

Elemental Mercury Use in Religious and Ethnic Practices in Latin American and Caribbean Communities in New York City

Clyde Johnson
Medgar Evers College

Elemental mercury is used in folk medicine and in certain religious practices in the Latin American and Caribbean communities. However, exposure to mercury can cause serious health problems including neurotoxicity. There are, therefore, concerns that mercury users are exposing themselves to dangerous levels of this toxicant. A survey was conducted to determine the use pattern of elemental mercury in the Latin American and Caribbean communities in New York City. Two hundred and three adults participated in the survey. Forty-four percent of the respondents from the Caribbean and 27% from Latin America stated that they have knowledge of such cultural uses.

INTRODUCTION

Mercury has long been known as a human toxicant. Paracelsus reported on mercury poisoning among miners several centuries ago (Goldwater, 1972). It has also been associated in other occupational exposures such as "Mad Hatters" disease. Elemental mercury is a heavy, silvery liquid at room temperature and pressure. It is remarkably volatile for a heavy metal, with a vapor pressure of 0.002 mm Hg at 20°C. Mercury can exist in three oxidation states: Hg^0 (metallic), Hg_2^{2+} (mercurous) and Hg^{2+} (mer-

Please address correspondence to Dr. Johnson, Department of Physical Sciences and Computer Science, Medgar Evers College, CUNY, 1150 Carroll Street, Brooklyn, NY 11225.

curic)² (Cotton et al., 1972; EPA, 1996). Most of the mercury encountered in the atmosphere is monatomic elemental mercury vapor.

Mercury has many uses including in fluorescent lamps, wiring devices and switches (e.g., thermostats) mercuric oxide batteries, instruments that measure temperature and pressure (thermometers, barometers, etc.), as a component of dental amalgams used in repairing dental caries (cavities). Some of these uses contribute to the ambient, and in some cases, the indoor air mercury levels.

Elemental mercury is a toxic substance that causes many serious health problems. These include neurotoxicity, learning disabilities in children, sleeplessness, acrodynia, lung disease and respiratory failure (Fagala et al., 1992; Karpathios et al., 1991; Schwartz et al., 1992; Klassen et al., 1986). Very young children and fetuses are most vulnerable (Dencker et al., 1983). Exposure to elemental mercury can occur through the air, water, food (usually from contaminated fish) and direct contact (absorption through the skin). Human exposure to elemental mercury occurs primarily from breathing contaminated air. Recently, The Agency for Toxic Substances and Disease Registry (ATSDR) and the Environmental Protection Agency (EPA) jointly issued a mercury alert to the general public (ATSDR, 1997).

It is common knowledge in the Latin American and Caribbean communities that elemental mercury is used in ethnic folk medicine and for religious practices. Elemental mercury is sold under the name "azogue," "azoge" or "quicksilver" in stores (sometimes called Botanicas) which specialize in religious items used in Esperitismo (a spiritual belief system native to Puerto Rico), Santeria (a Cuban and Brazilian-based religion that venerates both African deities and Catholic saints) and voodoo. The use of mercury in religious practices is recommended in some Latin American and Caribbean communities by family members, spiritualists, card readers and santeros.

In the present work, a survey was conducted to determine the use pattern of elemental mercury among Latin American and Caribbean communities in New York City. Two hundred and three (203) adults (128 Caribbean, 75 Latin American) age 19–56 years were asked about their knowledge or use of mercury in religious/ethnic practices in their homes. Forty-four percent of the respondents from the Caribbean and 27% from Latin America stated that elemental mercury is used in their homes, cars or carried on their person in these cultural practices.

In 1994, the Agency for Toxic Substances and Disease Registry (ATSDR) collaborated with the Hispanic Health Council of Hartford and the Connecticut Department of Health Services (CTDHS) in a project inves-

tigating the use of metallic mercury during spiritual rituals (ATSDR, 1994). Azogue is the term used by the Hispanic community when referring to metallic mercury. Santeria is the product of the syncretism of the worship of the Yoruban deity called the Oricha and the cult of the saints characteristic of Spanish Catholicism. This study found some evidence of mercury use inside homes (14%) and a limited number of persons have been identified who actually use azogue. The Connecticut study focused on the use of mercury among Santeria believers in the Hispanic community of Hartford. Our survey focused on mercury use in folk medicine and in religious and ethnic practices in Latin American and Caribbean communities in New York City.

