

Module 4



Mercury Use in Healthcare Settings and Dentistry





UNEP promotes environmentally sound practices globally and its own activities. This magazine is printed on 100% recycled paper, using vegetable-based inks and other eco-friendly practices. Our distribution policy aims to reduce UNEP's carbon footprint.

Module 4

Mercury Use in Healthcare Settings and Dentistry

Mercury Use in Healthcare Settings and Dentistry

K E Y M E S S A G E S

- Mercury is used in a variety of ways specific to the healthcare sector:
 - Mercury is contained in many common measuring devices, such as sphygmomanometers (which measure blood pressure), laboratory and patient-care thermometers and gastro-intestinal devices.
 - Mercury is found in some types of traditional medicines.
 - Mercury continues to be used for dental amalgams worldwide.
 - Mercury compounds are found in certain preservatives, fixatives and reagents used in hospital laboratories and as preservatives in multi-dose vaccines in which bacterial growth needs to be suppressed.
- There are safe and cost-effective non-mercury alternatives for all uses of mercury in health care.



W H Y I S T H I S I M P O R T A N T T O Y O U ?

Mercury spills associated with uses in health care contribute to the risk of human exposure in healthcare facilities.

Improper disposal of mercury contaminates the environment locally, downstream and globally.

There is limited awareness of mercury in medicines. Continued, repeated use of these products is a human health risk.



W H A T C A N Y O U D O ?

✓ For the Public

- ✓ Use alternatives to thermometers containing mercury, where available. Check labels on skin lightening products and Asian medicines for mercury and its compounds.
- ✓ Do not use products containing mercury or whose contents are unknown.
- ✓ Ask your dentist about dental filling materials and choose alternatives to mercury dental amalgam where available and feasible.

✓ For Health Care Workers

- ✓ Know where mercury is used in your facility. Provide sound advice to potentially exposed people.
- ✓ Work with administration to promote training, to implement policies for reducing mercury use and to procure mercury-free products.
- ✓ Follow practical steps in your work environment to manage mercury products carefully and to dispose of it properly.

✓ For Governments

- ✓ Encourage national assessments of mercury use and disposal.
- ✓ Ensure that controlled mercury disposal and/or storage facilities are available and maintained.
- ✓ Encourage the reduction of mercury use through voluntary initiatives or through regulation.
- ✓ Regulate the manufacture, import and sale of unlabelled and mercury-containing healthcare products.
- ✓ Make mercury-free medical devices available at government facilities.
- ✓ Promote training.
- ✓ Take part in the UNEP Global Mercury Partnership. Go to www.chem.unep.ch/mercury/partnerships/new_partnership.htm for more information.

Mercury Use in Hospitals and Health Care Clinics

Where is mercury used in health care settings?

Mercury is used in many different ways in hospitals, clinics and doctors' offices. First, mercury is contained in many common medical measuring devices: sphygmomanometers (blood pressure devices), thermometers (specifically body temperature thermometers but also others) and a number of gastro-intestinal devices, such as cantor tubes, esophageal dilators (bougie tubes), feeding tubes and Miller Abbott tubes. As in other types of instruments, mercury has traditionally been used in these devices because of its unique physical properties, including the ability to provide highly precise measurements.

Mercury is also used in a number of products in health care settings not specific to healthcare, described in Module 1. These include electrical and electronic devices, switches (including thermostats) and relays, measuring and control equipment, energy-efficient fluorescent light bulbs, batteries, dental amalgam and laboratory chemicals.

What are the risks in a hospital setting?

People are exposed to elemental mercury when medical devices containing mercury break and when liquid mercury spills or evaporates while bougie tubes and are other devices are being filled. Some devices, such as sphygmomanometers, contain quite a bit of mercury.

Mercury spills in hospitals, clinics and labs pose risks to doctors, nurses, other health care workers and patients. The most common exposure routes are through inhalation or through contact with the skin. The risk of exposure to mercury is highest in warm or poorly ventilated rooms.

