

RM2 ASSESSMENT DOCUMENT FOR
CULTURAL USES OF MERCURY

[US EPA
O.P.P.T.]

June 9, 1993

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CULTURAL USES OF MERCURY

I. INTRODUCTION

A. Background and Description of the Problem

In December 1992, the California Department of Health Services ("CDHS") investigated a consumer complaint that revealed that elemental mercury has been sold at several folk pharmacies or botanicas in the Los Angeles area. The State found that a retail pharmacy sold small vials of liquid mercury for use in candles to bring good luck. In the course of their investigation, the State learned that this and other practices may be widespread among communities of Haitian and other Caribbean origin. The State was concerned that the use of mercury in some cultural and religious practices specifically within the Santeria community could pose significant health risks. This matter was referred to EPA's Office of Enforcement for possible action under section 7 of the Toxic Substances Control Act ("TSCA"). In January 1993, the Office of Compliance Monitoring ("OCM") requested assistance from the Office of Pollution Prevention and Toxics ("OPPT") to determine the following:

- Does this current use of mercury constitute an imminent hazard to human health?
- Is there any additional information that OPPT requires in order to make a determination?

Mercury may also be used for certain folk medicinal purposes, such as to treat constipation, colic, or stomach ache ("empacho"). Similar problems involving folk medicinal uses of lead have also been brought to EPA's attention through the State of California. The medicinal uses of lead appear to be more widespread and may impact several ethnic communities. OPPT is currently evaluating possible risk management steps that can be taken for both lead and mercury. The risks posed by these folk medicinal practices will not be discussed in this document.

B. Source of Mercury for Retail Sale in Botanicas

EPA has learned that Los Angeles area botanicas, as well as retail establishments in other areas of the country, obtain mercury from a metal recycler based in Region II. This company sells a very small percentage of its recovered mercury to religious supply companies throughout the country. These companies repackage and redistribute mercury along with other religious articles to small establishments, such as religious stores and candle shops.

C. Description of Section 7 of the Toxic Substances Control Act

Section 7 of TSCA authorizes the Administrator of the Environmental Protection Agency ("EPA") to commence civil action in an appropriate district court for 1) the seizure of an imminently hazardous chemical substance, 2) relief against any person who manufactures, processes, distributes in commerce, uses, or disposes of, an imminently hazardous chemical substance, or 3) both seizure and relief. An imminently hazardous chemical substance is defined as a chemical substance which presents an imminent and unreasonable risk of injury to health or the environment. Such a risk is considered imminent if it is shown that the manufacture, processing, distribution in commerce, use or disposal of the chemical substance, or any combination of these activities, is likely to result in such injury to health or the environment before a final rule under section 6 of TSCA can protect against such risk.

The authority to determine that an imminent hazard exists under section 7 of TSCA has been delegated to the Assistant Administrator for Prevention, Pesticides, and Toxic Substances ("OPPTS") as well as Regional Administrators. The Regional Administrators must receive concurrence from OPPTS before exercising this authority, however. Since 1977, EPA has made an imminent hazard determination in only three instances. All of these cases involved the mishandling of polychlorinated biphenyls ("PCBs").

The authority to commence an imminent hazard action in an applicable U.S. District Court has been delegated to the Assistant Administrator for Enforcement ("OE") and the Regional Administrators. Before exercising this authority, OPPTS must be consulted and the concurrence of the Office of General Counsel ("OGC") must be obtained.

II. HEALTH HAZARD ASSESSMENT

The toxicological effects of the common inorganic forms of mercury are believed to be qualitatively similar. Significant differences in absorption and distribution have been observed, however. Elemental mercury vapor is absorbed especially quickly via inhalation and accumulates in brain tissue to a greater extent than other mercury species. Elemental mercury also penetrates the fetus at a greater rate than the inorganic salts of mercury.

The major targets organs of mercury are the central nervous system ("CNS") and the kidney, with CNS effects apparently occurring at lower doses. A particularly severe manifestation of mercury poisoning is a syndrome known as acrodynia that occurs almost exclusively in children. Symptoms of acrodynia include apathy, anorexia, fever, kidney damage, and most characteristically, a painful blistering and peeling of the skin on the hands and feet.

EPA currently classifies inorganic mercury as a Class D carcinogen, "not classifiable as to human carcinogenicity," because of inadequate data. Other data for mercury report a lowest observed adverse effect level ("LOAEL") of 0.076 mg/m³ for serious neurologic effects in workers exposed to mercury vapor. In general, serious effects, particularly neurological effects, have been seen in both human and animal data below 0.1 mg/m³. The majority of neurotoxicity studies report that motor system effects are reversible upon exposure cessation, while cognitive deficits may be permanent.

