

CULTURAL USES OF MERCURY IN NEW JERSEY

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EXECUTIVE SUMMARY

Mercury is a highly toxic chemical that enters the environment in a variety of ways. Waste from processes that deliberately employ mercury such as dentistry and chloralkalai or pesticide plants has been considered the main source, but New Jersey's Mercury Task Force and other agencies concluded that burning of fossil fuels and the metal processing and recovery industry, were two major sources. Among the minor sources, the use of mercury in a variety of cultural and quasi-religious procedures was identified by the Task Force as an area of great uncertainty. Arnold Wendroff, PhD, has been a major advocate for dealing aggressively with this source of mercury, based on his personal investigations in New York. Although cultural uses may be small in the external environment, it may be a major

source of indoor air contamination.

The mercury use practices were associated mainly with the practice of Santeria among persons of Caribbean origin. It has not been clear how mercury has been used for amusement, good luck, medical or spiritual purposes. Uses included amulets containing mercury and the sprinkling of mercury droplets, in automobiles, through candles, and on newborn infants as a token of good luck.

Accordingly the Task Force recommended that NJDEP investigate the nature and extent of cultural uses of mercury and the possible implication for human exposure and the contamination of residential buildings. The present preliminary study had two components: 1) interviews with practitioners of Santeria and related spiritual beliefs and 2) an air survey of buildings in Hudson County.

Leal and Newby interviewed 22 practitioners or botanica employees regarding their knowledge and use of mercury. Of the 21 practitioners, only four did not use mercury in some form. The results show that Santeria and related practices are widespread among Caribbean and Latino populations in Hudson County, and that many of the practitioners use mercury or mercury compounds in various forms of practice and services that they provide to clients. All of the interviewees denied recommending or endorsing practices involving the sprinkling of mercury in homes or cars, nor did they recommend that clients use mercury on their own. This appears to be rooted in the way they practice and receive compensation, and not because they consider mercury unusually hazardous. Most practitioners were aware that mercury can be hazardous. Among those who also sell or formerly sold mercury, several believe that it is now illegal to sell mercury (it is not illegal).

The air monitoring study involved 260 mercury readings (each an average of three 10-second counts) obtained by a real-time portable Lumex mercury analyzer, at 212 locations mainly in Union City and West New York, including outdoor samples, apartment building hallways and vestibules, in the botanicas and other buildings, and at five apartment buildings in Montclair. The median outdoor reading was 3.3 ng/m^3 . And 90% of the readings were below 12 ng/m^3 with a maximum of 26. These are similar to urban background mercury concentrations in the literature. Indoor building-average readings ranged from 1 to 299 with a maximum of 2000 ng/m^3 . The mean for 34 buildings in which halls were accessed was 24.8 (SD=53.2) with a median of 10.5 ng/m^3 . The maximum building average was 299 ng/m^3 . There were 33 buildings in which only the vestibule could be accessed. Mercury ranged from 0.7 to 29 ng/m^3 , with a mean of 7.5 and median of 5.3 ng/m^3 .

From these findings it is clear that the ambient air levels in these urban areas was not elevated, and that within residential buildings, most levels were below 20 ng/m^3 . However,

6 out of 34 building (17.7%) had average readings above 20 ng/m³. Since many of the sampled areas were well ventilated, these readings are not over-estimates. It appears that a significant minority of buildings in the West New York area have elevated mercury readings, although none exceeded the ATSDR MCL. Nonetheless, it is apparent that there are unappreciated sources of mercury in these buildings. Whether this can be attributed to cultural uses of mercury, or to accidental spills, is unknown. Vestibule readings > 20 ng/m³, predicted the likelihood that readings greater than 50 ng/m³ would be obtained in the hallways. Three readings in botanicas ranged from 40 to almost 500 ng/m³.

Based on these studies we conclude that

- 1) mercury is used in Santeria practices which involve spiritual healing.
- 2) Other reported uses of mercury including sprinkling in homes and cars, is not recommended by Santeros. It does appear to have a cultural relationship to the Dominican Republic, perhaps more than the Afro-Cuban traditions. It is labeled a cultural rather than spiritual usage.
- 3) Outdoor ambient air levels in West New York are generally within expected urban limits.
- 4) Most indoor samples were low, but about 17% of buildings had average air levels above 20 ng/m³, with one building average at 299 and a maximum internal reading of 2000 ng/m³.
- 5) The source of such elevated air levels has not been identified, but is possibly linked to sources in individual apartments, compatible with accidental spills or cultural practices.
- 6) Publicity has already driven mercury sales underground in West New York/Union City. Further regulation including banning sales of mercury, may criminalize the practice without reducing sales or usage.
- 7) An educational program is recommended to make the hazards known to practitioners, vendors, and users, and to minimize and contain use, and prevent spillage and long-lived residual mercury.
- 8) Santeros deny that they recommend the various reported uses of mercury attributed to Santeria. Nonetheless they are largely unaware of the hazardous nature of elemental mercury and are under the mistaken impression that skin contact rather than inhalation is the significant route of exposure.

Recommendations

Additional indoor air sampling is warranted to better characterize mercury distribution,

particularly in apartments. Comparable sampling in areas with different ethnic composition would provide reference data.

A better understanding of the cultural uses within the Dominican community in Hudson County is important.

An educational program aimed at those who sell mercury, recommend its use, or use it is essential. This should clarify the nature of the hazard from elemental mercury, emphasize the need to minimize its use, and demonstrate the necessity of keeping it in closed containers. Recommendations for disposal of mercury products and cleanup of spills is also important, and is generally lacking.