Use of mercury products and devices in a hospital setting can also affect the downstream environment. Medical waste containing mercury, including the remains of a cleaned-up spill, can end up in aquatic environments and the atmosphere through improper disposal (see Module 1 on Mercury Products and Wastes).

What alternatives are available for mercury-containing medical devices?

There are safe and cost-effective non-mercury alternatives for all uses of mercury in health care. Some developed countries have phased out mercury use, as a health precaution. This has also helped to reduce mercury pollution.

It is important to purchase devices that have been independently tested and that meet required validation standards.

A key resource for mercury-free alternatives is the Sustainable Hospitals Project - a clearinghouse of information on alternatives to certain toxic products in the health care sector, including mercury, PVC and latex:

www.sustainablehospitals.org/cgi-bin/DB_Index.cgi

What can governments do?

- Encourage national assessments of mercury use and disposal.
- Ensure that controlled mercury disposal and/or storage facilities are available and maintained.
- Encourage the reduction of mercury use through voluntary initiatives or through regulation.
- Regulate the manufacture, import and sale of unlabelled and mercury-containing healthcare products.
- Make mercury-free medical devices available at government facilities.
- Promote training in the health sector.
- The UNEP Global Mercury Partnership is open to new partners. Joining the partnership can be an excellent opportunity to network with experts and build capacity.

What can hospitals do?

- Know where mercury is used in your facility.
- Work with administration to implement policies for reducing mercury use and to procure mercury-free products.
- As for all hazardous substances, mercury spills should be handled according to agreed procedures. Such procedures should be developed for your workplace if they do not already exist.
- A mercury reduction initiative requires dedicated individuals, including members of both the healthcare institution and its external partners.
- The involvement of senior-decision makers is important because they can provide management and financial support for implementation.
- Any effective initiative for replacing mercury is dependent on the availability of alternatives, infrastructure for collecting and disposing of the leftover mercury and financial resources available to the facility.
- A first step for a mercury reduction team might include raising awareness about the risks involved from mercury and the available alternatives. In-house medical professionals and environmental services personnel may be of assistance, as may NGO, university, and government resources.
- No single list of strategic priorities is universally appropriate. Every institution must develop its own strategy (see India and Argentina Case Studies). Some mercury reduction teams have had early successes by carefully prioritizing where to begin their initiatives:
 - For instance, sphygmomanometers contain more mercury than any other instrument and frequently break and spill, incurring substantial clean-up costs. Hence, replacing these devices might be a priority.
 - In others cases replacing mercury thermometers may be a more appropriate first step.

How should a mercury spill in the healthcare facility be managed?

- > On-site spill management kits should be assembled and available for use in areas susceptible to spills.
- > Instructions in managing spills should be clear to all staff through regular staff training and be made available in the spill kit.
- > The following set of bullet points provides an example:
 - In the event of a mercury spill, remove all people from the contaminated area.
 - Keep the heat below 20°C and ventilate the area if possible.
 - Wear nitrile gloves in the clean-up.
 - Use cardboard or folded paper to make a small scoop to gather the mercury “beads.” Never use a broom or a vacuum cleaner.
 - Place all materials that have become contaminated in a sealable plastic bag and seal the bag. Place this sealed plastic bag inside an impact-resistant sealable container made of plastic or metal.
 - Put the container holding the contaminated material in sturdy secondary containers.
- > Keep all mercury containers tightly closed when not in use.
- > Store liquid mercury and mercury-containing waste in a cool place.
- > Post clearly visible signs in the storage area. Access to the storage area should be limited and contents should be monitored.

See Module 1 for detailed procedures for managing mercury spills and mercury waste.

How does an institution properly dispose of mercury?

Wherever possible, always dispose of mercury as a separate hazardous waste.

The best current management practices for disposing of mercury involve using protected temporary storage in off-site hazardous waste warehouses. If no such storage facilities exist locally or within a distance that is safe and economically feasible, a local facility can store the mercury waste on-site. Ideally, however, mercury should only be stored there for a short period of time until it can be transported to a mercury recycling facility or a safe large-scale storage facility.

