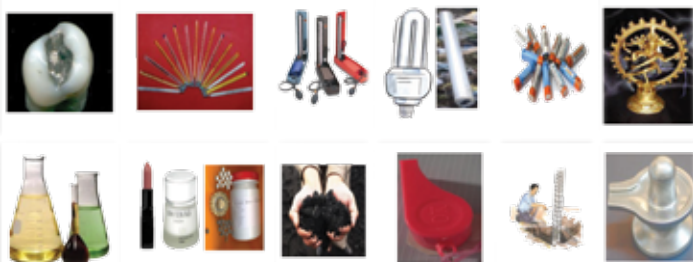


# Mercury

*An initiatives of Mercury Free Dentistry and Health Care Services in Nepal.*

**Mercury** is a notorious heavy metals of global concern and known to be a potent poison of the human nervous system [1]. Mercury is a chemical element with symbol **Hg** and atomic number 80 and atomic mass  $200.592 \text{ g}\cdot\text{mol}^{-1}$  [2], in its pure form; mercury is a shiny silver white metal that is liquid at room temperature. It is naturally occurring heavy, odorless, lustrous liquid metal found mainly in four forms: metallic (liquide), inorganic, organic and gaseous. Organic form of mercury is highly toxic forms in comparison to other inorganic and elemental forms.



## Mercury Issues In Nepal

Mercury has been used in various products and processes. Mercury and mercury containing compounds are highly toxic and have a variety of significant adverse effects on human health, wildlife, aquatic animals and the environment. While consumption of mercury in many developed countries

## Mercury Poisoning and Contamination Cases in Nepal

- National Poisoning Information Centre (NPIC) recorded 185 mercury poisoning cases in last 10 years [ 10].
- A Bio Monitoring of Mercury in 19 Fish sample shows contamination ranges from 0.003 to 0.242 ppm (CEPHED/ IPEN/BRI 2012) [11]
- A Bio Monitoring of Mercury in Fisher Folks found ranges from 345 to 1715  $\mu\text{g}/\text{kg}$  with 53% (8 of 15) higher than reference doses of 1000  $\mu\text{g}/\text{kg}$  (CEPHED/ IPEN/BRI 2012) [12].
- A bio monitoring of Mercury among 50+ Dental Doctor & Nurses found ranges from 205 to 447  $\mu\text{g}/\text{kg}$ (CEPHED/NDA/BRI 2013) [13]
- A bio monitoring of Mercury in fish eating 20 female of child bearing age ranges from 0.11 to 1 ppm (CEPHED/ZMWG 2013) [14]
- A nurse from Hetauda died of consuming huge amount of mercury to abort her last unwanted pregnancy.
- A patient died of severe Mercury Exposure in Biratnagar (Dr. D N Thakur, M.S. from Regional Hospital, Biratnagar).
- Metal plating workers professional from Syambhunath Stupa was found dead due to excessive mercury toxicity (Dr. Surya Man Shakya).
- Metal plating workers have severe dental carries, muscular damage and early death (Mr. Deepak Maharjan, Advisor CCNCI).
- Mercury used to abort pregnancy has been widely practiced in hilly as well as boarder Terai areas.

*NOTE: Some of these cases were not recorded anywhere. Listed based on personal and professional information.*



continues to decline, evidence suggests that mercury consumption remains significant in many developing countries, especially in South and East Asia (Larmer, B. 2009) [3].

Human get exposed to mercury through inhalation, respiration, ingestion, skin absorption. Mercury is highly toxic. It may be fatal if inhaled and harmful if absorbed through the skin. Around 80% of the inhaled mercury vapour is absorbed in the blood through the lungs. It may cause harmful effects to the nervous, digestive, respiratory, immune systems and to the kidneys, besides causing lung damage. Adverse health effects from mercury exposure can be: tremors, impaired vision and hearing, paralysis, insomnia, emotional instability, developmental deficits during fetal development, and attention deficit and developmental delays during childhood [4].

Acute exposure to elemental mercury and vapour can results in Acrodynia or "**Pink Diseases**" which is characterised by bright pink peeling palms, fingers, and soles of the feet, excessive perspiration, itchiness, rashes, joint palms and weakness, elevated blood pressures and heart palpitations [5]. Acute or chronic mercury exposure can cause adverse effects during any period of development. Mercury is a highly toxic element; **there is no known safe level of exposure**. Ideally, neither children nor adults should have any mercury in their bodies because it provides no



Fig 1 Pink Diseases

physiological benefit. Prenatal and postnatal mercury exposures occur frequently in many different ways. Pediatricians, nurses, and other health care providers should understand the scope of mercury exposures and health problems among children and be prepared to handle mercury exposures in medical practice [6].

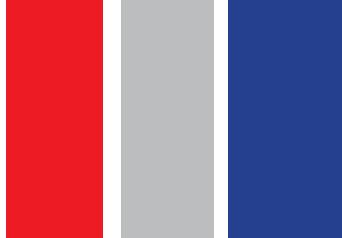
**Many medications use mercury as a preservative.** This is especially common in vaccines. The FDA has a list of more than 130 prescription and over-the-counter medications which contain mercury. These include **eye drops, nasal sprays, skin creams and hemorrhoid ointments**. Mercury is readily absorbed into the body from any of these sources [Dr. Alan Christianson 7].

