

The State estimates that of all mercury emissions, 50% to 75% are from human sources. Of those releases, approximately 10,415 pounds are emitted into the air, 1,800 pounds are discharged into municipal wastewater treatment plants or directly into state waters, and 3,800 pounds are released as solid waste. The healthcare industry is a significant contributor to all three categories.

Recommendations for the healthcare industry from the Mercury Pollution Prevention Task Force include:

- ✔the phasing out of mercury containing products or devices;
- ✔ongoing education efforts by state agencies such as the Department of Environmental Quality and the Michigan Hospital Association;
- ✔the halting of traditional activities such as sending home mercury thermometers with newborn babies; and,
- ✔encouraging mercury pollution prevention efforts at veterinary clinics.

For more information on the Task Force, its report and related issues, please refer to the following addresses and numbers:

- ✔Homepage- http://www.deq.state.mi.us/aqd
- ✔Fish Consumption Advice- 1-800-MI-TOXIC (1-800-648-6942)
- ✔Pollution Prevention Information- 1-800-NO-2-WAST (1-800-662-9278)

Jamie Harvie- ***Program Coordinator for the Mercury Zero-Discharge Project, Western Lake Superior Sanitary District***

The Mercury Zero-Discharge Project is a grant funded pilot to identify sources of mercury and implement pollution prevention practices with local partners. Part of the impetus for this program has been the changes in regulatory requirements that have reduced the amount of mercury that the WLSSD can now release into local waters. In response to these events, the agency has looked to pollution prevention as a solution. Removal technologies only relocate pollution, are costly and will never get industry to zero-discharge. Pollution prevention offers the best means for achieving these more stringent guidelines but will require changes in behavior and standard practices.

WLSSD is working with three major hospitals and three small clinics in the Duluth, MN area to help implement strategies to reduce mercury and its associated risks within their facilities. Efforts have been concentrated in the labs and maintenance departments where high concentrations of mercury have been found and in the purchasing department where decisions on what products to buy are made. The work is comprised of a few stages, which includes meeting with hospital staff, taking water discharge samples, educating staff regarding pollution prevention strategies and targeting discharges of high concentrations, such as those from laboratories and laundries. High concentrations of mercury were found at the first two hospitals, which yielded measurements as high as 1.8 ppm compared with an allowable limit of 0.3 ppm. Although such readings were not the norm, readings well above the limit were common, demonstrating the need for a mercury pollution strategy.

Dioxin is another persistent pollutant of concern to which hospitals contribute. Dioxin is a common name for a class of chemicals with similar characteristics. These pollutants are carcinogenic and affect reproduction and immune systems. They are formed as a by-product during manufacture and incineration of most chlorinated products, such as PVC and many of the other plastics used in hospitals. Some products made with PVC and widely used in hospitals include blood bags, IV bags and tubing, PVC packaging or #3 plastic, vinyl surgical gloves, and enema bags. Incineration of these products by medical waste incinerators alone contributes an estimated 48% of the dioxin deposited in the Great Lakes.

Strategies for eliminating dioxin release include ending medical waste incineration and using a three-step process of autoclaving, shredding and land filling, and substituting chlorinated products with their alternatives. Alternative products are readily available for IV bags, PVC containers, vinyl shower curtains, chlorine bleach, cleaning products and chlorine bleached paper products.

Pollution prevention is effective at reducing and eliminating toxic chemicals of concern, like mercury and dioxins, because it eliminates these substances at the source and makes people responsible for their own waste. Reduction of persistent pollutants is a community-wide concern, and education is important to help people know why, where and how to make a change. That is why programs like the Mercury Zero-Discharge Project and conferences like this one are so important for hospitals, the medical industry and their surrounding communities.

Laura Rauwerda- ***Environmental Quality Analyst for the Industrial Pretreatment Program, Michigan Department of Environmental Quality, Surface Water Quality Division***

Pretreatment standards were established in the Clean Water Act of 1972 and were revised to include control of toxic substances in 1976. The National Pollution Discharge Elimination System (NPDES) is a permit program, which was created as a means for regulating discharges from point sources, such as publicly owned treatment works (POTWs), industries, landfills and large agricultural feed lots.

In order to meet limits imposed by these permits, POTWs require industries, such as hospitals, that utilize their facilities to pretreat their wastes. The typical industrial pretreatment program includes four components: permitting, monitoring, inspection and enforcement. It regulates pollutants of concern that may pass through the POTW's treatment system, causing an NPDES permit violation, interfere with the POTW's treatment works, or contaminate the POTW's sludge. Prohibited discharges include pollutants that may cause: fire or explosion, corrosion, blocked flow, toxic gases, jeopardy to worker safety and health, or heat. Pollutants of concern in the hospital environment include silver, radioactive materials, chemotherapy and antineoplastic drugs, and mercury.

In order to maintain compliance with permit requirements, hospitals should:

- ✔work with POTW's to assist them in monitoring their facilities' discharges;
- ✔seek and purchase alternative products when possible; and,
- ✔install, clean and maintain drain line traps.

Steve Brachman- ***Waste Reduction Management Specialist, University of Wisconsin Hazardous Waste Extension***

Thirteen hospitals across the State of Wisconsin were assessed for mercury and other hazardous and solid wastes. The hospitals were rated low, medium, or high as to the effectiveness of their mercury management or reduction efforts. Each hospital was rated in three areas, which were spill prevention, commitment and education. The results were as follows:

	Spill Prevention	Commitment	Education
Hospitals Rated High	6	4	7
Hospitals Rated Medium	3	8	2
Hospitals Rated Low	4	1	4

Of the various mercury containing products typically found in hospitals, thermostats and thermometers were found in more hospitals than others. Viable alternatives exist for each of the following products:

- ✔batteries
- ✔electrical equipment
- ✔esophageal devices
- ✔Cantor and Miller Abbot tubes

✔lamps
✔sphygmomanometers
✔thermometers
✔chemicals (mercury (II) chloride, staining solutions, mercury (II) sulfate, mercury nitrate, etc.)