Mercury discarded in wastewater, burned with infectious waste or disposed of in landfills will eventually make its way to aquatic systems where it is readily transformed by microorganisms into organic mercury compounds that ultimately enter the food chain.

Never put spilled mercury in a sharps container (for needles, syringes and lancets) – these are usually incinerated, which would spread mercury through the air.

Never put mercury down the sink or in a regular garbage can.

Mercury in certain medicines

What medicines contain mercury?

- > Mercury-containing compounds are found in certain Asian medicines, such as traditional Chinese patent medicine and Indian Ayurvedic preparations. Regular users of medicines containing mercury are at particular risk.
- > Mercury in the form of '**cinnabaris**' (**mercury sulfide**), **calomel (mercury chloride)** or '**hydrargyri oxydum rubrum**' (**mercury oxide**) is included in some traditional Chinese herbal preparations (Ernst and Coon 2001; Ernst, 2002).
- > A list of Traditional Chinese Patent medicines in the 'Pharmacopoeia of the People's Republic of China' (English Edition, 1997) lists 43 different products containing one or more of these ingredients; these products are used for a wide variety of indications, including ulcers, insomnia, and epilepsy.
- > Some textbooks note the toxicity of mercury-containing products but include recommendations for preparation processes that reportedly 'detoxify' them, such as heating them until they glow, or cooking them with other ingredients (Prpic-Majic et al., 1996; Ernst, 2002). Mercury is an element and cannot be further broken down; therefore, no detoxification process is effective.
- > Sold as non-prescription medicines, herbal products and dietary supplements, these compounds are rarely subjected to the same rigorous testing, quality control, labeling, import or distribution regulations as are other medicines.
- > Traditional Chinese medicines and Ayurvedic preparations are widely advocated in Eastern countries and have become increasingly popular in the West where they are imported both legally and illegally and are often available in health food stores (Ernst, et al., 2001).

What can governments do?

- > Require the labeling of all mercury-containing medicines and healthcare products imported or sold to the public. This way people would know their ingredients and be able to avoid mercury products, allergens and toxins.
- > Regulate the manufacture, import and sale of unlabelled and mercury-containing healthcare products.
- > Educate people about the effects of potential toxins, like mercury, so that consumers can make informed choices.
- > Promote the training of health care providers, including in the recognition and treatment of mercury poisoning.

Thiomersal and vaccines

Thiomersal (also known as thimerosal, mercuriothiolate and sodium 2-ethylmercuriothio-benzoate) is a mercury-containing organic compound. It has been used since the 1930s as a preservative in some vaccines and other medical products to prevent potentially life-threatening contamination with bacteria and fungi during storage, and especially during use of opened multi-dose vials. It has also been used during vaccine production both to inactivate certain organisms and toxins and to maintain a sterile production line.

Many licensed vaccines do not contain thiomersal. Such vaccines include vaccines in single-dose presentation or vaccines for which thiomersal would interfere with vaccine efficacy such as live vaccines including measles, mumps and rubella (MMR), oral and inactivated polio, yellow fever and BCG vaccine.

Other vaccines may contain trace amounts of thiomersal (<0.5 µg per dose), if thiomersal has been used in the production process, but has not been added to the final product. A third group of vaccines have thiomersal added in varying concentrations (10 to 50 µg per dose) as a preservative to prevent contamination with microorganisms when formulated in multi-dose vials. Such vaccines include vaccines against diphtheria, tetanus and pertussis (DTP), diphtheria and tetanus toxoids (DT), tetanus toxoid (TT), hepatitis B, *Haemophilus influenzae* type b (Hib), and influenza (WHO, July 2006). In recent years, in some countries, much progress has been made in removing or reducing thiomersal in these vaccines. These changes have been accomplished by reformulating products in single dose vials that do not contain a preservative.