BACKGROUND

Mercury is one of the few elements that is liquid at ambient temperature. It is 13 times heavier than water and its unique properties both in its elemental form and in combination with other chemicals, has led to a wide variety of uses. Its physical properties have made it useful in instruments (thermometers, barometers), as a seal (gas meters and vacuum pumps), and in switches. It readily amalgamates with silver and gold, leading to its widespread use in dentistry and gold mining. Its high toxicity makes it a potent biocide. Thimerosal is bactericidal and is used in household antiseptics, but also as a stabilizer in vaccines. Other organomercurials have been used in antifouling paints, and as a fungicide in agriculture. Many of these uses have been curtailed, and others are being phased out. Today most concern focuses on methylmercury which is produced in nature when anaerobic bacteria convert inorganic and elemental mercury into the more toxic organic form which then bioamplifies in aquatic food chains. Humans are thereby exposed to methylmercury when they eat fish.

The Task Force focused its attention on sources of mercury entering and affecting environmental receptors. Certain types of exposure----infants to thimerosal in vaccines, adults to mercury in dental amalgams, and cultural uses of mercury---garnered substantial attention, but were fraught with uncertainties regarding exposure and toxicity.

The Task Force learned that Santeria is a cultural practice in Latino communities in the New York metropolitan area. There was some question as to its origin and to practices in the Cuban vs. Dominican communities. There was a question concerning the African contribution to the beliefs and practices of Santeria. There was no information on how widespread the Santeria practices are. In Brazil, condable, a related belief system is practiced by people who also attend Catholic church regularly. There was reason to believe that even among people with Caribbean or Afro-Cuban or Haitian ancestry, the practices

involving mercury might have originated or at least matured in the New York area.

Elemental mercury is a liquid at room temperature. Even at ambient temperature mercury vapor is generated by evaporation. Practices which involve the handling or dispersal of elemental mercury especially in confined spaces such as a home can generate significant mercury vapor concentrations. Mercury vapor is well absorbed when inhaled and readily crosses the blood-brain barrier. It is a potent neurotoxin. The release of elemental mercury, both intentionally or unintentionally, in residential structures may result in significant human exposure and is a public health concern.

Wendroff (1990) first reported the use of mercury in Latin American and Caribbean communities for occult purposes. He indicated mercury was widely available in shops called “botanicas”. Mercury was reportedly available in 86% (99 of 115) such shops surveyed nationally. Wendroff described the “prescription” that mercury be sprinkled on floors or mixed with soap and water and used to mop the floor among the methods to rid the house of evil influences.

Zayas and Ozuah (1996) report that 93% of the 41 botanicas surveyed in the New York City area report selling elemental mercury. The majority of botanicas reported selling several capsules of mercury on a daily basis. The most common conditions for which the use of mercury was recommended were for luck in love, money, work or health (78%) and/or protection against evil (56%). Twenty-nine percent (29%) of respondents further reported sprinkling of mercury in the home to be a common method of use.

Johnson (1999) surveyed 203 individuals in New York City regarding cultural uses of mercury. He reports that 44% of Caribbean and 27% of Latin American respondents acknowledged that elemental mercury is used either in their home, car or carried on their person. Eighty-two percent (82%) of respondents obtained their mercury from botanicas.

Most recently, Riley et al. (2001) noted the continued availability of mercury in 14 of 15 botanicas surveyed in New York, New Jersey and Pennsylvania. Ongoing surveys confirm the continued availability of mercury in botanicas in northern New Jersey (Newby, 2002). Mercury is commonly sold packaged in gelatin capsules though other packaging may be used. Gelatin capsules have been found to contain approximately 9 grams of mercury (Riley et al. 2001, Wendroff, 1990).

At least one case has been reported of overexposure to mercury related to cultural practices.

Forman et al. (2001) reported a case in which nine children and their mother were overexposed to mercury and required chelation therapy. The source of the mercury appears to have been a vial of mercury that had been used to prepare mercury-filled amulets.

Riley et al. (2001) modeled expected mercury concentrations from the release of 9 grams of mercury, the amount contained in an average gelatin capsule. Resultant modeled concentrations (7 ug/m^3), allowing for air exchanges, were an order of magnitude greater than ATSDR's minimal risk level for mercury (0.2 ug/m^3) but under OSHA allowable exposure limits (100 ug/m^3) or even the recommended exposure level of 25 ug/m^3 . The investigators aptly note that if such practices are conducted repeatedly, mercury vapor concentration could be significantly greater.

Thus, elemental mercury is commonly available in a quantities which if dispersed could create significant vapor concentration. The presence of elemental mercury in residential structures may expose both current and future occupants. Those who are exposed to mercury may have no idea of the prior use of mercury within their residence.

Mercury Task Force Recommendations

After reviewing information from several sources including Wendroff and Riley, the NJ Mercury Task Force learned that mercury can be purchased in many "botanicas", in Latino neighborhoods in northern New Jersey. The Task Force heard and read that mercury was considered "good luck" and was sprinkled in new cars, in homes, and even on newborn babies. The Task Force had very little objective data from New Jersey, but recommended that the State:

"Reduce exposures from cultural uses of mercury. To accomplish this, New Jersey should:

1. Complete research and evaluate available data on cultural uses and associated exposures" (NJMTF 2001 vol 1: p.11).

Both educational and regulatory interventions were considered, pending the results of the research.

