

Environmental Assessment and Risk Analysis Element



Research Project Summary



May, 2003

Cultural Uses of Mercury in New Jersey

Alan H. Stern, Dr.P.H.¹

Michael Gochfeld, M.D., Ph.D.^{2,3}

Donna Riley, Ph.D.⁴

Alison Newby, Ph.D.⁵, Tomas Leal⁶,

Gary Garetano, M.P.H.⁷

Abstract

This study has two components:

1. Interviews with practitioners of Santeria and related practices
2. Survey of air mercury levels in buildings located in Hudson County.

Twenty-two Santeria “priests” (i.e., Santeros), practitioners and/or botanica owners in Hudson County, NJ, were interviewed to determine their knowledge and use of mercury. Of the 21 interviewed, 17 used mercury in some form. All the interviewees, however, denied recommending or endorsing sprinkling of mercury or recommending that clients use mercury on their own. This, however, does not preclude independent, or more cultural uses of mercury by individuals. While initial indications pointed toward Caribbean and/or Afro-Cuban mercury-related practices, seven of those using mercury in rituals were from Mexico, Central America, or South America. In addition, anecdotal information from interviewees suggests that informal practices with mercury may specifically be part of Dominican cultural practices. Measurements of mercury concentration in air were obtained in the hallways of 34, and in the entrance vestibules of an additional 33 multi-family apartment buildings in Union City and West New York (Hudson County), NJ, using a highly sensitive Lumex portable mercury analyzer. Comparison buildings in Montclair, NJ, were also analyzed. In Hudson County the maximum building hallway concentration (as a possible indicator of mercury use in apartments) was significantly greater than the mean outdoor concentration in 38% of the surveyed buildings. In two buildings the maximum hallway concentration exceeded the U.S.EPA’s Reference Concentration (RfC) guideline of 300 ng/m³ although levels were significantly decreased on subsequent visits. Elevated hallway levels appear to result from specific apartments. These results suggest higher concentrations of mercury vapor in apartments. These results are consistent with intentional mercury use inside at least some of the buildings surveyed, but may also be consistent with recent data on indoor background levels resulting from historic spills.

Introduction

Anecdotal reports and small-scale observations over the course of the last decade in the New York City metropolitan area, Chicago, and elsewhere have suggested that mercury (Hg), particularly elemental mercury (Hg⁰) is used in certain cultural, folk, and religious practices. These have centered on Caribbean and Latin American populations, and appear to be linked to the Afro-Caribbean practice of Santeria, and related magico-religious practices. The reports suggested that uses of elemental mercury included amulets, sprinkling in cars, on household surfaces, and on and around newborns. Such uses could result in indoor air levels of mercury that pose a health hazard. Mercury droplets embedded in and adsorbed to household materials and surfaces could provide a long-term source of exposure which would be difficult to remediate. These studies have identified

botanicas as a major source for mercury in these practices. Mercury from botanicas appears to be sold typically in gelatin capsules. Laboratory measurement and modeling conducted in earlier research by one of the investigators (Riley) suggested that sprinkling of the contents of a typical capsule could result in household mercury concentrations in air which exceed the Agency for Toxic Substances Disease Registry’s (ATSDR) minimal risk level (MRL) of 200 ng/m³. Little information has, however, been reported on the extent of cultural mercury use, the characteristics of its use, or the demographics of the users. This study was designed to provide preliminary information to aid in assessing the potential for an environmental health problem resulting from cultural use of mercury in NJ. The study had two components: 1. To conduct interviews with parishioners of Santeria (through a collaborating Santeria

priest, a Santero) to elicit information on whether and how mercury is used in Santeria, and 2. To survey mercury vapor levels in hallways and vestibules of apartment buildings in Hispanic areas of NJ to detect evidence of possible residential mercury use.