METHOD

Fourteen (14) Environmental Science students from Hostos Community College in the Bronx, New York, conducted personal interviews with 203 adults in ten sections of New York City. Respondents had to meet two criteria to participate in this survey: (a) be an adult, and (b) be Latin American or Caribbean or of Latin American or Caribbean ancestry. Latin America includes all countries south of the United States of America: Central and South America. The Caribbean is made up of all the islands in the Caribbean Sea. Guyana, which is in South America, was grouped with the Caribbean nations. The survey was conducted in the following areas in New York City: Manhattan—Clinton, Harlem and Hamilton Heights; Bronx—High Bridge, Morris Heights, Concourse Village, Mott Haven, Longwood and East Crotona Park; Brooklyn—Wingate.

After establishing that respondents met the study criteria, they were asked the following questions: (a) is mercury being used in your home in religious/ethnic practices, (b) how is mercury used in the home, (c) how often is mercury used in the home, (d) would you be willing to have your home tested for mercury, (e) how many children are in the home, (f) what are the ages of the children, (g) would you be willing to have your children tested for mercury, (h) from where did you obtain the mercury, (i) what is your or ancestors' place of origin (Latin America or Caribbean) and (j) how do you dispose of "used" or surplus mercury.

Students were instructed on the sensitive nature of this survey and on the importance of being nonjudgemental and professional. They were instructed to focus on and emphasize the Environmental Science and Public Health concerns of our research. Informed consent was obtained after the research objectives were explained to participants. Because of the sensitive

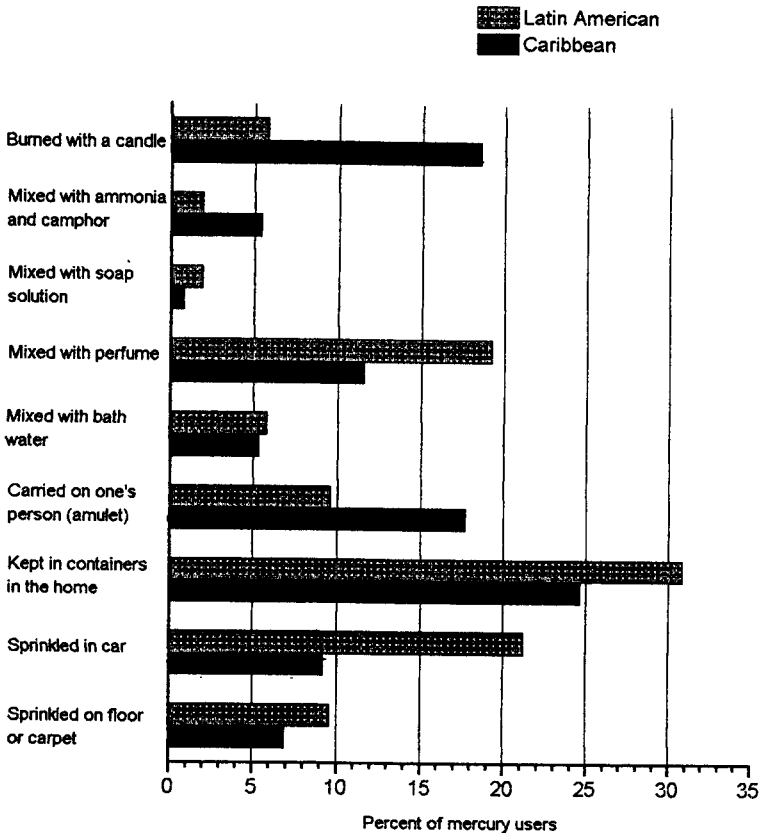


FIGURE 1. Elemental mercury use in religious and ethnic practices in Latin American and Caribbean Communities in New York City.

nature of such a survey, the names of the respondents were not requested and information about their specific country of origin was optional.