### International Episode of Mercury Impacts: Minamata disease and other

- Minamata disease is a form of a sever Methyl mercury poisoning first identified in Minamata, a city on the Island of Kyushu in Southern Japan in 1956. Between 1932 and 1968, an acetaldehyde plant owned by the Chisho Corporation released the effluents containing methyl mercury compounds into Minamata Bay and subsequently into the Minamata River and the Shiranui Sea. The methyl mercury bio-accumulated in the shellfish and fish that make up an important part of the local diet more than 200,000 people were exposed to the contamination. This lead to the chronic poisoning in residents of the coastal area of Kumamoto and adjoining Kagoshima Prefectures. The local public health institute reported in 1960 that the median value of mercury in hair or 1644 residents of the coastal area of the Shiranui Sea was 23.4 ppm (0 to 920 ppm), while the median value for non polluted Japanese was 2.1 ppm (0.1. to 8 ppm): Some 35000 people affected. More than half of whom have now died. DOI Matsushima, 1962 (UNEP, Introductory Booklet) [15].
- Another modern mercury tragedy occurred in Iraq in 1971, when 6,500 people were hospitalized and more than 400 died after consuming wheat grain treated with a methyl mercury fungicide [16].
- A study of 180 dentists by researchers at the Glasgow Royal Infirmary in Scotland found the dentists had up to four times the normal level of mercury in their urine and nails and had more kidney disorders and memory lapses than the general public [17].
- In a study involving 45 women dentists and 31 dental nurses, a positive association was found between elevated mercury levels and incidence of malformations and aborted pregnancies[18].
- A study employed pharmacy utilization data to evaluate the health status of a representative sample of 600 dentists, matched to control subjects, Dentists demonstrated significantly more prescription utilization of specific illness medications than did Controls, for the following disease categories: Neuropsychological, Neurological, Respiratory, and Cardiovascular. The greater majority of paediatric and general practice dentists still use mercury amalgam restorations. (International Journal of Statistics in Medical Research, 2012, 1, 1-15) [19].



Fig Source of exposure and health impacts



Traditional use of Mercury is also very much prevailing in and around the world. For example, Egyptian tomb ceremonial cup, mercury as a contraceptive, Cinnabar is still used as a sedative in traditional Chinese medicine [8], Parad Shivlings, Cup, Idol, even during the construction of new wells and houses.

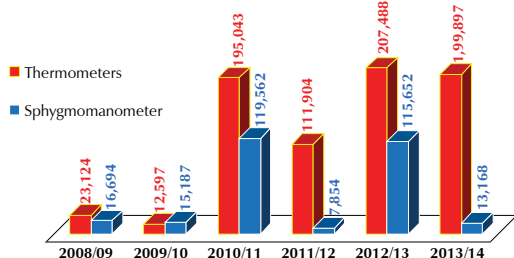
Also used as Vaastu or Tanrik dosh nivaran (removes bad luck from the workplace or home), Curing a range of diseases, Warding off evil spirits, Establishing an inner spiritual balance, Increasing willpower, Stopping nightmares and Resolving marriage problems [9]

The earlier and higher usage of **vaccines containing the mercury preservative thimerosal**, as well as exposure to mercury through mother's blood and milk. It has been estimated that by age 3 the typical child has received over 235 micrograms of mercury thimerosal from vaccinations, which is considerably more than Federal mercury safety guidelines.[18]

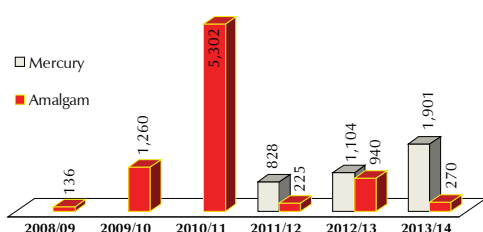
## Import of Mercury, Mercury based compound and Products in Nepal

There are numerous mercury based products, compounds and even liquid mercury in various quantities has been imported from different countries and used in different sectors of Nepal. Following graphs shows the amount of different mercury based products imported in Nepal over the period of time as per the **Trade and Economics Promotion Center (TEPC), Ministry of Supplies and Commerce, Government of Nepal** [20].

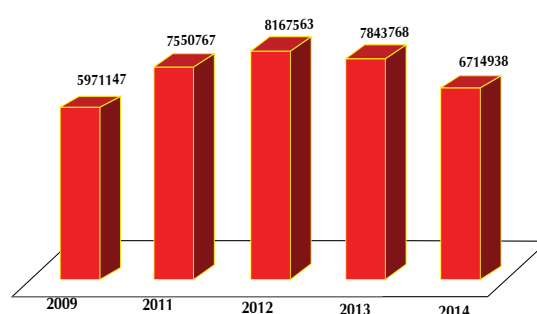
Yearly Import of Mercury Thermometers and Sphygmomanometer (No.) : TEPC data



Yearly Import of Mercury and Amalgam in Nepal (Kg) : TEPC data



Yearly Import of Fluorescent Discharge Lamps (pcs) : TEPC data



As number of mercury based products and compounds as well as even mercury has been imported, used, misused coupled with miss management of waste handling especially mercury contaminated wastes, hospital waste, hazardous waste and municipal waste, there was an increased evidence of increasing mercury occupational exposure and contamination in human body, doctors, nurses, aquatic ecosystem and even fish, fisher folks etc.

Based on these evidences and further possibilities of increased contamination, CEPHED has conducted series of activities right from research; data generation; preparation, production and widely dissemination of different types of electronic and printed IEC materials such as posters, briefing paper, fact sheets, training manual, radio jingle, video documentary etc on mercury issues; development and free distributed mercury spill management toolkits; model development of mercury free health care services and mercury free dentistry initiatives in Nepal is getting popular and brings about the policy changes as well.



## National, Regional and District level Awareness and Capacity building on Heavy Metals (Hg, Pb, Cd).

CEPHED conducted districts level workshops of Heavy Metals on 20 Districts with support of SSNC Sweden during the year 2011-2012 that directly benefitted over 1100 people directly and many more indirectly through mass media outreach, radio, TV programs and news article publications.





Awareness Rising and Capacity building Workshop, Kathmandu

The 20 workshop was completed by CEPHED were Sunsari, Dhankutta, Illam, Morang, Dhanusha, Kavre, Makwanpur, Kaski, Palpa, Rupandehi, Surkhet, Bardiya, Dang, Tanhu, Baglung, Kathmandu, Kailali, Kanchanpur, Doti and Siraha.

Similarly, Five regional level awareness program on Mercury was organised by CEPHED in all development regions of Nepal and a national level workshop on mercury in 2011 as well as mercury free dentistry organised in 2014 in Kathmandu, Nepal.

## Research on Mercury uses and Management in Dental Hospitals in Nepal

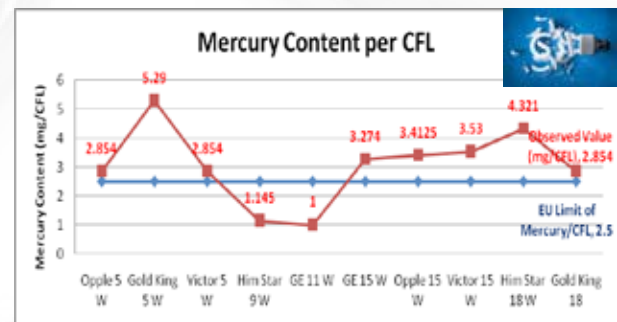
A research on mercury use and management in 20 Dental Hospital and Clinics in all five municipalities of Kathmandu Valley were found increasingly use of mercury and mishandling of the mercury contaminated waste (CEPHED, 20010)[21].