Methods

Interview Study

With the assistance of one of the investigators (Leal), who is, himself, a Santero (Santeria priest), contact was made with Santeros and other practitioners of Santeria in Hudson County, NJ. That this investigator was initiated into the generally secret rites of this practice, facilitated relatively open exchange of information in an otherwise secretive environment. Interviewees were questioned about their extent of initiation into the practices, their use of mercury in their religious practices, and about "prescription" of mercury in the rituals performed for their clients. Interviewees were also questioned about their knowledge of the hazards of mercury. Interviewees who were also botanica owners/employees were questioned about the sale of mercury in their establishments.

Mercury Vapor Monitoring Survey

The Mercury Vapor Monitoring Survey was intended as a method of screening buildings for possible residential mercury uses. Since mercury vapor concentrations were measured only in hallways and vestibules, the values obtained do not relate directly to exposure or health risk. Rather they are intended only to provide a semi-quantitative indication of indoor mercury use. Apartment buildings in Union and West New York (Hudson County), NJ, were selected on the basis of their location within 1/2 mile of a botanica. Real-time mercury vapor concentration measurements were made using a Lumex portable mercury vapor spectrometer with a sensitivity of 2 ng/m³. In buildings with interior access, mercury air concentrations were measured at multiple locations in the hallways on each floor of the building. In buildings without interior access, mercury air concentrations were measured in the entrance vestibule. Each reported reading was generated as the average of three 10-second measurements at sampling location. Attempts were made to localize elevated hallway mercury concentrations to the doors of specific apartments. No access into apartments was attempted. The number of units in each building was recorded, and data was subsequently obtained on the age of the buildings. Two buildings in Montclair, an area with little Hispanic/Latino population, were selected for comparison monitoring.

Results and Discussion

Interview Study

Table 1 provides a brief description of the 22 practitioners of Santeria and related practices interviewed in the study. It is interesting to note that 32% of those interviewed were from areas other than the Caribbean (Mexico and South America). About half of these practitioners said that they used mercury in their practice of Santeria and related rituals. This suggests that the cultural use of mercury may extend to groups beyond the Caribbean and Afro-Cuban communities. Mercury use was reported by 77% of the interviewees. Nonetheless, the interviewees reported that they do not

Table 1. Interview Summary Table

| Respondent | Date 2001 | Sex | Race/Ethnic Background | Status in Religion | Botanica Owner* | Azogue (Mercury Use) |
|------------|-----------|--------|------------------------|--------------------|-----------------|----------------------|
| 1 | 3-Dec | Female | Brazilian | Espiritista | own shop | Yes |
| 2 | 5-Dec | Female | Mexican | none | Employee | No** |
| 3 | 5-Dec | Female | Cuban | Santera | Yes | Yes |
| 4 | 6-Dec | Male | Afro-Cuban | Babalao | No | Yes |
| 5 | 6-Dec | Female | Afro-Cuban | Santera | Yes | Yes |
| 6 | 6-Dec | Male | Afro-Cuban | Babalao | No | Yes |
| 7 | 7-Dec | Male | Peruvian | Babalao | No | Yes |
| 8 | 7-Dec | Female | Afro-Cuban | Santera | No | Yes |
| 9 | 7-Dec | Female | Dominican | Santera | Yes | Yes |
| 10 | 7-Dec | Male | Mexican | Santero | Yes | Yes |
| 11 | 8-Dec | Male | Ecuadorian | Practitioner | No | No** |
| 12 | 8-Dec | Male | Dominican | Practitioner | No | No** |
| 13 | 10-Dec | Male | Peruvian | Practitioner | No | No |
| 14 | 11-Dec | Female | Columbian | Santera | Yes | Yes |
| 15 | 11-Dec | Female | Cuban | Practitioner | No | Don't know |
| 16 | 11-Dec | Female | Dominican | Santera | Yes | Yes |
| 17 | 11-Dec | Female | Cuban | Santera | Yes | Yes |
| 18 | 12-Dec | Female | Afro-Cuban | Santera | No | Yes |
| 19 | 12-Dec | Male | Cuban-American | Santero | Yes | Yes |
| 20 | 13-Dec | Male | Columbian | Palero | No | Yes |
| 21 | 14-Dec | Male | Afro-Cuban | Santero | Yes | Yes |
| 22 | 14-Dec | Female | Afro-Puerto Rican | Espirista | Yes | Yes |

*If a botanica is run by a husband and wife and both were interviewed, both will be designated as botanica owners in this category. Respondent number one owns her own spiritual consulting shop, but this is not a botanica.