Accordingly the current research was undertaken to identify the ways in which mercury was used in various cultural practices and the likelihood that residential structures were being contaminated by mercury. This report contains two chapters. The first chapter prepared by Dr. Alison Newby, provides details of interviews conducted in Union City, NJ, by Tomas

Leal, himself a practicing Santero. Dr. Newby and Mr. Leal spent two weeks in Union City. They identified gatherings where Santeros and other practitioners were present, introduced themselves as researchers, and conducted open-ended interviews with an emphasis on mercury. The second chapter was prepared by Mr. Gary Garetano, describing the results of air monitoring in the public-access areas of residential buildings in the neighborhood of botanicas and in reference neighborhoods.

Chapter 1: Final Report on Interviews

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Interview Summary Table

Respondent	Date 2001	Sex	Race/Ethnic Background	Status in Religion	Botanica Owner*	Azogue 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	Colombian	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	Colombian	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

This report covers the fieldwork conducted December 2-16, 2001 in Hudson County, New Jersey by C. Alison Newby and Tomas Leal. We begin with a presentation of the basic demographics of the respondents and information obtained about their elemental mercury use. The second section of the report discusses the potential differentiation between “religious” and “cultural” uses of mercury, and the final section presents a brief background on Santeria and the process of becoming a santero(a).

Below is a brief description of the respondents listed in the summary table, along with their mercury use. We do not include a discussion of the “prescription” of elemental mercury which we found does not really apply to this population. Most of those santeros (as) and babalaos interviewed may perform rituals which include mercury, but do not prescribe it. This is discussed in greater detail in a subsequent section.

Repondents

- 1.) Brazilian espiritista and condomble practitioner, late 50s (interviewed 12/3/01)

Stated that elemental mercury “could be useful for some problems.” Did not want to talk about the ways in which she uses mercury.

- 2.) Mexican (Oaxacan) botanica employee, 18 years old, doesn’t know anything about Santeria (interviewed 12/5/01)

Working in a botanica is just a job for this young woman. She doesn't know anything about Santeria. She did say that her boss doesn't sell mercury because it's illegal.

3.) Cuban Flower shop/botanica owner, early 50s, more than 20 years as an initiated santera

Uses elemental mercury in santeria rituals. Will also get mercury for interested clients.

4.) Newly initiated Babalao, R.C., and his wife, botanica owners (interviewed 12/6/01)

R.C. is an Afro-Cuban male of about 45 years of age. He has lived in the United States for eight years and has been a Santeria practitioner for about 40 years. Less than a year ago, he returned to Cuba to be "confirmed" in the religion, receive the saints and pass Ifa (become a Babalao). R.C. had wanted to go through this process when he lived in Cuba, but never had the money.

5.) R.C.'s wife is a 52 year old Afro-Cuban Santera. (Interviewed 12/6/01)

She arrived in the U.S. in 1980 and owns a local botanica. She was initiated into Santeria before leaving Cuba and helped her husband to return to Cuba for his ceremonies.

As mentioned above, the couple owns a thriving botanica business, with many Mexican, Dominican, Cuban, Haitian, and African-American customers. Although both work in the business, R.C. cannot see clients alone (he must be accompanied by at least one other babalao) for spiritual consulting since he is still in his one year initiation period. His wife does do spiritual consulting there in the botanica. Unfortunately, she was visiting Cuba for most of the time we were in the field. She does use elemental mercury in her religious practice.

Although no ritual practices were observed, R.C. said that they do use mercury in a number of rituals, but no mercury is sold in their botanica. Mercury for personal use is obtained from thermometers purchased at the local pharmacies.

6.) Afro-Cuban Babalao from Havana, 44 years old, 20+ years in religious practice (interviewed 12/06/01)

Uses elemental mercury and precipitado rojo in secret santeria rituals. Does not prescribe

mercury. Was unaware of other uses (sprinkling, etc.) of mercury in the community.

7.) Peruvian babalao, 54 years old, 10 years in the religion, 4 as a babalao (interviewed 12/7/01)

This respondent affirmed that elemental mercury must be used in certain secret rituals. He does not “prescribe” mercury, but uses it in rituals that he is hired to perform. He had heard that “some people” sprinkled mercury, but didn’t know who these people were or why they would use mercury in that way.

8.) Cuban santera and wife of #7, 60 years old, approximately 30 years as an initiated santera (interviewed 12/7/01)

This santera uses mercury in rituals, but was not particularly interested in discussing this with our research team. She did say that there are so many ways in which rituals can be done that she didn’t understand why people appear to be so interested in mercury. We did not force the issue with this informant.

9.) Dominican Santera and Botanica owner, mid-50s, 5-6 years as an initiated Santera (interviewed 12/7/01)

Uses elemental mercury and red, yellow and blue precipitados in secret Santeria rituals. Although it was not clear if she “prescribes” mercury, she did say that elemental mercury could be sprinkled for good luck or could be placed in a water goblet (with water and camphor). She said that she had heard that mercury was used in many different ways, but that she only used it in the ways mentioned above. The various types of precipitado were not prescribed.

10.) Mexican Santero and husband of #7, mid-50s, 2 years as an initiated Santero (interviewed 12/7/01)

Became a santero in order to help his wife with her religious consulting. He does not consult on his own, and is not particularly interested in religious practice. This respondent has *pinardo*, which is the right to sacrifice animals in Santeria rituals. Not every Santero has the money to pay to acquire this privilege.