Single-dose vials require significantly larger cold storage space as well as increased transport needs, which is currently not feasible for many countries. For some vaccines, it is more cost effective to use multi-dose vials. The safety of thiomersal-containing vaccines is reviewed at regular intervals. The WHO immunization policy with respect to thiomersal-containing vaccines remains (WHO, July 2006).

Mercury Use in Dental Amalgam

What about mercury in dental amalgam?

- > In 2005 approximately 240-300 tonnes of mercury were used as an ingredient in dental amalgam by dentists worldwide.
- > Dental amalgam contains approximately 50% elemental mercury, 30% silver and 20% other metals such as copper, tin and zinc.
- > Some countries are taking a precautionary approach to protect the environment from the harmful effects of mercury and taking measures to reduce the use of mercury in dentistry.
- > Alternatives to mercury dental amalgam exist, such as composites (most common), glass ionomers and copolymers (modified composites). These are all effective alternatives that are generally considered more attractive than traditional amalgam.
- > Most dental practitioners continue to charge less for mercury amalgams than for the alternatives.

The speed with which dental amalgams are being replaced varies widely, and mercury use is still significant in most countries.

What are the risks?

- > Use of mercury in the dental sector has an impact on the downstream environment. Mercury-containing waste from dental clinics often ends up in aquatic environments and the atmosphere through improper disposal. In addition, the primary source of mercury in municipal wastewater effluents generally originates from dental practices.
- > There is limited information available regarding the risk associated with dental amalgams to the individual. The removal of sound amalgam fillings in patients who have no indication of adverse health effects attributable to mercury exposure is not currently justified.

Dental sector occupational exposure levels to mercury are generally considered rather high, especially where amalgam is still mixed by hand. The population of greatest potential risk to mercury exposure from dental amalgam is the dental professional, consistently exposed to higher levels of mercury vapour in the work environment.

What can governments do?

- > Promotion of good dental hygiene reduces the need for dental fillings.
- > Encourage mercury use reduction and proper waste management procedures in the dental sector, through voluntary or regulatory measures. Measures could include implementation of proper waste management procedures and installing amalgam separators at dental clinics to reduce most of the emissions from wastewater.

- > Establish collection programs to store safely surplus mercury from dental clinics.
- > Ensure that controlled mercury disposal and/or storage facilities are available and maintained for hospitals and health care facilities.
- > Much of the mercury in municipal wastewater (originating from various sources but is often dominated by dental amalgam wastes) ends up in sewage sludge, and therefore, knowledge of the mercury content in sewage sludge is important.
- > Governments should note that an additional source of mercury releases to the environment from mercury amalgam tooth fillings are crematoria.

What can you do?

- > Reduce your personal need for dental fillings by practicing good dental hygiene.
- > If you are having a tooth restored, consider asking your dentist to use alternatives to traditional dental amalgam, such as composites should they be available.

What can dental professionals do to minimize risk in the use of mercury?

- > Promotion of good dental hygiene reduces the need for any dental fillings.
- > Follow practical steps in your work environment to manage mercury carefully and dispose properly of it, such as the World Federation of Dentists Policy Statement on Mercury Hygiene Guidance (www.fdiworldental.org/federation/3_0statements.html).
- > Use alternatives to dental amalgam containing mercury whenever possible.
 - Where mercury is used, convert to single use amalgam capsules to help minimize the chance of an accidental spill and exposure in the dental clinic.
 - Where mercury is used, reuse as much amalgam as possible.
 - Wear nitrile gloves when handling mercury. Do not use latex gloves because mercury penetrates latex.
- > When possible for precautionary reasons, do not use amalgam fillings with people who have impaired kidney function. It is also recommended that amalgam fillings not be placed in or removed from the teeth of pregnant women.
- > Audit your office with equipment that detects mercury vapour (and which can be rented) to know and manage occupational exposure levels to mercury.

What are the general procedures in removing an existing mercury amalgam?