Other forms of mercury cause similar effects. Mercury-containing compounds metabolize to inorganic mercury after entering the body. The proposed reference dose for methyl mercury, for example, is 5×10^{-5} mg/kg/day based on retarded mental development and paresthesia in children of women exposed to methyl mercury during pregnancy. Several review articles discuss the capability of mercury compounds to be particularly damaging to the developing brain. These articles detail degenerative alterations and biochemical changes in various brain regions of humans and many species of laboratory animals.

III. EXPOSURE ASSESSMENT

A. Limitations and Uncertainties

OPPT developed exposure estimates for two scenarios involving cultural uses of mercury. Information on these scenarios was obtained through the assistance of the State of California, Los Angeles County officials, and Dr. Arnold Wendroff, a sociologist and teacher in New York who has done research in this area.

Many uncertainties still exist regarding the extent and conditions of use of mercury in these practices. Factors such as quantity used per event and frequency of events will have a major effect on exposure levels. To date, these types of data are limited to anecdotal sources and informal surveys. EETD's Multi-Chamber Consumer Exposure Model was used to model mercury concentrations in both scenarios. Modeled concentrations should be considered to be "bounding" estimates.

B. Burning Mercury in a Candle

Within the Santeria religion, a common practice is to place mercury into candles for good luck or fortune ("white magic"). Under this scenario, OPPT assumed complete volatilization of 4 grams of mercury within 1 minute in an average-size room (27 m³). The maximum concentration in the exposure zone was estimated to be 2.37 mg/m³. The average concentration in the exposure zone was estimated to be 0.046 mg/m³.

C. Sprinkling Mercury Around the Crib or Bed of a Young Child

To bring good luck to young children, another common practice is to sprinkle mercury inside the home. To estimate exposures in this type of situation, EPA assumed that 9 grams of mercury was applied to the floor around a crib or bed once every 3 days for 2 years. The air concentration of mercury is assumed to rise to a maximum level and then decline as the emission source is removed. The maximum concentration could persist for about 16 months. The concentration drops to zero about 40 months after cessation of the practice. The total exposure period is approximately 5.5 years.

The average concentration during the period of exposure (5.5 years) is 0.26 mg/m^3 . The concentration during the peak period of exposure is estimated to be 0.39 mg/m^3 . The average daily dose for the entire exposure period is approximately 0.13 mg/kg/day . The average daily dose during the peak period of exposure is 0.2 mg/kg/day .

IV. RISK ASSESSMENT

A. Acute Exposures

Acute exposures are of low to moderate concern based on the fact that the bounding estimates for the peak exposure level resulting from the candle-burning scenario is about an order of magnitude below the National Institute for Occupational Safety and Health ("NIOSH") Immediately Dangerous to Life and Health ("IDLH") standard of 28 mg/m^3 . The Agency for Toxic Substances and Disease Registry ("ATSDR") Toxicological Profile for mercury reports this same exposure level as the level at which serious effects occurred in an acute inhalation study with rabbits. However, because the database on acute effects from metallic mercury vapor appears to be very limited, any conclusions regarding acute exposures should be interpreted with caution.

B. Chronic Exposures

Chronic exposures are of high concern. The chronic exposure levels of 0.26 mg/m^3 and 0.39 mg/m^3 estimated for the crib scenario far exceed any established standards or effect levels. The Occupational Safety and Health Administration's ("OSHA") Permissible Exposure Limit ("PEL"), based on an 8-hour time-weighted average, is 0.05 mg/m^3 . Serious effects, particularly neurological effects, have been seen in both human and animal studies at exposures below 0.1 mg/m^3 . Because the developing fetus appears to be particularly sensitive to mercury, exposures to pregnant women are of especially high concern.

V. RISK MANAGEMENT OPTIONS

OPPT has identified a number of risk management options that could be pursued to handle this situation. The following discussion briefly outlines the option as well as the advantages and disadvantages of pursuing the option. More specific strategies will be developed once OPPT makes its risk management decision. It should be noted that although presented as individual options, OPPT could elect to pursue an integrated strategy that combines some or all of these options.

A. Risk Communication

OPPT would develop a public education campaign that would warn of the dangers of mercury exposure. This education campaign would need to be carefully designed so as not to send a message that the federal government was taking action against the religion or passing judgement on the customs of individuals who practice the Santeria faith. In addition, in order to achieve maximum effectiveness, OPPT would need to engage national as well as community-based Hispanic organizations in these efforts.

This option provides a good opportunity for coordination with the states and regions. In addition, this action could be a good first step for OPPT in the area of environmental equity issues. Recently, the Agency has pursued attempts to interact with the Hispanic community through a number of forums. For example, the Office of Communications, Education, and Public Affairs is currently negotiating an agreement with the Hispanic Radio Network.