This Mexican santero is also able to give a santo which must have mercury. The mercury is inside a sealed gourd. Our conversation with this respondent was limited, and we are not

sure if he prescribes mercury for other uses.

11.) Ecuadorian male, grocery store employee, mid-20s, have been to consultas (interviewed 12/8/01)

Although this informant did not say that he had used mercury personally, he did say that it was widely used and that the small grocery store/bodega where he works used to sell it.

12.) Dominican male, grocery store employee, mid 20s, have been to consultas (interviewed 12/8/01)

This informant was interviewed together with #11. He confirmed that their bodega used to sell mercury to people who asked for it. It is no longer sold there because it's thought to be illegal.

13.) Peruvian practitioner, 46 years old, approximately 3 years in Santeria (interviewed 12/10/01)

This respondent knew that mercury was used in certain rituals, but did not know in what ways. He did not use mercury himself or prescribe it to others. It is possible that he has had rituals which use mercury performed for him.

14.) Colombian Santera and botanica owner, 5 years as an initiated santera (interviewed 12/11/01)

C.G. is a 43 year-old, Colombian Santera . She is the owner of a botanica, but says that most of her income is from spiritual consulting as opposed to sale of spiritual items. She lamented the fact that it's now more difficult to sell mercury due to crackdowns by inspectors and the fact that people can get into trouble. C.G. said that mercury made up an important part of her sales in the past. She has sold mercury to other Colombians, Mexicans, Cubans and North Americans. She keeps it in her house rather than the botanica and prefers to sell larger quantities as opposed to capsules, although she used to sell capsules as well.

15.) Cuban botanica employee (white female), 48 years old, 15 years as a practitioner (interviewed 12/11/01)

This woman has sold elemental mercury in the past but said that her boss received "a letter

from Public Health” saying that it was illegal to sell mercury. The respondent had only been in the United States for five months at the time of the interview and was not aware of the different uses of mercury in the area. She does not use mercury. This shop does sell red, blue and yellow precipitado and she has recommended it to customers to “accelerate” their spiritual work.

16.) Dominican botanica owner, female (employer of #12), approximately 50 years old, 3 years as an initiated santera, 15 years practicing santeria (interviewed 12/11/01)

This botanica owner said that she no longer sells elemental mercury because of the crackdowns by the “inspectors.” She did say that she may prescribe mercury to someone in a spiritual consultation, but that she will not sell it herself. Fear of reprisals by officials made obtaining more information difficult.

17.) Cuban wife of Puerto Rican botanica owner, mid-50s, more than 30 years as an initiated santera (12/11/01)

This woman works in her husband’s botanica, but she does not do spiritual consultations. At the same time, this botanica sells mercury capsules to people they feel comfortable with. Tomas purchased mercury here (which he left with Gary Garetano). They do not prescribe mercury, but wait for people to ask for it. They are aware of the fact that elemental mercury is being used in a number of ways (religious/cultural) in the community. Mercury capsules are very cheap in this botanica (\$1.50). Their logic is that people won’t report them if they get a bargain.

18.) Afro-Cuban santera and strip club owner, late 40s, 12 years as an initiated santera (interviewed 12/12/01)

Although this informant is an initiated santera, she does not see clients and only does spiritual work to help her business (attract clients, etc.). Elemental mercury use is very infrequent. She has heard of other types of mercury use in the community, but was not able to be specific.

19.) Cuban American botanica owner, C.A., and his wife: (interviewed 12/12/01)

C.A. is a white, Cuban American Santero (33 years old). He owns a botanica and has a B.S. in computer programming. While he’s at work, his wife (28 years old), who’s Cuban/Puerto Rican and born in the U.S. works in the botanica. She practices Santeria as

well, but has never been initiated. C.A. plans to go to Cuba in the future to be initiated as a Babalao; his wife will be initiated as a Santera at the same time. They would prefer to be initiated in Cuba where they believe that the process is more “natural” as well as being less expensive.

C.A. was very forceful in his statements about mercury. He told Tomas that he doesn't sell mercury and doesn't want to know anything about it because of the inspectors. According to C.A., you can get into a lot of trouble if you are caught with mercury and it's not worth the trouble for the small amount of money it brings in. Of all respondents, C.A. was the most adamantly opposed to mercury, but for legal reasons as opposed to potential dangers to one's health. He does use mercury in his own personal rituals, but does not prescribe it for others. Since his destiny is to become a babalao, he is not permitted to engage in religious consulting.

20.) Colombian Palero (boyfriend of #14), 32 years old, 3 years in Palo (interviewed 12/13/01)

Uses elemental mercury in his prenda. Does consultations for his friends (from NYC) when they're setting up a “business” deal. Does not prescribe mercury.

21.) Afro-Cuban botanica owner, late 30s, 10 years as an initiated santero (interviewed 12/14/01)

This informant arrived in the U.S. in 1994. He uses mercury in his rituals, but couldn't understand what the big deal was/is with mercury in the Union City area. He doesn't sell mercury in his botanica because he said that he doesn't have a supplier, and he's afraid of the inspectors.

22.) Afro-Puerto Rican wife of #21, late 30s, espiritista (interviewed 12/14/01)

Works in the botanica. Personal use of elemental mercury when needed.