- > Try to remove the amalgam in chunks rather than dust so it will be caught in the chair-side trap.
- > Avoid removing mercury amalgam chunks with high speed suction (the vacuum line).
- > Use a finer mesh on your traps (100 versus 40) if your suction system can handle it. It requires more cleaning but allows less pollution to go through.
- > Consider purchasing an amalgam separator, which is a device that can remove amalgam from dental wastewater.

What are the considerations for amalgam waste management?

According to the World Federation of Dentists Policy Statement on Amalgam Waste Management (www.fdiworldental.org/federation/30statements.html):

- > Dental staff should be trained to take appropriate measures to minimize the amount of waste and adopt best management practices for ensuring that all generated waste is properly disposed of in accordance with applicable environmental legislation.
- > Dental offices should collect, store safely and forward for recycling as much of the amalgam waste as possible, regardless of whether or not it has been in contact with a patient. Such waste includes used amalgam capsules, excess amalgam that is not used in placing a restoration and amalgam waste retained in chair side traps, vacuum pump filters and amalgam separators. Extracted teeth restored with amalgam can also be recycled with other types of amalgam waste.
- > If amalgam separators are to be installed in the dental clinic, they should comply with ISO 11143.
- > In addition, dental workers should also read the suggested practices within 'How does an institution properly dispose of mercury?' noted earlier in this module for hospitals and health care workers.

Philippines Example: The dental profession is slowly replacing dental amalgam with composite materials, says Dr. Michelle Sunico, who is in charge of clinical operative dentistry at the College of Dentistry of the University of the Philippines. Dr Sunico counsels her fellow dental health practitioners about using amalgam substitutes whenever feasible and minimizing amalgam waste generation. "As dentists, we should also work towards caries reduction and prevention... thereby eliminating the need for amalgam," she says. Indonesia and Malaysia are also witnessing an increase in the use of amalgam substitutes in restorative dentistry, particularly in private practice.

CASE STUDY 11: MERCURY REDUCTIONS AT HOSPITALS IN INDIA 12 -14

CASE STUDY 12: MERCURY REDUCTIONS AT RIVADARIA HOSPITAL ARGENTINA 15

CASE STUDY 13: A NORWEGIAN DENTAL ASSISTANT'S STORY FOR 12 YEARS, TORDIS STIGEN KLAUSEN, A FORMER DENTAL NURSE IN NORWAY, STRUGGLED TO CONVINCHE HEALTH AUTHORITIES THAT SHE HAD BECOME ILL DUE TO OCCUPATIONAL EXPOSURE TO MERCURY. 16

CASE STUDY 11: MERCURY REDUCTIONS AT HOSPITALS IN INDIA

St. Stephen's Hospital is a 600-bed (70% occupancy rate) multi-specialty hospital with a staff of 1650 people. For 120 years, it has been a centre of excellence, providing health care and health care teaching to thousands of people from all sections of the society. The hospital's planning for its mercury phase-out planning began in 2003, when in a training session conducted on occupational safety informed employees learned about mercury's toxicity. The hospital's concern for the safety of the staff, coupled with the fact that the hospital had acquired an ISO certification (International Standards for environmental management), made it imperative for the hospital to phase-out mercury.

The hospital took the following actions to ensure a smooth mercury phase-out programme:

- A written policy on mercury was drafted and included in the overall hospital policy document.
- The infection control committee was placed in charge of the programme.
- Written memoranda were sent to staff to inform them about efforts to pursue mercury reductions.
- The hospital phased out mercury thermometers first and then mercury sphygmomanometers. The latter are being replaced with aneroid blood pressure instruments.
- The Purchasing Department is making no new purchases of any equipment containing mercury.
- Regular training is being conducted for staff on how to prevent and manage mercury spills. Over 1000 nurses have been trained so far.
- A specific staff member has been designated to store all the mercury collected after each spill from the remaining mercury containing equipment. Mercury from spills are collected by the staff and sold to a thermometer manufacturer.
- Another staff member was assigned to calibrate mercury sphygmomanometers. This ensures that this person understands the safety measures that need to be taken while handling mercury.