- 15 (75%) Dental clinics are aware about the health impact of Hg
- 13 (65%) Dental clinics were untrained on handling of Hg
- Other than public health background personnel were also engaged in amalgam preparation.
- Manual, mechanical amalgam preparation practices were found in some dental clinics .

In the same year, study of mercury use and handling in Science Laboratory in 10 schools and colleges. Students were found touched 32%, inhaled 18%, taken on place and paper 70%, and even played with mercury 28%. None of the school and colleges have written precautionary notice in their laboratory.

## Research on Mercury in CFL imported and used in Nepal

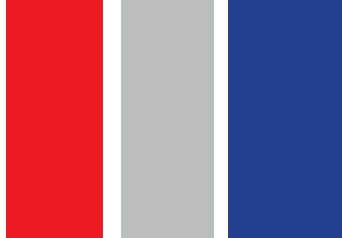
Nepalese market has been flooded with several electrical and electronic items due to low level of awareness and absence of required regulatory authority, legal framework for the end of life management of electrical and electronic items. Study on 10 CFL samples tested on Delhi Test House for its mercury content and wattage were found to have mercury contain from 1 mg to 5.3 mg per unit and average mercury 3.67mg in them with the high potential to cause the environmental damage as well as impact on human health. Only 20% lies within the permissible range of EU ROHS standard of 2.5mg/CFL up to 30 W blubs. With a conservative estimate



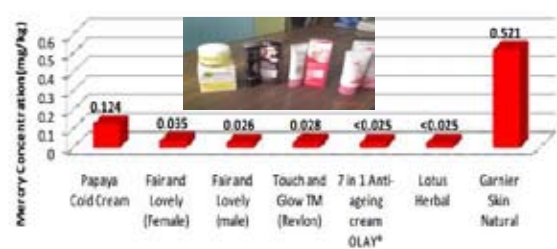
about 8 to 209 Kg of mercury has been dumped into the environment annually (and/or at the end of the warranty period) only from Fluorescent lighting system of Nepal with no any collection, recovery and recycling facilities for the end of life management of fluorescent lamps as of today. Most of the bulbs did no adhere with their claimed wattage power too (CEPHED, 2012)[22].

## Research on Mercury in Cosmetics (Skin whitening Creams)

Nepalese market has been flooded with several registered and unregistered cosmetics products by authorized as well as unauthorized dealers and retailers. Study on Mercury in Skin Whitening Cream and Moisturizer Lotion has been conducted by CEPHED through laboratory testing of seven selected national, multinational and international products of skin whitening creams. Most common and widely used skin whitening creams from Nepalese market found to be contain some level of mercury ranges from below 0.025 mg/kg to 0.521mg/kg. Though mercury content is less than USFDA guideline value



Mercury Content in Skin Whitening Creams (mg/kg)



of 1 mg/kg for mercury in cosmetic but it will build up at the level of health concern in the body upon its continuous and repeated applications. There was no proper labelling about mercury content in most of the cosmetic products. There is neither any legal frameworks nor any authorized government agencies to monitor this sector yet. Besides that there is lack of awareness among all active as well as passive consumers, users of the cosmetic like skin whitening creams and other cosmetics products in Nepal (CEPHED 2012)[23].

## Mercury Usage and Release from Healthcare Sector in Nepal

Study conducted by CEPHED (2010), thermometer breakage rate in the 10 Hospitals in Kathmandu Valley and found the breakage rate ranges from 0.48 to 3.44 per bed per year. From the same estimation it was found that about 501.75 kg (125.15 kg + 376.6 kg) of mercury usage in thermometers and sphygmomanometers used in health care sector of Nepal. Total annual mercury releases just from thermometers breakage were estimated as 125.15 kg. Results of Mercury Level in Indoor Air of Hospital showed very high concentrations (up to 3.92 microgram per cubic meter) in certain locations and wards as compared to international standards by The Environmental Protection Agency (EPA), 0.3  $\mu\text{gm}^{-3}$ , about 13 times higher than the guideline value [24].



## Biomonitoring of Mercury (Hg) contamination in Fish and Human Body in Nepal

Human exposed primarily to methyl mercury highly toxic form of mercury through the consumption of contaminated fish. Many national and international

health organizations recognize the risks associated with fish diet and international guidelines for the maximum amount of Hg in fish have been



established. Under the Global Fish and Community Mercury Monitoring Project of IPEN, a study was conducted with the motive to generate new data, raise awareness about global Hg pollution, and identify specific hot spots, primarily from developing and transition countries to influence national and thus global mercury treaty. CEPHED conducted bio-monitoring of mercury in Fish and Human body to determine the Hg concentration in all together 20 human hair samples and 19 fish samples in the year 2012. 15 fishes sample were collected from Fewa Lake whereas 4 fishes sample were from Kalimati market in Kathmandu. Similarly, 15 human hair samples were collected from the Fisher Folks community of Khapaudi, Sarangkot-2, Kaski and 5 samples from nurses and doctors working in the dentistry health care services at National Dental Hospital, Kathmandu were included in the study. Samples were tested in Biodiversity Research Institute (BRI), Gorham, USA lab by using DMA 80 method of direct mercury measurements .

All the tested fish samples contain mercury ranges from 0.003ppm to 0.24ppm, though below than US EPA limit except in one most popular species of fish called Bhitte among fisher folks have problem from multiple exposure[11].

The tested hair samples of Fisher Folks contain mercury ranges from 205  $\mu\text{g}/\text{kg}$  to 1775  $\mu\text{g}/\text{kg}$ . In total 8 out of 15 (53%) samples contain higher mercury



concentration than that of mercury reference dose 1000  $\mu\text{g}/\text{kg}$  limit of mercury in human body set by US National Research Council was the real threats to the public health. The Mercury concentration among 5 Dental health care professionals (Doctors and Nurses) during this period were also found ranges from 205 to 447  $\mu\text{g}/\text{kg}$  [12].