Santeria vs. “cultural” uses

Several of the babalaos and santeros interviewed in the Union City area were surprised to hear about the mercury uses (sprinkling, burning, etc) that are being attributed to religious practice. One babalao stated that this rumor is being spread by people who want to damage

the reputation or prestige of Santeria so it doesn't spread. He also confirmed that when they (the babalaos and santeros that he knows) prescribe something that has mercury or some other complicated or powerful ritual, the babalao or santero goes to the person's house to perform the ritual. They don't just tell the person what to do and send them on their way. This makes a lot of sense – how can you charge people if you don't go and perform the ritual for them? In addition, babalaos and santeros will not divulge their secret rituals, therefore, they must perform them themselves. (Tomas Leal reports that he practices this way as well).

Other babalaos supported this opinion, saying basically the same thing that people who are saying that the Santeros are doing that (sending people to sprinkle mercury, etc.) are envious of the religion and just trying to give it a bad name so it won't progress. All agreed that part of their job is to conduct the actual ritual, not just send clients to do things on their own.

They also talked about the fact that they had heard of or seen various books on Santeria that exposed things about the religion that are supposed to be secret AND they exaggerated for effect. That is the books exaggerated to make a real impression.

The babalaos had two ideas about what's going on. The first is that there are people, principally some white Cubans, who get into Santeria just to make money. After all, it's not their custom (African) and since they'll do anything to make money they end up causing problems for the religion.

The other idea is that there are people from all over who are entering Santeria. They also bring with them their own traditions and belief systems which they may be combining with Santeria. Various types of mercury use may come from these traditions as well. The babalaos said that they thought Dominicans, Puerto Ricans, Mexicans, Brazilians, or Nigerians could be the source of this practice.

One Peruvian babalao had more specific information. He stated that a Dominican ex-girlfriend explained to him that in the Dominican Republic people sprinkle mercury in their homes and/or businesses in order to bring good luck. She said that this custom had crossed the border from Haiti into the Dominican Republic, but that people thought that it worked and that it became part of some people's cultural practice. Although this evidence is anecdotal, it would appear necessary to increase our focus on the Dominican and Haitian communities.

Although not funded as part of this project, Alison Newby spent two weeks in Cuba over

the summer 2002. She spent time with Santeria and Palo practitioners in Havana and the province of Matanzas. Out of twenty three people who were asked about mercury use within religious practice, not even one had ever heard about sprinkling, burning or mixing with cream, perfume or bathwater. In fact, mercury does not play a central role in Afro-Cuban religious practice in Cuba. It is used in small quantities in secret rituals.

Knowledge about the hazards of mercury

In general, our informants were unaware of the hazards of mercury. Several respondents mentioned that they knew that it was bad to touch or play with. No one knew about the dangers of mercury vapors or the possible effects of long term exposure. The only “hazard” they mentioned was the legal trouble they thought you could get into if you were caught with mercury. Likewise the Cubans interviewed by A. Newby in Cuba, did not know that mercury vaporizes, but all mentioned that it was a toxic substance and should not be touched too much.

Requirements for becoming a Santero

The first “requirement” for becoming a Santero is to believe in the religion. The future Santero may have grown up within this belief system or may have gone to see a Santero about a problem in his or her life. If the problem was resolved according to the satisfaction of the client through Santeria rituals, the person may become interested in the religion and decide to increase his or her participation.

The second and perhaps more difficult requirement for some, is to have enough money to pay for the necessary initiation rituals. Depending on the specific saint/santo whose path the initiate is to follow within Santeria, initiation can cost from ten to fifteen thousand dollars in the Northern New Jersey area.

There are no requirements in terms of education, racial or ethnic background, sexual orientation, or even knowledge about Santeria. Since Santeria is a secret religion, initiates can learn about the religion only after they been through the necessary rituals.

It is also important to note that there are various “levels” of initiation in the religion, and each one requires a fairly expensive ritual. Someone can be a practitioner of Santeria

without having undergone rituals, but each ritual “level” implies an increasing commitment to the religion.

Recognition as a Santero

There are no formal credentials for Santeros. Within the Santero community, people will mention the name of their padrino or godfather, or mention the names of those people that were present during the initiation ritual, along with where and when the ritual took place. If doubts still exist about a person’s affiliation with the religion, he or she may establish credibility by presenting information which only initiates are party to. Obviously, this information would only be discussed with another Santero, not with a client who is not yet initiated.

Religious jewelry such as bead necklaces and bracelets are also worn by Santeros, but are not enough, in and of themselves, for recognition as a Santero.

Formal Training

If a person is committed to being initiated as a Santero, he or she may begin to receive more information about religious rituals from his or her padrino. At the same time, information is carefully controlled. After the ceremony itself, initiates begin a one-year period of entering the religion, during which they will also go through various other rituals. It is only after this one-year period when the initiate is a full Santero with the right to attend and participate in other initiation ceremonies and to receive answers to his or her questions about the religion.

At the same time, one’s access to information depends, to a large extent on his or her padrino and how much information he is willing to divulge.

Comments

Mercury continues to be used in the Latino communities residing in the study area of Northern New Jersey. At the same time, ritual practices involving mercury tend to be quite restricted and are conducted in private homes or botanicas. It appears that recent educational efforts, September 11th, and incorrect information have lead to the perception that one can be arrested and imprisoned if caught with mercury. The subject has become taboo, especially in conversations with those perceived as outsiders. This obviously creates a very secretive, and potentially hostile (not to mention dangerous!) environment for

conducting interviews.

It appears that those “cultural” uses which may result in high exposures (i.e. sprinkling, mixing with creams and bath water) are not part of traditional Afro-Cuban religious practice. Anecdotal evidence points to the possibility of elemental mercury usage in Haiti that diffused over time into the Dominican Republic, and later to the United States.