The number of mercury thermometers issued per year has gone down from 687 in 2002 to zero in 2005. Even though certain mercury-containing equipment can still be found in some wards, the hospital remains committed to phasing it out completely over time. St. Stephens plans to address the issue of mercury-containing dental amalgam in the future by using alternatives and collecting it for safe disposal.

Sir Ganga Ram Hospital is a 650-bed (100% occupancy rate) state-of-the-art hospital in Delhi with multiple specialties and 2,148 staff members. For 48 years, it has provided comprehensive health care services to the community. The potential environmental and health risks associated with mercury convinced the hospital to adopt a mercury phase-out program in 2004. It started by drafting a mercury reduction policy and assigning a senior administrator to oversee the two-phase programme. The plan included the following steps:

- Written memoranda informed staff about mercury and mercury-reduction efforts.
- Laboratory and dental departments were involved in finding ways to eliminate their use of mercury.
- Waste mercury was collected in sealed containers that were handed over to a disposal squad.
- The staff was trained on how to prevent and manage mercury spills.

Mercury thermometers were successfully phased out first, and in the dental wing 80% of the restorations are now alternatives to dental amalgam. During the current second phase the hospital is replacing its mercury sphygmomanometers with aneroid units.

Max Devki Devi Hospital is a newly constructed, 178-bed hospital. When the facility was in the planning phase it was decided that only digital thermometers and sphygmomanometers would be purchased. Since the decision to obtain mercury-free equipment was made during the planning stage itself it was easier to

implement later. Although the hospital has not had a formal policy for preventing mercury, initial mercury-free procurement policies helped avoid any problem. In 2004 the hospital conducted training sessions on occupational safety, including the hazards of mercury, at its other locations throughout the city. The phase-out of mercury at those facilities has become part of the hospital's long-term strategy.

The Holy Family Hospital is a 300-bed multi-specialty hospital with 1,200 staff. It offers three schools of treatment: allopathic, homeopathic and ayurvedic. The hospital's mercury-reduction efforts began in December 2005. The hospital adopted a mercury phase-out program that included a purchasing policy banning the purchase of new mercury thermometers and sphygmomanometers. It replaced all the mercury thermometers in the neonatal ward with digital ones. A system for collecting spilled mercury was put in place, and a staff member identified for its collection and storage. Approximately 500 g of mercury, collected from spills, have been sent for recycling. The staff now receives regular training on preventing and managing mercury spills. Over 160 nursing staff have been trained so far.

LESSONS LEARNED

Health Care lessons learned in India:

- ① Success depends upon committed staff in the health care setting.
- ② A written policy on mercury hazards and alternatives is a useful tool for communication.
- ③ Good communication between the administration and the staff is vital.
- ④ The phase-out requires endorsement and commitment at all levels of the organization.
- ⑤ Healthcare workers may resist moving away from the familiar mercury-containing instruments. They may question the accuracy and/or the cost of the alternatives. However, when hospitals train the staff on the use of alternatives, the change-over will be gradually accepted.
- ⑥ New facilities should plan from the outset to purchase mercury-free equipment.

CASE STUDY 12: MERCURY REDUCTIONS AT RIVADARIA HOSPITAL, ARGENTINA

Several excellent examples of mercury-reduction initiatives in the healthcare sector are found in Argentina. At the Rivadaria Hospital in Buenos Aires, a small survey was initially distributed to medical staff in the Neonatal Intensive Care Unit (NICU). As a result of the interest generated by the survey, a series of educational seminars on the life cycle and human health impacts of mercury were presented to hospital staff.

The hospital director authorized the purchase of digital thermometers for a small pilot project. Each NICU nurse was given a digital thermometer and trained how to use it properly. News of this project spread quickly to other facilities within the city. Thereafter, the Pediatric Hospital at Hospital Elitazalde received a donation of digital thermometers. As awareness of the health impacts of mercury and these programmes grew, the city government signed a Letter of Intent to phase-out mercury thermometers. Within about a year, 33 neonatal units across the city had eliminated or were in the process of eliminating their use of mercury thermometers.