**Respondent does not use azogue but has sold it in his/her place of employment "prescribe" mercury for clients to use on their own. Rather, they conduct the rituals themselves for their clients with small amounts of mercury. This appears to be rooted in issues of compensation and of secrecy. The money paid to the Santeros is for conducting the rituals rather than for advice about what rituals to perform, and the details of the rituals are not disclosed to the clients. The interviewees expressed surprise at accounts of sprinkling, or "burning" mercury in households. Some interviewees attributed such practices to Dominicans, Puerto Ricans, Mexicans, Brazilians, and/or Nigerians. One specific anecdotal report related information that such practices had originated in Haiti, and been adopted by Dominicans. One of the investigators spent time in Cuba on an unrelated grant in 2002 conducting research on Santeria and Palero practices. She reported that none of the practitioners interviewed there had heard of sprinkling or "burning" mercury, or of mixing mercury with bathwater or personal products. Thus, it appears that while some mercury use is involved in the formal practices of Santeria, if indiscriminant use is occurring, it may be linked to more informal and broadly cultural practices. Despite some apparent degree of caution in handling mercury, the interviewees were generally unaware of the hazards of mercury. In addition, there is a general notion in this community that mercury is an illegal substance. This makes information gathering difficult and poses problems for outreach.

Mercury Vapor Monitoring Survey

Outdoor mercury vapor concentrations averaged 5 ng/m³

Table 2. Mean and Maximum Mercury Vapor Concentration in Interior Hallways

| ID | Bldg Mean (ng/m ³) | Bldg Max(ng/m ³) | ID | Bldg Mean (ng/m ³) | Bldg Max(ng/m ³) |
|-----|--------------------------------|------------------------------|-----|--------------------------------|------------------------------|
| 101 | 14 | 35 | 118 | 4 | 4 |
| 102 | 299 | 2022 | 119 | 10 | 12 |
| 103 | 1 | 2 | 120 | 10 | 11 |
| 104 | 4 | 20 | 121 | 107 | 774 |
| 105 | 59 | 82 | 122 | 12 | 13 |
| 106 | 2 | 6 | 123 | 2 | 4 |
| 107 | 1 | 3 | 124 | 20 | 22 |
| 108 | 9 | 10 | 125 | 14 | 17 |
| 109 | 3 | 5 | 126 | 7 | 9 |
| 110 | 73 | 129 | 127 | 9 | 12 |
| 111 | 1 | 4 | 128 | 26 | 32 |
| 112 | 17 | 20 | 129 | 12 | 14 |
| 113 | 15 | 19 | 130 | 13 | 15 |
| 114 | 12 | 14 | 131 | 9 | 16 |
| 115 | 9 | 13 | 132 | 13 | 45 |
| 116 | 7 | 10 | 133 | 6 | 7 |
| 117 | 11 | 12 | 134 | 33 | 52 |