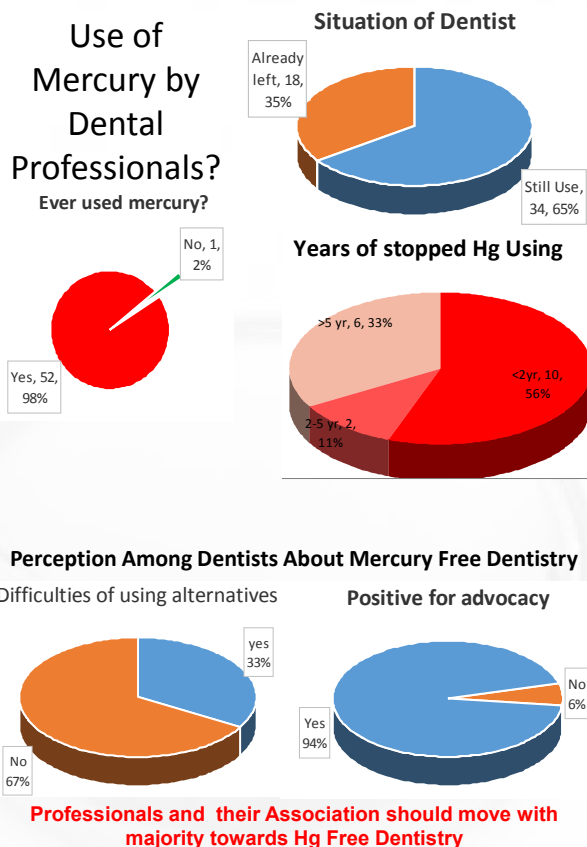


## Biomonitoring of Mercury contamination in Dental Health Care Professional in Nepal

In the year 2013, a total of 56 people comprising mostly Dental doctors (50), people with dental amalgam in their mouth (1), dental Nurses & Assistants (4) and hospital staffs working with waste management (1).

Study was conducted among the dental doctors and nurses as to assess their occupational exposure of the mercury from their day to day use of mercury based dental filling preparation, filling and removal as well as lack of any proper waste handling practices. Samples were tested in Biodiversity Research Institute (BRI), Gorham, USA lab using DMA 80 method. A lab result from the total of 56 hair samples of mostly from Dental Doctors including the high level government officials such as Secretary from Ministry of Health and Population (MOHP) and Joint Secretary from Ministry of Science, Technology and Environment (MOSTE) confirmed the 100% positive mercury contamination results ranging from 0.097 to 0.547  $\mu\text{g}/\text{kg}$  [13].

Same study also found some interesting facts that can be taken as the basis of mercury free dentistry in Nepal.



Yet another study of CEPHED in 2014 of bio monitoring of 20 Female with different fish eating frequency were also found 100% contaminated with mercury. Hg Content in fish eating female with child bearing age was ranges from 0.11 to 1 ppm (CEPHED & ZMWG, 2013) [14].

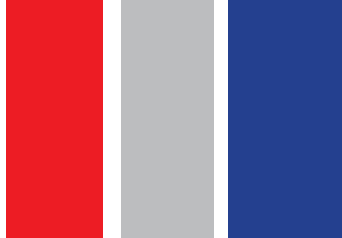
**In summary, the 100% mercury contamination in aquatic animals fish, Fisher Folks, occupationally vulnerable groups of people like Dental Doctors, Nurses, Waste handling staffs, people with dental filling and fish eating population with different frequency were found is the real health and environment threats from toxic metals mercury, required immediate attention by all concerned and especially by the government agencies of Nepal like Ministry of Health and Population (MOHP) and Ministry of Science, Technology and Environment (MOSTE).**

### Mercury Free Health Care Facilities Model Development initiatives of CEPHED

CEPHED with the support of WHO Country office for Nepal carried out research on feasibility study of mercury free health care services in Nepal and developed strategy paper on Mercury free health care services along with the series of interaction program on mercury free health care services. With the advocacy and technical support of CEPHED to different hospitals, mercury based equipment's such as mercury thermometer and mercury sphygmomanometer were replaced with more economic and environmentally friendly yet equally reliable safer alternative digital thermometer and aneroid sphygmomanometers. CEPHED provided technical support and mercury free alternatives to Propakar Maternity Hospital Thapathali, Stupa Community Hospital Jorpati, Kanti Children Hospital, Maharajgunj, Alka Hospital, Lalitpur, Blue Cross Hospital, Kathmandu, Dhulikhel Hospital, Kavre, BPKIHS Hospital in Dharan Sunsari and Nobel Hospital in Biratnagar with the support of WHO, UNDP GEF SGP, SSNC, Toxic Link to piloted mercury free hospital and has been delivering mercury free health care services successfully.

After a year of intervention, 99.9% locations of visited hospital in Maternity and Stupa Community showed zero mercury contamination in the air, as measured by ZEROME mercury analyzer as well as continuous advocacy for based on real time bio monitoring of mercury among health care professional, fisher folks and fishes of CEPHED's results into successful campaign with the Government of Nepal, Ministry of Health and Population (MOHP) took the bold decision of banning 'Import, Purchase and Use' of mercury based equipment effective from 16 July 2013.





## Mercury Free Dentistry initiative in Nepal

Dental amalgam is the most commonly used dental filling material. It is a mixture of mercury and a metal alloy. The normal composition is 45-55% mercury; approximately 30% silver and other metals such as copper, tin and zinc [4].

Mercury exposure has been scientifically linked to memory loss, confusion, irritability fibromyalgia, hypothyroidism and a host of others. The main sources of exposure are dental amalgams, seafood, high fructose corn syrup and medications. Dental amalgams are silver-colored fillings. They are made of mercury. They gradually degrade and constantly leech mercury into our body. **Amalgams are so toxic**



### Conservative Thought

Few year back, a dental doctor was asking an example of death case from mercury in Nepal who himself was practicing mercury dental amalgam filling in his clinic.

### CEPHED Intervention

CEPHED ensured his participation in bio-monitoring testing of mercury in his body. His hair sample was found to be contaminated with high level of mercury contamination i.e. second highest among all tested 56 samples 2013.

### Change in Attitude and Practices

Currently, he completely shifted to mercury free dentistry and promoting mercury free dentistry requesting fellow dentists for the same is the clear examples working together will change the scenario and becoming the changing agent for others and society.