RESULTS

Fifty-four percent (54%) of those respondents who are users said that they use mercury in several different religious and ethnic practices. Some sprinkle it in their homes and cars, burn it with candles, add it to their bath water, soap solution and perfume, or wear an amulet containing mercury. Figure 1 lists the different uses. Thus, exposure is from multiple sources.

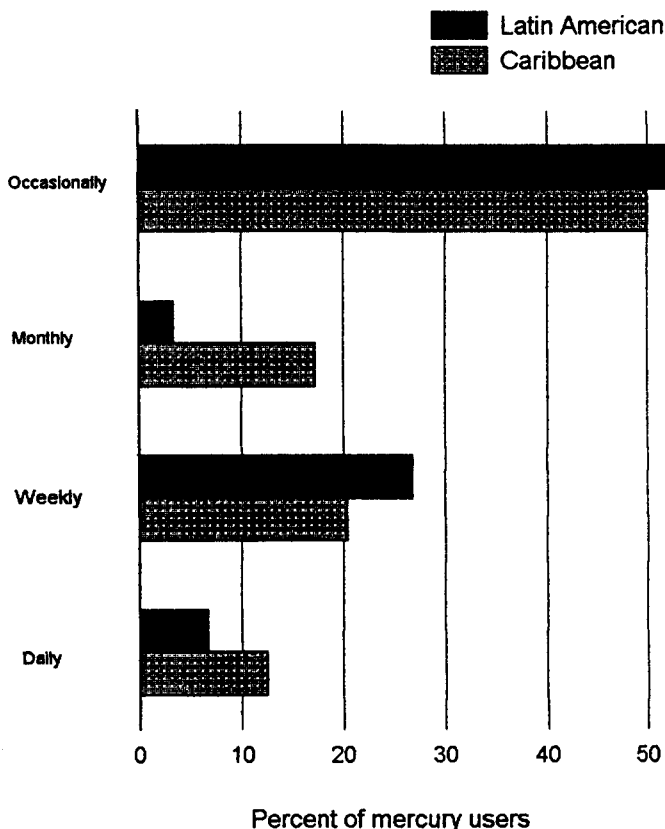


FIGURE 2. Frequency of elemental mercury use in religious and ethnic practices in Latin American and Caribbean Communities in New York City.

Figure 2 gives the frequency of mercury use in the Latin American and Caribbean communities. Fifty-four percent (54%) of the Latin American and 50% of the Caribbean practitioners use it occasionally. Twelve percent of the Caribbean and 6% of the Latino practitioners use mercury daily. The second largest groups of users in both communities are the weekly users. It is important to note here that exposure to mercury may not be limited to religious practitioners and their families, but includes all visitors to contaminated homes and passengers in contaminated cars. During the survey, we asked respondents how they disposed of their mercury and learned that "used" or "surplus" mercury was being disposed of improperly. Sixty-four

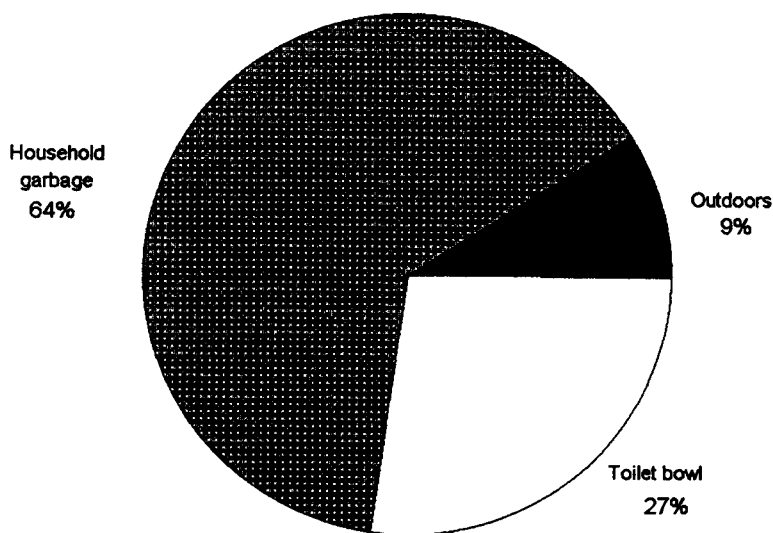


FIGURE 3. Methods of disposal of elemental mercury used in religious and ethnic practices in Latin American and Caribbean Communities in New York City.

percent said they threw it in the garbage, 27% flushed it down the toilet and 9% threw it outdoors (Figure 3).