Difficulties in this area lie in that OPPT does not have a good sense of how widespread the problem may be. The Hispanic community is particularly diverse and the practice may not be common to many members of this ethnic group. Without these critical pieces of information, it may be difficult to design an effective outreach strategy that will reach the target audience. Furthermore, many within the target group may not believe a government pronouncement. In addition, groups may perceive any government action to be a persecution of their religion.

B. Product Stewardship

OPPT could elect to enter into negotiations with mercury recyclers and distributors to encourage them to voluntarily limit their sales of mercury to more traditional uses. The Agency would encourage this effort through a product stewardship approach and would request that companies get a better handle on the downstream uses of their products.

Such an effort is likely to be successful. Mercury is known to be a very hazardous substance and is well-regulated by various government agencies. Many suppliers may not know that their product is being used for these cultural practices. Therefore, industry is likely to be very cooperative in such an effort.

However, even if industry were to cooperate with the Agency, there are other legal sources of mercury. Individuals could resort to breaking open thermometers, for example. The product stewardship approach could result in these cultural practices being driven even further underground, making any government action much more difficult.

C. Seek Regulatory Action under TSCA

EPA could elect to pursue action under either sections 6 or 7 of TSCA. A section 7 action, for example, might enjoin the distribution of mercury to retailers who further redistribute for use in cultural practices. A section 6 rule could accomplish similar results.

Regulatory action would provide a basis for the regions to seek enforcement actions against these uses of mercury. In addition, such action could potentially be well-received by the public in that it could send a message that the government is serious about abating problems of this type.

However, both types of regulatory actions could be difficult to implement. The Agency has little experience with section 7 and would probably need to obtain better information on how widespread the problem is before a court would grant the injunction. Furthermore, actions under section 6 require a tremendous amount of resources to promulgate a rule and could delay getting information to the affected communities. Because of the cultural aspects of this problem, any regulatory action would probably be very difficult to enforce. Most importantly, regulatory action could be deemed an infringement of religious freedoms protected under the First Amendment.

VI. VIEWS OF STAKEHOLDERS

On May 26, 1993, OPPT, OGC, and Region 9 met with representatives from three national Hispanic organizations: National Council of La Raza, National Puerto Rican Coalition, and the National Hispanic Leadership and Policy Development Institute. These organizations provided feedback on EPA's definition of the problem as well as the possible risk management options that could be pursued.

A. Description of the Target Population

Participants indicated that the Agency should better define the population involved in these types of cultural activities. The Hispanic community is large and ethnically diverse. In all likelihood, the problem is relatively small, even within the Santeria community. The organizations suggested looking at demographic information, such as the location of large Caribbean (Haitian, Cuban, and Dominican) communities within the United States as well as large Hispanic Catholic populations. Likely areas to target the Agency's efforts include Southern California, South Florida, Chicago, and the New York/New Jersey area.

B. Feedback on Risk Management Options

Despite the lack of specificity on the size of the affected population, the stakeholders all agreed that the Agency should try to get its risk communication program started as soon as possible. They suggested aiming the message at educating people to the dangers posed by mercury exposure and the health and well-being of young children. In their opinion, any discussion of the religious implications should be omitted from the risk communication message. Most importantly, these representatives urged OPPT to begin its risk communication efforts quickly in order to show its concern for the affected population.

These organizations also expressed an interest and willingness to assist the Agency in its efforts. All three groups are membership organizations, meaning that they have strong ties to local community groups. They suggested that the Agency set up systems with these community groups, including religious groups and social service providers, to help get the message out. The national organizations can introduce EPA to these local organizations and can help bring credibility to the Agency's efforts as well as calm any fears of government intervention.

The groups felt that product stewardship efforts would not work. If the current sources of mercury were to be reduced, community members could still go to Mexico or other Latin countries to obtain the substance. In addition, they could find other domestic sources of mercury (e.g., breaking open thermometers). These types of efforts would probably drive the practice further underground, making any attempts at government intervention even more difficult.

The groups felt that regulatory action at this time is unwarranted. Furthermore, it could send the message of government interference in the practicing of one's religion as well as create a panic within the Santeria community, further eroding the low level of trust for the government. Many of those involved in these activities may be illegal aliens and individuals could perceive government efforts in this area to be an attempt to inquire about their citizenship status.

C. Areas for Future Work with Hispanic Community

One goal of the stakeholders meeting was to initiate an ongoing dialogue with national Hispanic organizations on environmental and public health problems. Ideas for future projects include: crossing data from the Toxics Release Inventory ("TRI") with census data to determine geographic areas where large Hispanic populations are exposed to hazardous chemicals, cross-border disposal problems along the Rio Grande, and the effects of agricultural chemicals on Hispanic farm workers. This last issue will be referred to the Office of Pesticides Programs.