PARADIGM SHIFT

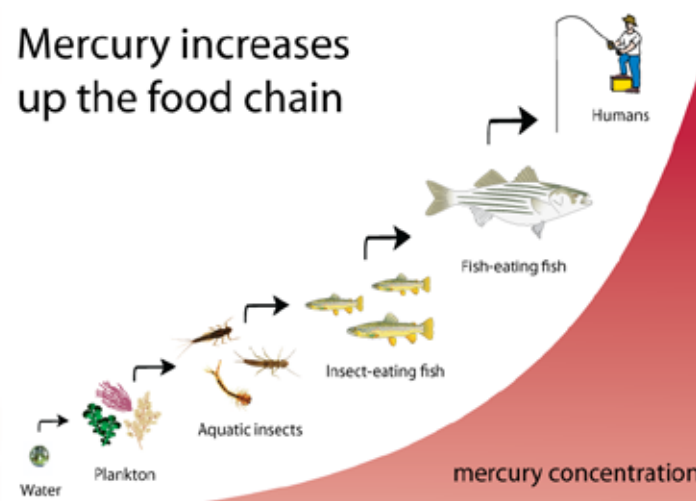
that the U.S. Environmental Protection Agency (EPA) has written elaborate procedures that dental labs must follow when disposing of any unused material [Dr. Alan Christianson 7].

**The toxic effects of mercury exposure have been implicated in birth defects, autism, attention deficit disorders, impotency, and significant reduction in sperm motility and sperm count leading to infertility. In women, mercury and other toxic metals have been shown to inhibit fertility [18].**

Dental mercury accounts for 10% of annual global mercury consumption [25] and 260-340 metric tons of mercury pollution around the world each year [26].

The dental amalgam mercury enters the environment via many pathways, polluting air via cremation,

## Mercury increases up the food chain



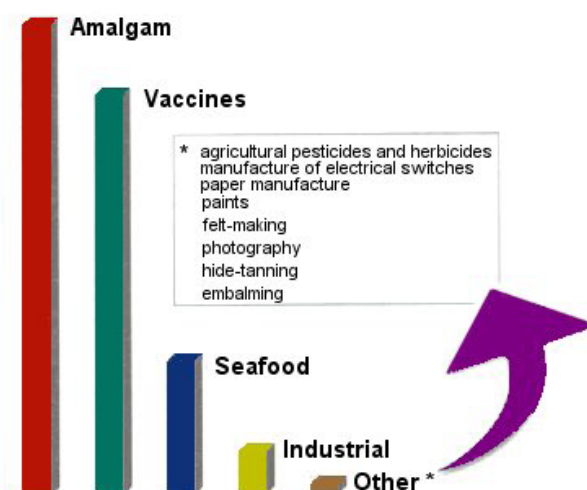


dental clinic releases, and waste and sewage sludge incineration; water via human waste and dental clinic releases to septic systems and municipal wastewater; and soil via landfills, burials, and fertilizers [27]. Once dental mercury is in the environment, bacteria in soils and sediments may convert it to methylmercury [28], “a highly toxic form that builds up in fish, shellfish and animals that eat fish, thereby making fish and shellfish the main sources of methylmercury exposure to humans. In the dental workplace, uncontrolled mercury vapours are a major occupational risk, especially to young women of childbearing age [29].

Dental workplace, uncontrolled mercury vapours are a major occupational risk, especially to young women of childbearing age [30], and that amalgam is not consistent with modern dentistry; unlike less invasive mercury-free filling materials, amalgam placement requires the removal of a substantial amount of healthy tooth matter, which weakens the tooth structure and can lead to more expensive dental care later [31].

**The 100% positive results of mercury contamination through consecutive bio-monitoring of the mercury in aquatic animals, Dental Health Care Professionals, People with mercury dental amalgam filling in their mouth and female of child bearing age, shows an urgency for all and especially among dental health care professional and academicians to move towards mercury free dentistry in Nepal. Since amalgam is proved to be the greatest source of mercury exposure.**

### Relative Sources of Mercury Exposure



Source: [www.palmbeachgardenshealthandwellness.com/mercurytoxicity.html](http://www.palmbeachgardenshealthandwellness.com/mercurytoxicity.html)



Interaction program on Minamata Convention on Mercury

The phase down is possible since Mercury-free dental restorative materials are far less expensive than dental amalgam when environmental and societal costs are factored in [32]. The costs of using mercury-free options (including retreatment) is about half the cost of amalgam without retreatment, making this mercury-free technique significantly more affordable in low-income communities, particularly in areas without electricity or dental clinics [33].

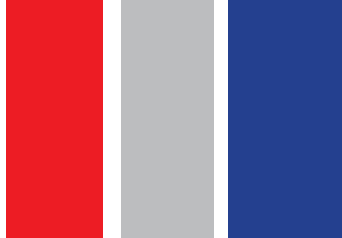
World Health Organization (WHO) report Future Use of Materials for Dental Restoration, says that “recent data suggest that RBCs [resin-based composites] perform equally well” as amalgam [34]– and offer additional oral health benefits because “Adhesive resin materials allow for less tooth destruction and, as a result, a longer survival of the tooth itself.

Responding to these urgent needs, a joint research, publications, awareness raising, capacity building and advocacy campaign is also in progress, for Mercury Free Dentistry, dental curriculum improvements and required mercury phase-out plan with a necessary legislative and institutional framework, in Nepal. All these initiatives help strengthen oral health improvements and the realization that early implementation of the **Minamata Convention on Mercury** is the best possible way and means to reduce as well as completely eliminate mercury use for safeguarding public health.

National Workshop on Mercury Free Dentistry







All these initiatives strengthening the oral health improvements, reduce occupational exposure of mercury to the people and especially the dental health care professionals and also contribute to realization of early implementation of the Minamata Convention on Mercury`s provision on Dental Amalgam. It calls for measures to be taken by a party to phase down the use of dental amalgam, dental caries prevention, health promotion, promoting use of cost effective and clinically effective mercury free alternatives, encouraging professional organization and dental school to educate and train dental professionals and students on the use of mercury free dental restoration alternatives and on promoting best management practices etc. thereby eliminating the need for mercury dental amalgam is the best possible ways and means to reduce and ultimately eliminate mercury use for safeguarding public health in Nepal.