with a 95th percentile of 21 ng/m³, and a maximum of 26 ng/m³. These values are consistent with levels generally reported in urban areas. Table 2 presents a summary of the mercury vapor concentration in interior hallways of buildings in Union City and West New York. The average mercury vapor concentration for the 34 buildings with access to interior hallways was 25 ng/m³. This value is, however, skewed upward by a few buildings with markedly elevated concentrations. In 38% of the buildings, the maximum hallway concentration significantly exceeded the outdoor concentration (> mean outdoor concentration + 2 standard deviations). In two buildings, the maximum hallway concentrations were 155 and 400 times the average outdoor concentration. In both cases the indoor concentrations exceeded the U.S.EPA's Reference Concentration (RfC) guideline of 300 ng/m³. Elevated hallway mercury concentrations were generally traceable to the doorways of individual apartments. In the two buildings with the highest hallway concentrations, there appears to be a clear indication of a mercury spill or uncontrolled mercury use inside apartments. In five other buildings whose maximum hallway concentrations were larger than the maximum outdoor concentrations, there is a suspicion of mercury use or spillage in apartments. Subsequent sampling visits were made to the buildings with the two highest mercury concentrations. Given the tendency of spilled mercury droplets to continue to volatilize over long periods of time, it is surprising that these highest concentrations varied considerably, declining on some visits by a factor of more than 140. In the building with the largest number of follow-up visits (6), the levels declined and rose, but remained significantly elevated on most visits. The reason for this variability is not clear, but may be a function of ventilation. In 33 buildings with access to entrance vestibules only, the mean mercury concentration was 8 ng/m³, and the maximum concentration was 29 ng/m³. These values are difficult to interpret, but at least some buildings had vestibule concentrations which exceeded the maximum outdoor level. In two comparison buildings in

Montclair, NJ, the mean mercury hallway concentrations were 5 and 24 ng/m³, and the maximum concentration was 36 ng/m³. It was later reported that a "shaman" lived in the building with the maximum concentration. The significance of this is unclear.

It seems clear that there are significantly elevated indoor mercury concentrations in at least some of the buildings surveyed in Hudson County in areas anecdotally associated with cultural mercury use. A recent report of mercury vapor levels inside 12 New York City apartments selected without reference to possible mercury use detected a maximum concentration of 522 ng/m³, and two apartments with concentrations >50 ng/m³. There was no evidence of intentional mercury use, and in some locations, historical thermometer breakage was reported (Carpi and Chen, 2001). Levels measured inside living spaces cannot be easily compared to levels measured in hallways. However, comparison of the findings in the current study to those of Carpi and Chen (2001) suggests that the highest concentration found in the hallways in the current study may be consistent both with intentional (i.e., cultural) mercury use, and with unintentional breakage of mercury-containing appliances.

Recommendations

1. Additional indoor air sampling is warranted to better characterize mercury levels in apartments. Comparable sampling in areas with different ethnic characteristics is needed to better understand the relative contributions of intentional/cultural mercury use, and unintentional mercury appliance breakage.
2. A better understanding of cultural mercury uses in specific ethnic communities in Hudson County including, but not limited to, the Dominican community is important in order to target outreach efforts.
3. An educational effort aimed at those who sell mercury, recommend its use, and/or use it themselves is needed in order to ensure that the potential for a significant public health problem is minimized.

References

Carpi, A., and Chen, Y. Gaseous elemental mercury as an indoor air pollutant. *Environ. Sci. Technol.* 35:4170-4173 (2001).

Prepared By

1. Alan H. Stern, Dr.P.H, New Jersey Department of Environmental Protection, Division of Science, Research and Technology
2. UMDNJ-Robert Wood Johnson Medical School, Piscataway, NJ
3. Environmental and Occupational Health Sciences Institute, Piscataway, NJ
4. Picker Engineering Program. Smith College, Northampton, MA
5. Dept. of Sociology and Anthropology, New Mexico State Univ. Las Cruces, NM
6. New Mexico State Univ.; Santero
7. Hudson Regional Health Commission, Secaucus, NJ

STATE OF NEW JERSEY

James E. McGreevey, Governor

Department of Environmental Protection

Bradley M. Campbell, Commissioner

Division of Science, Research & Technology

Martin Rosen, Director

Environmental Assessment & Risk Analysis Element

Dr. Eileen Murphy, Assistant Director

Please send comments or requests to:

Division of Science, Research and Technology

P.O.Box 409, Trenton, NJ 08625

Phone: 609 984-6070

Visit the DSRT web site @ www.state.nj.us/dep/dsr



RESEARCH PROJECT SUMMARY