Table 1 shows that 66% of the respondents who use mercury in religious practices and 64% of the respondents who are nonusers would welcome indoor air measurement for this metal. Sixty-one percent (61%) of mercury users and 63% of nonusers want their children tested for mercury. Thus, most users and nonusers alike are interested in indoor air measurement and biological testing.

Eighty-two percent (82%) of the respondents said they obtained elemental mercury from a Botanica, 3% brought it with them when they migrated to the US, while a total of 6% got it from their job (unspecified), a pharmacy, their landlord or their parents. The other 9% got it from unnamed sources. Twenty-six percent (26%) of the respondents gave specific country of origin data. Figure 4 gives us a sampling of nationalities involved in these practices. However, this is not truly representative since this information was optional and it was found that Puerto Ricans and Dominicans were more likely to give their country of origin.

TABLE 1

**Respondents from the Latin American and Caribbean Communities
in New York City Who Were Asked Whether They Want Their
Homes and Children Tested for Mercury**

	Indoor Air (% of Respondents)	Biological Testing (% of Respondents)	Want Test Done
Mercury users	66	61	Yes
	34	39	No
Mercury nonusers	64	63	Yes
	36	37	No

DISCUSSION

The results suggest that elemental mercury is ever present in the living environment of frequent users who are almost certainly receiving high and continuous doses. The highest exposure levels of mercury vapor are probably associated with burning elemental mercury with a candle. The temperature of a typical candle flame normally exceeds 500°C. The boiling point of liquid mercury is 356.9°C. This means that if the mercury is in contact with the flame for an appreciable amount of time, at least some of it will vaporize and fill the room with harmful vapors. This practice is theoretically the most hazardous. Adding mercury to bath water and soap solution may result in multiple exposures from inhalation, skin absorption and accidental swallowing of bath water. Mercury can also adhere to skin, and will contaminate towels and clothes.

Most human exposure to elemental mercury is by inhalation. Oral and dermal exposure, however, are also important routes of entry (Hursh et al., 1989). Mercury vapor is readily absorbed through the lungs. Studies have shown that 75–85% of inhaled doses of elemental mercury vapor were absorbed by the body (Hursh et al., 1985; Hursh, 1985; Oikawa et al., 1982). Because of its appreciable lipid solubility, the vapor readily diffuses across the alveolar membranes having an affinity for red blood cells and the central nervous system (Berlin, 1986).

The high temperature inside a contaminated car that is parked outdoors on a sunny day will result in very high mercury levels—exposing