Some of the remaining challenges to widespread utilization of alternative products include the following:

✔resistance to change among practitioners;
✔cost of equipment conversion;
✔lack of suppliers for alternative products;
✔the need for ongoing staff training; and,
✔practical limits.

David S. Eppstein- ***Director of Policy and Special Projects, Academic & Scientific Community Organization (MASCO), (Boston, MA)***

The Massachusetts Water Resources Authority (MWRA) has established a discharge limit of 1.0 parts per billion of mercury for regulated industries, including hospitals. The Mercury Products Work Group was formed by MWRA to develop strategies for reducing the amount of mercury being discharged from industries. MASCO, a not-for-profit provider of services and technical assistance, coordinated the participation of 28 hospitals.

MWRA drafted a Memorandum-of-Understanding (MOU) with participating hospitals. It stated, in part, that hospitals who were active participants in Work Group activities would not be subjected to escalated enforcement, which could result in additional fines. One benefit of this cooperative work was that the hospitals focused on bringing their collective resources to the table. The pooling of knowledge and staff helped to produce results more quickly and thoroughly than would otherwise have been possible. This effort also allowed a savings of over $1 million in eliminated compliance efforts that would have been redundant.

The Hospital Mercury Work Group approached the problem from three directions:

✔identifying sources of mercury contamination and developing recommendations for their control;
✔developing guidelines for the removal of residual mercury from hospital wastewater systems; and,
✔identifying and evaluating potential mercury pretreatment systems.

The products of the Work Group include the following:

✔an Infrastructure Maintenance Guidebook, which contains "hands-on" information on removal and cleaning of hospital wastewater systems;
✔a database of more than 5,500 products used in clinical and research laboratories with semiannual updates available; and,
✔an outline for hospitals and others to use when educating employees on proven methods of mercury source reduction.

Phase two of the project will involve continued work on a detailed cost-benefit analysis of end-of-pipe treatment methods. Also, a *BEST MANAGEMENT PRACTICES* manual will be produced based on the data gathered during the project. All of these materials are available via the Internet on the MASCO homepage (http://www.masco.org).

Neil Findley- ***Director of Operations, Quest Diagnostics, Incorporated, (Grand Rapids, MI)***

In October 1994, MetPath of Michigan, now known as Quest Diagnostics, Incorporated, announced a mercury elimination and control strategy. MetPath-Grand Rapids had been cited by the local POTW for release of mercury. This prompted MetPath to perform a thorough analysis of their Wyoming, Michigan facility and operations.

The major elements of this strategy are summarized below:

- ✔Laboratory test waste known to contain mercury will be prevented from entering the Wyoming wastewater discharge system through segregating and disposing in accordance with USEPA and Michigan Department of Environmental Quality regulations. Waste with mercury content of less than 0.2 ppm is classified as medical waste and is handled by a licensed medical waste hauler.
- ✔All drain traps that are directly exposed to laboratory test waste will be sampled periodically for mercury. These tests will be unannounced and no less frequent than once per year. If any traps are measured at higher than 0.4 ppm, they will be replaced and also resampled approximately 30 days later. Any traps found to be recontaminated will prompt investigation as to the source of mercury. All corrective actions will be documented and included in the MetPath semiannual report.
- ✔Quest Diagnostics will seek alternatives to methodologies in which mercury is a component of test protocols. Successful alternatives and their implementation will be documented.
- ✔All other procedures not covered above will be evaluated for their potential for mercury contamination. This will be an ongoing process.

The entire process and all progress are reported in the semiannual reports. The goal of this plan was to allow the Corning Laboratory facility to meet its permitted limit of 0.5 ppb of mercury. The goal has been accomplished.

Jennifer T. Carver- ***Certified Industrial Hygienist, University of Michigan Health System***

The University of Michigan Health System has over 860 beds, on and off site clinics, 8,000 employees and is continually increasing. Efforts to address mercury use within its facilities date back to 1992 and have continued to the present. In 1995 some of these efforts became part of a Supplemental Environmental Project (SEP) that resulted from an enforcement action by the Michigan Department of Environmental Quality (MDEQ). The goals of this project and other mercury reduction policies include the following:

- ✔the identification of mercury-containing products and their replacements;
- ✔the collection and recycling of mercury used in all facilities; and,
- ✔staff education through written correspondence, the *SPEAKING OF SAFETY NEWSLETTER*, and training at offsite clinics.

The University has accomplished much toward these goals, including:

- ✔the replacement of 660 mercury sphygmomanometers with aneroid units;
- ✔the elimination of mercury thermometers from Material Services inventory;
- ✔the use of only thimerosal free products and mercury free batteries; and,
- ✔the recycling of about 440 lbs of mercury.

Sampling of selected sink traps, testing of incinerator ash and waste disposal monitoring are just a few measures that have also been instituted to ensure compliance with mercury reduction policies.

Mercury reduction efforts do not end here as mercury-free alternatives are continually sought, mercury collection efforts extend to new facilities, and additional mercury sampling is instituted.

Appendix B

Sample Vendor Affidavit

Hospitals may want to present vendors with an affidavit to sign, which ensures that products being purchased are mercury-free. The following is an example of the kind of language that can be used to express a hospital's desire to keep mercury and other hazardous materials out of their facility and the environment:

> Upon acceptance of this purchase order, it is mutually agreed that the vendor will not knowingly sell a product containing material hazardous to the environment (ie. mercury, etc.) and that the purchaser will consider the contract void if hazards to the environment are discovered after acceptance of the purchase order.

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