MERCURY RISING

Mercury Pollution in Lebanon and Morocco

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Mercury is emitted into the atmosphere through both naturally occurring and anthropogenic processes. Natural processes include volatilization of mercury in marine and aquatic environments, volatilization from vegetation, soils and volcanic emissions. Anthropogenic sources of mercury includeits use in chlor-alkali plants, in paints as preservatives or pigments, in electrical switching equipment and batteries, in measuring and control equipment (thermometers, medical equipment), in tooth-filling materials (amalgams), and many other sources. Globally, the major sources of anthropogenic mercury air emissions are fossil fuels combustion, artisanal and small-scale gold production, metal production; cement production, waste incineration, land filling, steel scrap, and release by breaking and waste recycling.

Mercury is highly toxic and may be fatal if inhaled and harmful if absorbed through the skin. When inhaled, it may cause harmful effects to the nervous, digestive, respiratory, immune systems, and the kidneys. Adverse health effects from mercury exposure can be tremors, impaired vision and hearing, paralysis, insomnia, emotional instability, development deficits during fetal growth, attention deficit, and development delays during childhood. Recent studies suggest that mercury may have no threshold below which some adverse effects don't occur.

Mercury has become an increasingly popular chemical of concern over the last several years. The United Nations Environment Program (UNEP) released its Global Mercury Assessment in 2002 (UNEP Report), citing information and comments submitted by 81. Several important findings have shown that mercury pollution as a problem of global concern. This has led the UNEP Governing Council to initiate in 2009 a historic new process of governmental negotiations for the development of a comprehensive global treaty on the reduction of mercury releases to protect human health and the environment. 140 countries have agreed to establish an Intergovernmental Negotiating Committee (INC) for this purpose. At the time this report was produced two sessions of the INC have been concluded, and the third session will be held in Nairobi, Kenya, in October/November 2011. UNEP aims to have the treaty adopted in 2013, after five more global negotiating sessions.

Lebanon and Morocco still lack a comprehensive national survey that presents an objective assessment of mercury risks in the two countries. Initial literature review has shown that there is no data on the level of mercury pollution in the air in both Lebanon and Morocco. Therefore, IndyACT initiated a sampling operation of mercury pollution levels in the air in several areas in Lebanon and Morocco as a preliminary step to fill the existing gap. The operation covered the medical sector (hospitals, medical labs, and dental clinics), various industrial zones, waste dumps, and other potentially contaminated sites. This preliminary sampling operation aims at starting the debate around mercury pollution and elimination in the Arab region. The operation serves as a sneak preview on the existing situation of air mercury pollution, and the following information was found.

Baseline concentration levels for mercury in the atmosphere in rural areas of Lebanon was identified, and was found to range between 1.6-2.7 ng/m^3. In urban areas, the concentration levels of mercury in Lebanese and Moroccan cities were in the range of 5.7-20.2 ng/m^3, which is comparable to mercury concentrations in the air in European cities.

All measured mercury concentration levels in the air in proximity of cement industry in Lebanon and Morocco have been found to be higher than those found in rural areas. This indicates that the cement industry has an effect on the air quality in terms of mercury pollution.

Mercury levels were measured in the proximity of Chlor-alkali factory called Coelmain the region of Tetouan, Morocco. This plant is of particular importance regarding mercury pollution, since it produces caustic soda, chlorine and other products using an old technology called mercury cell. This process uses mercury as a catalyst in its processes. Measurements were also taken along the river that passes by Coelma factory and continues across the city of Tetouanto Madiaq. This river receives industrial effluents from Coelma. The measurement results clearly show a higher concentration of mercury in the atmosphere of the entire region around the plant. What is more interesting is that mercury concentrations in the air along the river are also higher than background levels even at a long distance from the plant, which confirms the conclusion that the river has become a secondary source of mercury emissions.

Mercury measurements taken next to electrical power plants in Jieh, Lebanon, and in Mohammedia, Morocco, have shown that the dispersion of mercury follows the plume direction. Therefore mercury concentration following the prominent wind direction is higher than other directions.

Mercury measurements in the proximity of waste dumps, such as the ones taken in Lebanon next to the Nabatieh, Kafr Tibnit dump, and the Tyr, RasElA in dump, have reached 10 ng/m^3. Nevertheless, in other waste dump areas, such as next to Saida dump in Lebanon and Casablanca – Mediouna dump in Morocco, concentrations of mercury in the air have only slightly exceeded baseline levels. The reason for the differences depends a lot on the content of waste, which varies from place to place and time to time, as well as

what happens in these dumps during time. For example, just after a dump catches fire, concentration levels of mercury in the atmosphere are expected to rise. This concludes that waste dumps could also be an important secondary source of mercury emissions.