Interest and involvement in mercury education quickly grew. This provided the impetus for a Latin American Conference on Mercury-Free Healthcare that has helped generate additional interest and understanding throughout Argentina and other parts of Latin America.

The conference led to resource-sharing and further education on health impacts, reduction strategies and spill management. Three months after the event a number of hospitals had developed low-cost spill clean-up kits and were educating staff on proper spill management. Posters and other educational resources are now available in many hospitals.

Facilities outside of Buenos Aires have also begun now to reduce the use of mercury. For example, a facility in the City of Esquel, in the Province of Patagonia, has eliminated all mercury thermometers and replaced them with digital alternatives. As a result of education and training, the collected mercury devices are now stored on-site at these facilities, in sealed containers. Plans towards a local waste mercury management system evolve.

Rivadaria Hospital is now in the process of replacing mercury blood pressure devices containing mercury with mercury-free aneroid alternatives. The experience of Argentina illustrates the momentum that can be generated by a step-wise approach to eliminating mercury and demonstrates how education and resource-sharing can remove the major obstacle presented by a lack of knowledge and awareness. While much remains to be accomplished, there is now a widely-shared recognition in Argentina that mercury is an important and significant public health concern.

S

CASE STUDY 13:

A NORWEGIAN DENTAL ASSISTANT'S STORY FOR 12 YEARS, TORDIS STIGEN KLAUSEN, FORMER DENTAL NURSE IN NORWAY, STRUGGLED TO CONVINCHE HEALTH AUTHORITIES THAT SHE HAD BECOME ILL DUE TO OCCUPATIONAL EXPOSURE TO MERCURY.

Ms. Klausen had worked as a dental assistant in a municipal dental clinic in Norway for 23 years during the 1970-80s. During this period, nurses prepared amalgam by hand. They heated amalgam (containing 69% mercury) in a spoon until the mercury appeared in droplets on the surface and then kneaded the amalgam in their bare hands. Starting in 1978, Ms. Klausen began to experience symptoms consistent with mercury intoxication.

In 2005 Norwegian Television Broadcasting aired a documentary on her struggle. Two documentaries were produced: the first was about occupational exposure and health damage to dental assistants from mercury called *Kvikksølvjentene* (The Mercury Girls) and the second was about health damage and birth defects to children of dental assistants called *Kvikksølvbarna* (The Mercury Children).

Phone lines were set up to receive calls from viewers after the broadcast. Within two months, 394 women had called. It became clear that many dental nurses had worked while pregnant and breastfeeding. A high number reported that their children had been born with birth defects, had severe depressions, learning difficulties, immunological and muscular/skeletal problems. In addition, the mothers had severe bleedings and multiple late abortions. These results were similar to those found in New Zealand where dental nurses were exposed to similar levels of mercury.

In January 2006, Ms Klausen was awarded the prestigious *Zola* prize for her work in spreading information about the damage to health from exposure to mercury in dental clinics. The *Zola* prize is awarded in Norway to persons who, "Openly and courageously have revealed or opposed conditions in Norway that threaten basic values in Norwegian society: human rights, democracy and legal protection."

Effective 1 January 2008, the Norwegian government has prohibited the production, importation, exportation, sale and use of substances and products that contain mercury to protect the environment. As a result, a general ban on the use of dental amalgam materials now applies in Norway. Denmark has also recently taken strong action against mercury use in dental amalgam. Sweden is also considering future actions in this area.

FOR ADDITIONAL INFORMATION

Anyone interested in airing the documentaries should contact TV2 WORLD DENMARK, www.tv2world.com The e-mail addresses for the sales office is sales@tv2.dk and their telephone number is +45 65 21 22 23.

The UNEP Global Mercury Partnership:

www.chem.unep.ch/mercury/partnerships/new_partnership.htm

Healthcare Environmental Resource Center: www.hercenter.org

Health Care Without Harm website: www.noharm.org/us/mercury/issue

"Mercury in Health Care Fact Sheet, June 2006."