Respondents were not aware of the hazards of mercury exposure, nor of the existence of mercury vapors. In fact, mercury was only seen as “dangerous” because of the perception that selling, possessing and using it was thought to be illegal.

Recommendations

The information in this report is a first step toward gaining a better understanding of the various religious and/or cultural uses of elemental mercury. It appears that “serious” Santeria practitioners differentiate between those ritualistic uses that are acceptable within their religious practice and those which are not strictly religious. At the same time, the difference is difficult to disentangle and more work should be done in this area. Based on our experiences in the field, we feel that reliable information can only be obtained by cultural and religious “insiders.” Even when researchers are members of the community, time is needed to establish rapport.

We believe that the Dominican connection is worth exploring as well. Several Cuban babalaos stated that because mercury is so powerful, using too much or sprinkling it in one’s home or workplace could actually backfire and bring bad luck. This idea directly contradicts the (possibly Dominican or Haitian) idea that sprinkling has positive effects.

As mentioned by Riley et al. (2001) previous efforts to control/regulate mercury sales have led to perception that mercury use is illegal and driven its sale underground. Recent exploratory interviews with Afro-Caribbean mercury users in New Mexico found that people are much more willing to talk about their mercury use than in the New Jersey research site. Since mercury has not acquired the status of being “illegal,” respondents were found to be more open to the research process, despite the closed nature of the religious community.

Health officials and others interested in educating people about the hazards of mercury should focus on the substance rather than the practice. Attempts to change religious and/or cultural belief systems will NOT be successful, and will only make it more difficult to

continue to conduct research and obtain reliable data in these communities.

Chapter 2 : Air Monitoring Survey

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Purpose of this effort

An assessment of residential buildings in Latin American and/or Caribbean communities is warranted to determine the prevalence of mercury contamination. To date no such studies have been published. Therefore this component comprises a preliminary evaluation of ambient mercury vapor concentration within residential structures in a community in which elemental mercury may be used for cultural purposes.

Methods

Site selection

The primary study area (Union City-West New York) was selected for inquiry was based on prior knowledge of a large number of botanicas in the area as well as the prevalent Hispanic or Latino population (approximately 80%). Many of the botanicas had been documented to have elemental mercury available for sale. All residential sites were within ½ mile of a botanica.

Multifamily apartment buildings were visited with the intent of conducting mercury vapor monitoring in readily accessible common areas. “Readily accessible” meant accessible through unlocked doors to the street. Common areas were considered as the vestibule (hallway between street and an inner door to a common hallway) and the interior hallways of the building.

Building selection was as follows: The initial cluster of sites was selected based on the identification of a readily accessible apartment building that also housed a botanica on a prior inspection for other purposes. This building was visited and evaluated. Adjoining buildings and those on neighboring blocks were systematically canvassed. All accessible buildings that were encountered were evaluated. On subsequent visits adjoining blocks were visited.

Two additional areas, located a distance (1.5 and 2 miles) from the initial survey area were canvassed in a similar manner.

The interior hallways of 34 buildings were assessed. In an additional 33 buildings only the vestibule was accessible.

Seven additional sites were visited for investigational purposes. These consisted of: three botanicas, one former botanica, two restaurants/markets, and one private home.

A preliminary effort to identify a suitable locale for the selection of reference buildings was conducted. Montclair, NJ was selected as a potential location to evaluate control buildings based on demographics (Montclair 5% Hispanic or Latino as compared to Union City and West New York – 82.3% and 78.7% respectively) and general age of the buildings evaluated (> 50 yrs (“pre-war”). Additionally, there are no known botanicas in Montclair. Within Montclair, two buildings had the interior hallways assessed. Three other buildings had the interior vestibules assessed.

Site visits were conducted on 6 days in June and August, 2002 (6/8/02, 6/10/02, 6/15/02, 6/17/02, 8/13/02, and 8/14/02). Repeat visits were made to two buildings.

Mercury vapor analysis

Mercury vapor in air was monitored directly using a Lumex brand atomic absorption spectrometer – Model RA-915. The instrument has a sensitivity of 2 ng/m³ of mercury in air according to the manufacturer. The sensitivity of the instrument is provided by a built in 10-meter multi-pass cell. The selectivity of the instrument to mercury is assured by using a single Mercury isotope lamp along with Zeeman correction according to the manufacturer.

All results are expressed as nanograms per cubic meter (ng/m³).

The instrument warm-up and operation was according to the manufacturers instructions. The instrument was calibrated in the field prior to the initiation of field sampling activities according to the manufacturers' instructions utilizing an internal mercury calibration standard. Once the instrument was warmed up and calibrated it was operated continuously for the sampling date.

Procedural detail is as follows:

1. The inlet probe height above the floor was measured once prior to the initiation of field activities and found to be about 3 feet (approximately 1 m) when held by the shoulder strap by the primary operator. Periodic measurements close to ground level were taken for investigational purposes are noted in the raw data where appropriate.
2. The instrument was turned on and warmed up according to manufacturers instructions.
3. The instrument was set to display mercury vapor concentrations continuously as well as to calculate 10 second average concentrations.
4. The instrument was calibrated using the internal calibration standard according to manufacturers' instructions.
5. Three ten second average concentrations were recorded for each location within a building reported (Vestibule, 1st floor, 2nd floor etc.), as well as for outdoor locations. Multiple measurement sets were obtained where circumstances warranted (large floors, multiple wings to a floor, notably elevated vapor concentration)
6. The direct reading mercury vapor concentration was employed to allow stabilization of the measurement in circumstances with notably different vapor concentrations in different areas. It was also used to verify appropriate instrument response when returning to the outdoor environment.
7. Measurements and general observations were recorded by hand in the field and transcribed to Microsoft Excel.
8. Each reported measurement represents the average of three ten-second measurements.