CEPHED jointly with Government agencies and Nepal Dental Association (NDA), started working on this issue from joint bio monitoring to awareness raising, capacity buildings and policy dialogue. The recommendations to move for mercury free dentistry from two days **National Conference on Mercury Free Dentistry** from May 26 to 27, 2014 jointly organized by CEPHED and Nepal Dental Association (NDA) in close coordination with the Government supported by World Alliance for Mercury Free Dentistry (WAMFD), Asian Center for Environmental Health and UNDP GEF SGP [35]:



## Government Response

Along with the awareness raising, Training, Posters and Manual preparation through its line agencies Management Division, Department of Health Services, **Ministry of Health and Population (MOHP)** issue a public notice to mercury free health care services through imposing the blanket ban of Import, Purchase and Use of Mercury based equipments in health sector of Nepal in March 2013 and

**decision is effective from the first day of the new physical year 2070/71 of Nepal** i.e. July 16 of 2013. Also wrote to its respective departments (Department of Health Services, Department of Drug Administration and Department of Ayurvedic Medicines) repeatedly to fully implements and also to the Department of Custom to fully tighten the importation of such mercury based products through the customs in boarder areas and transit points [36]. Based on the successful model of mercury free health care services at different hospitals and continuous advocacy with the concerned government agencies of Nepal, a detail guideline of health care waste management including mercury has been developed by Management Division, Department of Health Services, Ministry of Health and Population (MoHP), Government of Nepal.



CEPHED joint programs on mercury with MoHP



## Government of Nepal, Ministry of Health and Population (MoHP) banned the import, purchase and use of mercury based equipments effective from July 16<sup>th</sup> 2013



- 1 Government of Nepal, Ministry of Health and Population (MoHP) decision
- 2 Follow up letter for effective implementation of the decision
- 3 Letter to the custom department to complete the import of mercury based equipments from all entry points.

Note: Due to this government decision import of mercury based equipments including dental amalgam has reduced substantially but not completed stopped needs further effectiveness in implementation of government decision.

### Promote and Use of Mercury Free Alternatives for Mercury Free Health Care Services [16]

Mercury Base Equipments and Products	Mercury Free Safer and Reliable Alternatives
Thermometers	Digital or Radioation Thermometers
Sphygmomanometers	Aneroid or Digital Sphygmomanometer
Gastrointestinal tubes	Non Mercury based Gastrointestinal tubes
Dental amalgam	Composite, Glass Ionomer, Compomer, Zirconomer, Ceramics etc.
Pharmaceutical Supplies	Non Mercury Pharmaceutical Supplies
Electrical Equipment	Non Mercury based electrical equipments
Float control	Non Mercury based floating control/stoppers
Thermostats	Non Mercury based thermostat or Foams
Thermostat probes in electrical equipment	Digital Probe and indicators in electrical equipments
Lamp (Tube, CFL, Discharge, Sodium Vapor)	Light Emitting Diode (LED)
Batteries	Mercury with Zero Mercury or non mercury

Mercury Base Equipments and Products	Mercury Free Safer and Reliable Alternatives
Pressure gauges	Non Mercury based Pressure Gauges
Laboratory chemicals etc.	Non Mercury based laboratory reagents
Button Batteries	Mercury free button batteries
Quicksilver Maze Toys	Mercury Free Toys
Old Latex Paints	New Latex Paints
Switches	Mechanical or Pressure Switches
Contact lens solution containing Thimerosal	Mercury free solution
Nasal Spray (with Thimerosal / phenylmercuric acetate)	Mercury Free Spray
Flame Sensor	Hot surface Ignition System

**Mercury Based Chemicals and Equipments**

- Mercury Based Dental Amalgam Filling
- Mercury Thermometer
- Mercury Sphygmomanometer
- Mercury Tubelight and CFLs
- Mercury Based Batteries

**Mercury Free Alternatives**  
(Safe, Reliable, Cost Effective, Durable & Environment and Public Health Friendly)

- Go for composite filling and glass ionomers
- Digital and Radiation Thermometer
- Digital and Aneroid Sphygmomanometer
- LED (Light Emitting Diode) Tube
- Go for Zero Mercury Batteries





## Global Movements to Address Mercury Issues: Minamata Convention

A legally binding treaty called **Minamata Convention on Mercury** to protect the environment and human health from manmade emissions and releases of mercury and mercury compounds was adopted and opened for signature on 10th October 2013. As of latest information, **there are 128 signatory countries including Nepal and 10 country had already became parties by ratifying this Convention and agreed to control** and “where feasible” reduce emissions of mercury and mercury compounds, (i.e. “total mercury”) to the atmosphere through control measures of emissions from point source categories such as coal-fired power stations and non-ferrous metal smelters (e.g. aluminum smelters).



Government of Nepal signed the Convention on 10th October 2013 and in process of ratification.

The Convention has taken sectoral time framed strategies to control the sources of the mercury emission and release to the environment through a provision of five Annexes. More details about the Convention can be seen at <http://www.mercuryconvention.org> [37]. The details provision of the Convention for Products subject to Article 4 Paragraphs 1 (Mercury Added Products) and Paragraph 3 (Mercury Added products Dental Amalgam) can be found in the table .....

## Regional Movement on Mercury Free Dentistry

Mercury-free dentistry is growing in Asia. Recent studies in India, Pakistan and Nepal show that, already, over 50% of dentists are using alternatives to dental amalgam in India, while in Pakistan 42.86% dental professionals strongly recommend to phase out the use of mercury/dental mercury amalgam. In Nepal and Bangladesh, the Dental Association and Society of the dentist groups are also supporting the phase down and/or phase out of dental amalgam. In case of Nepal 94% Dental Doctors also advocate for Mercury Free Dentistry (CEPHED & NDA 2013) [13].



Regional Workshop on Mercury Free Dentistry, Dhaka, Bangladesh

Asian countries are requested to declare that the children of Asia -- and all the people of Asia -- have a basic human right to mercury-free dental care and a mercury-free environment. The the existence of sound scientific evidences that mercury can damage children’s developing brains and nervous systems even before they are born [38].” In addition to the literature, the **Minamata Convention on Mercury** adopted in October 2013, noted that the world recognizes dental amalgam as a major environmental pollutant which requires each participating nation “to phase down the use of dental amalgam [37] and regionally translated this global convention in the respective parties countries [39].”