POPULATION AND ENVIRONMENT

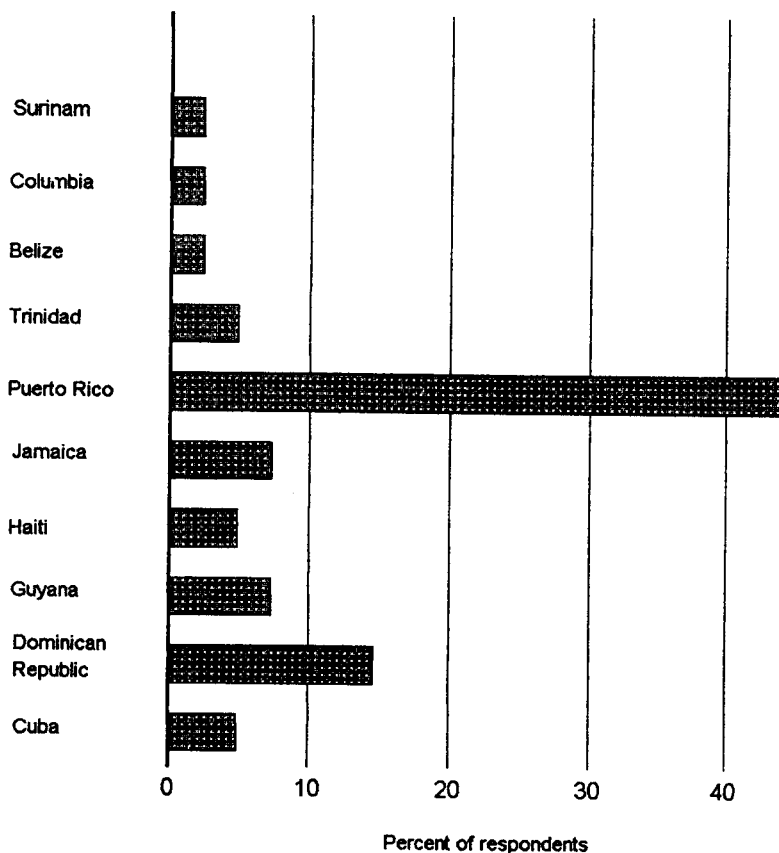


FIGURE 4. Country of origin of 26% of the respondents from the Latin American and Caribbean communities in New York City who use elemental mercury in religious and ethnic practices.

riders to potentially high doses. Some mercury-containing folk medicines are taken orally. Oral exposure is thought to be of little toxicologic consequence since metallic mercury is only slowly absorbed from the gastrointestinal tract (0.01 percent) (Fagala et al., 1992). Frequent mercury users are probably receiving very high and continuous doses.

Elemental mercury and its vapor are extremely difficult to remove from skin, clothes, furniture, carpet, floors and walls. It accumulates in electronic equipment such as computers where it vaporizes and condenses as the instrument is turned on and off in a continuing cycle depending on the temperature. Additionally, since some people use mercury frequently

and the residence life of mercury is estimated to be much longer than one year; when that mercury user vacates the property, the new occupants are unwittingly exposed to mercury for many months.

Improper disposal of mercury down the toilet bowl or in the garbage, contributes to the high mercury load found in sewage and garbage (Figure 3). It is commonly thought that the high mercury levels in sewage and garbage in New York City come from dental clinics. Our survey suggests that improper disposal by religious practitioners in the Latin American and Caribbean communities may contribute to this burden. Outdoor disposal is likely to contribute to the mercury load in the local atmosphere.

The Clean Air Act Amendments (CAA) of 1990 requires the United States Environmental Protection Agency (EPA) to study mercury emissions from electric utility steam generators, municipal and medical waste generators and other sources, including area sources. The U.S. EPA interpreted the phrase ". . . and other sources . . ." to mean that a comprehensive examination of mercury sources should be made and to the extent that data were available, air emissions should be quantified. Religious and ethnic uses of metallic mercury may pose a health problem but data are not available to assign a quantitative estimate of exposure, dose and health effects.

Very little data exists on the dynamics of mercury cycling in indoor air. For ambient air, studies indicate that the residence time of mercury in the atmosphere may be in the order of a year, allowing its distribution over long distances, both regionally and globally, before being deposited to the earth (EPA, 1996). Even after it deposits, mercury commonly is emitted back to the atmosphere either as a gas or in association with particulates to be re-deposited elsewhere. Humans, plants and animals are routinely exposed to mercury and accumulate the metal during this cycle, potentially resulting in a variety of ecological and human health impacts (EPA, 1996). Sprinkling or accidentally spilling elemental mercury on clothes, furniture, carpet, floors, walls, in cars, the natural environment and even the human body will result in contamination. The use of elemental mercury in homes and apartments poses a health risk to anyone who spends time in these locations. It has been shown that accidental exposures to elemental mercury vapors in private homes have led to interstitial pneumonia, dyspnea, lung disease and respiratory failure (Hallee, 1969; Snodgrass et al., 1981; Taueg et al., 1992). The results of this survey suggest that moderate to extensive contamination of dwellings and cars can occur following religious/ethnic use of mercury.

There is evidence that the EPA's Mercury Study Report overlooked or underestimated the contributions of elemental mercury from religious use

to indoor air contamination. The EPA has finalized mercury emission limits for municipal waste combustors, and has proposed mercury emission limits for medical waste incinerators. These emission limits are expected to reduce mercury emissions from these sources by 90% (3). No action is recommended for sources from religious and ethnic uses at this time, but there is a potential public health problem here. The EPA took this position, in part, because of a lack of data. The present study suggests that a comprehensive study of the religious and ethnic uses of elemental mercury should be undertaken including indoor air measurements. Such a study should be given high priority and should be done with the full support and cooperation of the Latin American and Caribbean communities.