Lumex Mercury Analyzer

The ability to conduct the field studies and obtain large quantities of data is dependent on the access to the Lumex R-915+ portable analyzer. The following information is provided by the manufacturer, Ohio Lumex. The R-915+ is an atomic absorption spectrometer, which employs the effect of the resonance radiation absorption by the mercury atoms. It uses a proprietary scheme of the Zeeman correction for non-selective absorption which provides high measurement accuracy irrespective of interfering factors, such as dust,

aerosols, absorbing gases and vapors. It incorporates a Multipath cell with an effective optical length of 10 m provides the highest measurement sensitivity. It provides a detection limit of 2 ng/m³ in air and provides a dynamic range of 2 to 50,000 ng/cubic meter. The ultra low detection limit is coupled with high selectivity, to provide direct continuous mercury determination (without preliminary mercury concentration on a sorbent). Calibration and operation details followed manufacturer specifications. In practice the instrument showed excellent stability, taking sequential readings at a single site over a period of minutes.

We also compared it at the Hillsboro mercury depot the Tekran analyzer, a non-portable instrument of even greater sensitivity over a range of 10 to 200 ng/m³. The two instruments agreed within 5%. On one occasion the operator noted that the instrument was not performing properly---sequential readings in the same location varied dramatically. All readings that day were eliminated, and the instrument was re-calibrated in the laboratory.

Measurements were made in various buildings in Hudson County primarily by Gary Garetano (Hudson Regional Health Commission), accompanied at various times by Michael Gochfeld, Donna Riley, and Alan Stern.

Measurements were made in the public access areas of a variety of buildings in communities with botanicas. For each sample the following information was obtained:

- Type of building
- Address
- Number of units
- Description
- Mercury concentration.

Additional comments were made to note proximity to botanicas, recent painting or renovations, and unusual ventilation situations (such as open windows or doors). In cases of high readings, multiple visits were made.

RESULTS

Site access and characteristics

North Hudson Multi-Family Buildings: Building age was not available for the individual buildings assessed. However, based on the investigators knowledge of the area, overall

appearance, and census characteristics for the area, all buildings are believed to be greater than 50 years old.

Of the 67 buildings evaluated, interior hallways were readily accessible in 34 and only vestibules were accessible in 33. The number of residential units in each building was verified from tax records. Records were available for 62 of 67 buildings (93%). The most common cause for a building not being found in the records searched is a corner location that uses alternate addresses. It is not believed this missing item will skew any derived data. However, the sites can be revisited as necessary to determine the number of units.

Overall building size ranged from 3 to 50 units. The number of residential units was distributed as follows: Mean – 14 units, Median 12 units, 90th percentile - 23.8 units.

Buildings in which the interior halls were accessible tended to be larger (mean 15.3 units) than those in which only the vestibule was accessible (mean 12.4), though this difference was not significant (p. =.18).

None of the buildings evaluated were noted to have central ventilation systems that influenced the areas evaluated. Ventilation within the building hallways is primarily influenced by windows and doors. Several of the buildings had open windows during the time of this visit. Within those buildings in which vestibule measurements were made, the front door (to the street) was primary source of ventilation within this area.

Montclair Buildings: Based on their appearance and discussion with local officials the buildings evaluated appear to be “pre-war” or greater than 50 years old as were the North Hudson buildings. Ventilation also appears to be as described previously.

Of note, the Montclair buildings possessed significantly more marble, metal work and gilded paint in interior hallways and vestibules.

The number of residential units was only noted for the two buildings in which the interior halls were surveyed (25 and 40 units).

Miscellaneous North Hudson Sites:

Three botanicas and one former botanica, currently a medical supply store were evaluated.

One restaurant/fish market adjoining a botanica was selected for evaluation due to the fact

that it was reported to be used for various ceremonies. A nearby restaurant was evaluated for comparison.

All commercial establishments were open for business. The duration of the assessment in each location was brief and there was little to no interaction with proprietors (“just looking” or a small purchase).

One private residence, in West New York located within a few blocks of many of the buildings was evaluated. This included all rooms and a basement work area.

Mercury Vapor Concentration:

The grand mean for outdoor readings was 5.3 ng/m³

The grand mean for indoor readings was

Outdoors:

Outdoor measurements were recorded at 29 locations in Union City/West New York associated with the multifamily sites over the sampling period. The measured mercury vapor concentrations were as follows:

Median 3.3 ng/m³

Mean 5.3 ng/m³ (95% CI, 3.25, 7.35)

95th percentile - 21.1 ng/m³

Minimum 0.7 ng/m³ - Maximum 26 ng/m³.

Note: We do not consider readings below 2 ng to be reliably quantified by the Lumex.

About 10% of the readings exceeded 10 ng/m³.

The frequency distribution of outdoor measurements follows in Table 1.