# Call to stop mercury use in dentistry

**POST REPORT**  
KATHMANDU, JAN 13

Civil society representatives from Nepal, India, Bangladesh, Sri Lanka, Pakistan and Thailand have agreed to a declaration that calls to end the use of mercury in amalgam fillings in dental care in Asia.

More than 137 civil society organisations. individuals

environment. “The continuous use of mercury-filled dental amalgam in medical field is not justified when alternatives are now affordable, effective and available in the region,” said a press statement issued by Center for Public Health and Environmental Development on Tuesday.

The organisations also urged the Asian countries to

therefore be more significant. “We are calling on Asia to end the use of mercury-based dentistry. Asia is the most densely populated continent on the planet and therefore risks incredible harm to human health and environment,” the statement further reads.

Mercury-free dentistry is

growing in Asia. Recent studies in India and Pakistan show that, already, over 50 percent of dentists are using alternatives to dental amalgam in India, while in Pakistan 42.86 percent of dental professionals strongly recommend to phase down the use of mercury/dental mercury amalgam.




### Provision of Mercury Convention (Annex A, Part I: Products subject to Article 4, paragraph 1)

Mercury- added products	Phase-out date*
<b>Batteries</b> , except for button zinc silver oxide batteries with a mercury content < 2% and button zinc air batteries with a mercury content < 2%	2020
<b>Switches and relays</b> , except very high accuracy capacitance and loss measurement bridges and high frequency radio frequency switches and relays in monitoring and control instruments with a maximum mercury content of 20 mg per bridge, switch or relay	2020
<b>Compact fluorescent lamps (CFLs)</b> for general lighting purposes that are ≤ 30 watts with a mercury content exceeding 5 mg per lamp burner	2020
<b>Linear fluorescent lamps (LFLs)</b> for general lighting purposes: a) Triband phosphor < 60 watts with a mercury content exceeding 5 mg per lamp; b) Halophosphate phosphor ≤ 40 watts with a mercury content exceeding 10 mg per lamp	2020
<b>High pressure mercury vapour lamps (HPMV)</b> for general lighting purposes	2020
<b>Mercury in cold cathode fluorescent lamps</b> and external electrode fluorescent lamps (CCFL and EEFL) for electronic displays: a) short length (≤ 500 mm) with mercury content exceeding 3.5 mg per lamp b) medium length (> 500 mm and ≤ 1 500 mm) with mercury content exceeding 5 mg per lamp c) (c) long length (> 1 500 mm) with mercury content exceeding 13 mg per lamp	2020
<b>Cosmetics</b> (with mercury content above 1ppm), including skin lightening soaps and creams, and not including eye area cosmetics where mercury is used as a preservative and no effective and safe substitute preservatives are available	2020
<b>Pesticides, biocides and topical antiseptics</b>	2020
The following non-electronic measuring devices except non-electronic measuring devices installed in large-scale equipment or those used for high precision measurement, where no suitable mercury-free alternative is available: (a) Barometers; (b) Hygrometers; (c) Manometers; (d) Thermometers; (e) Sphygmomanometers.	2020

\*Date after which the manufacture, import or export of the product shall not be allowed

### Provision of Mercury Convention (Annex A, Part II: Products subject to Article 4, paragraph 3)

Mercury-added products	Provisions
 <p><b>Dental amalgam</b></p>	<p>Measures to be taken by a Party to phase down the use of dental amalgam shall take into account the Party's domestic circumstances and relevant international guidance and shall include two or more of the measures from the following list:</p> <ol style="list-style-type: none"> <li>I. Setting national objectives aiming at dental caries prevention and health promotion, thereby minimizing the need for dental restoration;</li> <li>II. Setting national objectives aiming at minimizing its use;</li> <li>III. Promoting the use of cost-effective and clinically effective mercury-free alternatives for dental restoration;</li> <li>IV. Promoting research and development of quality mercury-free materials for dental restoration;</li> <li>V. Encouraging representative professional organizations and dental schools to educate and train dental professionals and students on the use of mercury-free dental restoration alternatives and on promoting best management practices;</li> <li>VI. Discouraging insurance policies and programmes that favour dental amalgam use over mercury-free dental restoration;</li> <li>VII. Encouraging insurance policies and programmes that favour the use of quality alternatives to dental amalgam for dental restoration;</li> <li>VIII. Restricting the use of dental amalgam to its encapsulated form;</li> <li>IX. Promoting the use of best environmental practices in dental facilities to reduce releases of mercury and mercury compounds to water and land.</li> </ol>





## Non Mercury Alternative in Dental Fillings

There are many non-mercury alternatives to amalgam today, including:

- Composite;
- Glass Ionomer;
- Compomer,
- Zirconomer
- Ceramics etc.



## Phaseout plan and policy of Mercury, Mercury based products and Mercury Dental Amalgam

### Phase Out /Banned/Restrict of using Mercury, Mercury based products and Practices

Plan, Policies and Personal	Mercury based proucts/equipments	Mercury Dental Amalgam
Production, import, export, sale and use of substances and products that contain mercury	Norway, Sweden, Denmak	Noway, Sweden, Denmark, Mangolia, South Africa, Russia, Japan, EU member countries
Banned Import, Purchase and Uses	Argentina, Bazil, The European Union, Magolia, Philippines, South Africa, Taiwan, USA, Nepal etc.	
National Guidelines of Mercury free health care services	Chile , India	
Replacement policy BP set with Anefoide	Cuba	
Controlling Dental Amalgam waste and Waste water discharge		New Zealand
Banned Gama 2 Phase amalgam and Issue advisory against the use of amalgam in children and pregnant women and people with kidney problem.		Germany and Austria
Mercury Free Dentists		Nepal, USA, Canada, Australia, UK, Italy, Mexico, New Zealand, Philippines, South Korea, Norway, Sweden, Denmark, Magolia, South Africa

Source: 40, 41

## Measures that phase Down Dental Amalgam

1. **Promoting Alternatives:** through mass media, IEC materials, patients consent forms to ensure dissemination of mercury, its impacts and alternative related information.
2. **Training about Alternatives:** encouraging professional associations and dental school to educate and train dental professionals and students on the use of mercury free dental restoration and alternatives and on promoting the best management practices.