ACKNOWLEDGMENTS

The author would like to thank the students of Hostos Community College in the Bronx, New York for collecting the data reported in this paper; and Drs. Michael Iba and Arthur Greenberg for critical reviews of the manuscript.

REFERENCES

- Agency for Toxic Substances and Disease Registry (ATSDR). (1994). *Use of azogue (metallic mercury) in santeria practices of residents of Hartford, Connecticut*. U.S. Public Health Service, Atlanta, Georgia.
- Agency for Toxic Substances and Disease Registry (ATSDR). (1997). *National alert: Warning about continuing patterns of metallic mercury exposure*. Atlanta, Georgia.
- Berlin, M. (1986). Mercury. In L. Friberg, G. R. Nordberg & V. B. Vouk (Eds.): *Handbook on the toxicology of metals* (2nd ed.). New York: Elsevier Press.
- Cotton, F. A. & Wilkinson, G. (1972). *Advanced inorganic chemistry* (3rd. ed.). New York: John Wiley & Sons, Inc.
- Dencker, L., Danielsson, B., & Khayat, A. (1983). Deposition of metals in the embryo and fetus. In T. W. Clarkson, G.G. Nordberg & P. R. Sager, (Eds.). *Reproductive and development toxicity of metals*, pp. 607–631. New York: Plenum Press.
- Environmental Protection Agency (1996). *Mercury study report to Congress*. (EPA publication No. 452-R-96-001). Washington: U.S. Government Printing Office.
- Fagala, G. E., & Wigg, C. L.(1992). Psychiatric manifestations of mercury poisoning. *J. Am. Acad. Child. Adolesc. Psychiat.* 31, 306–311.
- Goldwater, L. J. (1972). *Mercury—A history of quicksilver*. Baltimore, MD: York Press, Inc.
- Hallee, T. J. (1969). Diffuse lung disease caused by inhalation of mercury vapor. *Am. Rev. Respir. Dis.* 99, 430–436.
- Karpathios, T., Zervoudakis, A. & Thodoridis, C.(1991). Mercury vapor poisoning associated with hyperthyroidism in a child. *Acta. Paediatric. Scanddinavia.* 80, 551–552.
- Klaassen, C. D., Amdur, M. O. & Doull, J. (1986). *Toxicology, the basic science of poison* (3rd. ed.). New York: Macmillan.

- Hursh, J. B., Clarkson, T. W. & Miles, E. F. (1989). Percutaneous absorption of mercury vapor by man. *Archives of Environmental Health* 44, 120-127.
- Hursh, J. B. (1985). Partition coefficients of mercury (^{203}Hg) vapor between air and biological fluids. *Journal of Applied Toxicology* 5, 327-332.
- Hursh, J. B., Clarkson, T. W., Nowak, T. V., Pabicio, R. C., Mc Kenna, B. A., Miles, E. & Gibb, F. R. (1985). Prediction of kidney mercury content by isotope techniques. *Kidney International*. 27, 898-907.
- Oikawa, K., Saito, H., Kufune, I., Ohshina, T., Fujii, M. & Takizawa, Y. (1982) Mercury absorption by inhalation through the nose and expiring through the mouth at various concentrations. *Chemosphere* 11, 943-951.
- Schwartz, J. G., Snider, T. E. & Montiel, M. M.. (1992) Toxicity of a Family from vacuumed mercury, *American Journal of Emergency Medicine*. 10, 258-261.
- Snodgrass, W., Sullivan, J. B., Rumack, B. H., et al. (1981). Mercury poisoning from home gold ore processing: use of penicillamine and dimercaprol *J. Am. Med. Assoc.* 246, 1929-1931.
- Taueg, C., Sanfilippo, D. J., & Rowens, B., Szejda, J. & Hesse, J. L. (1992). Acute and chronic poisoning from residential exposures to elemental mercury. *J. Toxicol. Clin. Toxicol.* 30, 63-67.