Maybe the most interesting finding was the Mercury concentrations in indoor air of the dentistry sector in Lebanon and Morocco. The use of mercury containing amalgam in the dentistry sector leads to high concentrations of mercury inside the closed spaces of dental care clinics. This leaves dentists and personnel of dental care clinics exposed to high concentrations of mercury vapor, which poses risk of chronic mercury intoxication. A number of clinics visited have reported that they have completely stopped the use of mercury amalgam. Nevertheless, a substantial number of dental care clinics still use it, but most of those use the amalgam in a packaged form and through a mechanical closed mixer. Given the wide variation in the type of dental care clinics and their locations, four categories of clinics have been identified, which are:

A The first category of dental care clinics use mercury amalgam without any specific control or precaution. In such clinics the level of mercury samples exceeds 3000 ng/m^3. The dentists and staff in this category of dental care clinics are highly exposed to mercury, which could lead to chronic intoxication.

B The second category of dental care clinics are those that still use mercury amalgam, but in a packaged form and utilize a mechanical closed mixer. The level of mercury concentrations measured in these clinics varied between 214 -797.1 ng/m^3. These levels of mercury concentration are significant and can pose real risks to the health of those exposed.

C The third category of dental care clinics has in general stopped the use of mercury amalgam. However, they still use them in rare and special cases, when the alternative is out of stock or is too expensive for the customer. Measurements of mercury concentrations this category of clinics was found to be between 62-170.4 ng/m^3. This concentration level is medium. This shows that mercury could be persistent in closed spaces, and decontaminating the air from mercury will require a substantial amount of time. Long-term exposure to mercury in this category of clinics could have health risks.

D The fourth and final category of clinics is those clinics that completely stopped the use of mercury amalgam for a long period of time. These clinics have shown to have similar mercury concentrations to locations in the vicinity of dental clinics. The level of mercury in this category is between 2.4-31.4ng/m^3. This level of mercury concentration is low, but given the severe toxicity of mercury, it is not to be neglected.

Indoor Mercury concentrations air in the rest of the health care sector, such as hospitals and clinics in Lebanon and Morocco, has also been measured. In all the sampled sites in Lebanon and Morocco, measurements varied form low, medium, and sometimes high levels. The highest levels measured in this sector pose a real risk to exposed doctors, nurses, laboratory technicians, other personnel, patients, and especially newborns. Even the lowest concentration levels are not devoid of danger in cases of long-term exposure.

Finally, measurements taken inside some university laboratories in Lebanon and the poison control center in Rabat, Morocco are relatively low and medium. This could be as a result of not having any recent accidents involving mercury, or due to the low rate of evaporation of mercury from apparatus and analytical instruments. The highest concentration recorded in the sampling was in the poison control center in Rabat, which was 47.4ng/m^3. This could be due to an accident that involved mercury.

CONCLUSIONS AND GENERAL RECOMMENDATIONS

1 In Lebanon, the health care sector is the sector that uses mercury the most. Dentistry is the sub-sector where we found the highest concentrations of mercury. Staff working in this sector is the most exposed to mercury in Lebanon. This is also true in the case of Morocco where this sector was found to be one of the most sectors that uses mercury.

2 Unintentional emissions of mercury from industrial zones and contaminated sites have raised mercury concentrations in areas far away from the source.

3 During the measurement period, it was found that there is little awareness on the heath impact of mercury in both Lebanon and Morocco.

4 Mercury containing wastes is disposed of with the rest of the solid wastes stream without any specific precautions or handling.

5 There is a lack of specialized sites for the temporary or perpetual storage of mercury waste and instruments containing mercury.

GENERAL RECOMMENDATIONS

1 Lebanon and Morocco need to give more importance to the assessment and reduction of mercury releases into the environment.

2 Lebanon and Morocco should develop a national strategy to phase out the use of mercury and its products.

3 Due to the lack of information on Mercury, Lebanon and Morocco need to monitor more closely mercury pollution in air, water, soil, sediments and nutrients (especially in fish).

4 Lebanon and Morocco need to set specialized storage sites for mercury waste and mercury containing waste on the local and national level.

5 Necessary national legislation needs to be developed to assess and reduce mercury contamination.

6 Lebanese and Moroccan governments need to strongly engage in the current intergovernmental negotiations for the elaboration of a new international legal instrument on mercury.

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