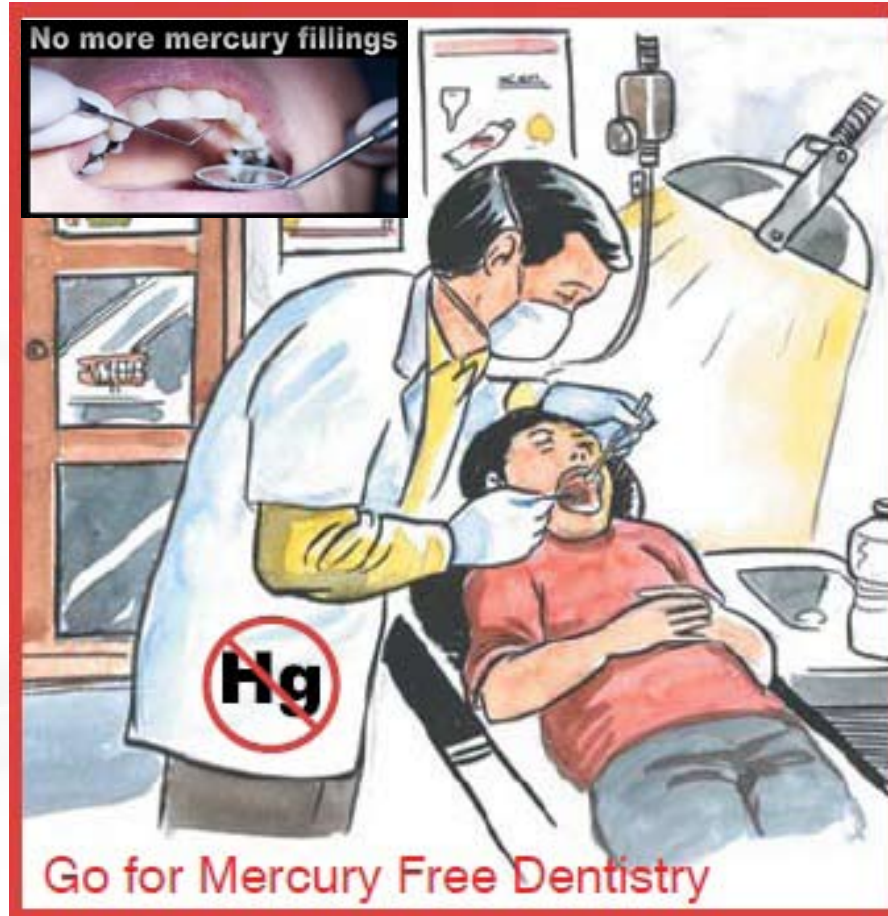




3. **Promulgation of Government Regulatory and Institutional frameworks and Programs:** sectors specific regulations of banning mercury based products and process, environment sound dental care waste management plan, discouraging insurance policies and program favourable for dental amalgam and encourage insurance policies and programs favourable for mercury free alternatives.
4. **Making Plan to Minimize and eliminate the uses of Mercury and Mercury base products and practices :** setting national objectives aiming at minimizing and possibly eliminating the use of dental amalgam and other products and practices

## Additional Issues

- **Crematoria**
- **Metal Plating's**
- **Burning of Coal** in Brick Industries and Cement Industries
- **Mercury in Vaccines**
- **Hydropower**
- **Mercury containing toxic wastes management**



## Way Forward for Mercury Free Dentistry and Health Care Services

Asian nations to adopt effective amalgam phase out strategies that have been proven in nations that have already phased out or significantly reduced dental mercury use by:

1. Raising awareness about dental mercury to parents, consumers, dental workers, health professionals, and educators.
2. Promotion of Alternatives through mass media, IEC materials, patients consent forms
3. Promoting the benefits of non-mercury dental restorative materials and other alternatives.
4. Promulgation of Government Regulatory and Institutional frameworks and Programs
5. Encouraging government programs and insurance policies that favour non-mercury dental restorative materials, products and practices,
6. Updating dental schools and general medicine curriculum and training programs to emphasize mercury-free dentistry and mercury free health care services.
7. Teaching and Training dental and general medical professionals to use non-mercury dental restorative materials, products, practices, equipments and techniques,
8. Immediate stopping amalgam use in milk teeth (primary teeth),
9. Protecting dental workers, general health professional, patients and waste workers from mercury vapours and exposure in the workplace,
10. Developing a national plan setting goals for minimizing and eliminating amalgam use, and use of other mercury based products.
11. Moving hospitals to mercury-free health care services.
12. Enact the effective banning of all form of Mercury being used in Dental and General health care services
13. Routinely testing of mercury level in all Dental Health Workers, their children's and waste management tasks force.
14. Research and Development in Mercury free health care services and Dentistry
15. Early ratification of the Minamata Convention on Mercury and prevent the further exposure of human health, wildlife, aquatic animals and toxic mercury load to the environment.





CASE STUDY 1: NORWEGIAN DENTAL ASSISTANT'S STORY OF TORDIS STIGEN KLAUSEN, FORMER DENTAL NURSE IN NORWAY, STRUGGLED TO CONVINCHE HEALTH AUTHORITIES ABOUT HER OCCUPATIONAL EXPOSURE TO MERCURY.

**Ms. Klausen**, a dental assistant in a municipal dental clinic in Norway work for 23 years, prepared amalgam by hand, 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. Ms. Klausen began to experience symptoms consistent with mercury intoxication in 1978.



Tordis Stigen Klausen

In 2005 Norwegian Television Broadcasting aired a documentary on her struggle about occupation exposure and associated health damage and birth defects to children of dental assistant. 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. 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 and Sweden has also recently taken strong action against mercury use in dental amalgam.

In 2012, Ms. Klausen was the first dental nurse awarded compensation, and a number of other cases were recently addressed by the Norwegian Supreme Court, In particular it means that Serigstad will have her disability pension calculated in a more favourable way, which will also have a beneficial effect on her retirement pension. In addition she has been awarded compensation for permanent injury of 1–3 G, i.e. between €10,000–€30,000. This very important ruling by the Supreme Court looks likely to be a breakthrough for female-dominated workplaces. **It has finally been established that mercury is harmful to health and that it made dental nurses ill** (<http://www.world-psi.org/en/mercury-victims-win-supreme-court-case-against-norwegian-state>) [42].

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