Available on the European Public Health Alliance website: www.ephha.org/a/2455

Sustainable Hospitals Project - a clearing-house of information on alternatives to certain toxic products in the health care sector:

www.sustainablehospitals.org/cgi-bin/DB_Index.cgi

Life Sciences Research Office: 2004 'Safety assessment on dental amalgam safety'
www.lsro.org/home.html

National Institutes of Health: www.nih.gov/od/ors/ds/nomercure/alternatives.htm

Mercury Amalgam and Other Filling Materials, A patient education/Information brochure. Prepared by the Maine Department of Human Services, Bureau of Health, 2002. www.mercurypoisoned.com/hearings/amal_broch_maine.html

U.S. EPA, Frequently Asked Questions:

www.epa.gov/epaoswer/hazwaste/mercury/index.htm

World Federation of Dentists (FDI) Policy Statements on the Environment:

www.fdiworldental.org/federation/3_0statements.html

Ernst, E. and J. Thompson Coon, 2001. Heavy metals in traditional Chinese medicines: A systematic review. *Clinical Pharmacology & Therapeutics*, 70(6), 552-560

Ernst, E., 2002. Toxic heavy metals and undeclared drugs in Asian herbal medicines. *Trends in Pharmacological Sciences*, 23(3), 136-139.

Health Canada. 1996. The Safety of Dental Amalgam.
<http://dsp-psd.pwgsc.gc.ca/Collection/H49-105-1996E.pdf>

Prpic-Majic, D. et al., 1996. Lead poisoning associated with the use of Ayurvedic metal-mineral tonics. *Clinical Toxicology*, 34, 417-423.

WHO Policy Statement, Mercury in Healthcare, August 2005
www.who.int/water_sanitation_health/medicalwaste/mercurypolpaper.pdf

WHO, 2000. World Health Organization (WHO). Thimerosal as a vaccine preservative. WHO position paper, *Weekly Epidemiological Record*. No. 2, January 14, 2000

WHO, July 2006. GACVS. Thiomersal and vaccines. Questions and answers. Available at: www.who.int/vaccine_safety/topics/thiomersal/en/index.html

WHO, 2007. PHE. Exposure to mercury: A major public health concern.
www.who.int/phe .

Acknowledgements:

Mercury Policy Project
World Health Organization

Copyright © United Nations Environment Programme, 2008

Disclaimer

This publication is intended to serve as a guide. While all reasonable precautions have been taken to verify the information contained in this publication, this published material is being distributed without warranty of any kind, either expressed or implied. UNEP disclaims any responsibility for possible inaccuracies or omissions and consequences that may flow from them. The responsibility for the interpretation and use of the material lies with the reader. Neither UNEP nor any individual involved in the preparation shall be liable for any injury, loss, damage or prejudice of any kind that may be caused by persons who have acted based on their interpretation and understanding of the information contained in this publication.

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the United Nations or UNEP concerning the legal status of any country, territory, city or area of its authorities, or concerning the delimitation of its frontiers or boundaries.

www.unep.org

United Nations Environment Programme
P.O.Box 30552 Nairobi, Kenya
Tel.: ++254-(0)20-62 1234
Fax: ++254-(0)20-62 3927



Governments have agreed that there is sufficient evidence of significant adverse impacts from mercury and mercury compounds to warrant action on mercury. This publication was developed to raise awareness in certain countries and regions amongst stakeholders on the effects of mercury on human health and the environment. It is hoped that it will assist citizens, governments and health care workers to build support and the capacity to take action to reduce or eliminate mercury uses, release, and exposure to mercury.

This is one of five modules.

For more information, contact:
UNEP DTIE
Chemicals Branch
11-13 Chemin des Anémones
CH- 1219 Châtelaine, Geneva
Switzerland
Tel.: +41 (0) 22 917 12 34
Fax.: +41 (0) 22 797 34 60
Email: mercury@chemicals.unep.ch
Web: <http://www.chem.unep.ch/mercury/>