Table 1. Frequency Distribution of Mercury Vapor Concentration – Outdoors (ng/m³)

Mercury Concentration	Frequency	Percent	Cumulative Percent
0.7	2	6.9	6.9

1	2	6.9	13.8
2	1	3.4	17.2
2.3	1	3.4	20.7
2.7	2	6.9	27.6
3	1	3.4	31
3.3	6	20.7	51.7
3.7	2	6.9	58.6
4	1	3.4	62.1
4.3	2	6.9	69
5	1	3.4	72.4
5.3	1	3.4	75.9
5.7	1	3.4	79.3
7	1	3.4	82.8
9.7	1	3.4	86.2
11	1	3.4	89.7
13	1	3.4	93.1
16.3	1	3.4	96.6
26	1	3.4	100

Indoors:

Buildings with all interior hallways assessed -Overall Building Average Concentration:

The overall mean mercury vapor concentration of each building (n=34) was computed by averaging the individual mean concentration of interior hallways on each floor of the building. The maximum mercury vapor concentration in each building is the maximum of any measurement set (average of three - 10 second measurements) in any interior hallway within the building. Results for all buildings may be found in Table 2. Averages for all buildings with access to halls is mean 24.8 (SD=53.2) and median 10.5 ng/m³.

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

	Bldg	Bldg		Bldg	Bldg
ID	Mean	Max	ID	Mean	Max
101	14	35	118	4	4
102	299	2022	119	10	12
103	1	2	120	10	11
104	4	20	121	107	774

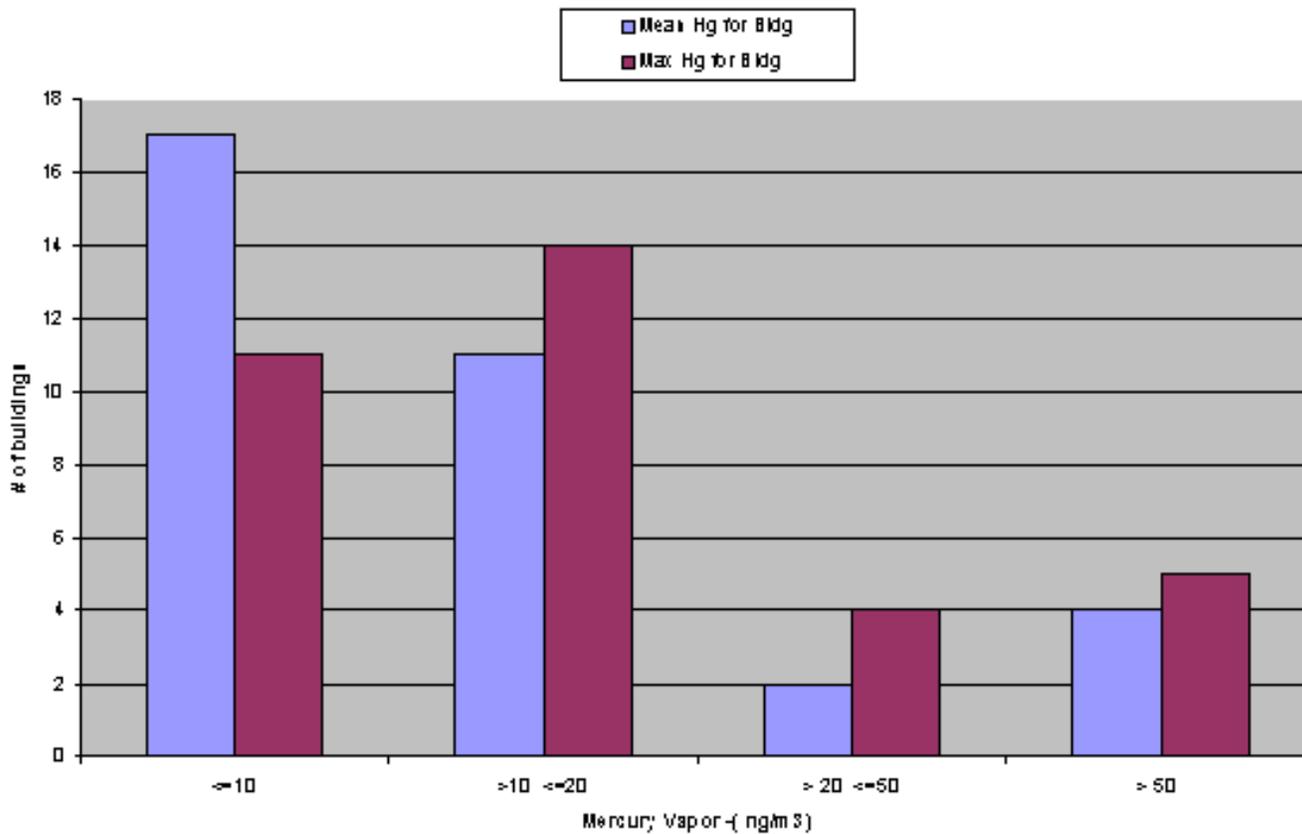
105	59	82	122	12	13
106	2	6	123	2	4
107	1	3	124	20	22
108	9	10	125	14	17
109	3	5	126	7	9
110	73	129	127	9	12
111	1	4	128	26	32
112	17	20	129	12	14
113	15	19	130	13	15
114	12	14	131	9	16
115	9	13	132	13	45
116	7	10	133	6	7
117	11	12	134	33	52

The presence of buildings with “elevated” mercury vapor concentrations will skew the mean and widen the confidence interval. If buildings (n=5) in which had a maximum mercury concentrations $> 50 \text{ ng/m}^3$ are removed from the analysis, the mean mercury concentration for the remainder of the buildings is 9.4 ng/m^3 , (95% CI 7.1, 11.7).

A graphic depiction of the distribution of mercury of mercury vapor concentrations in buildings in which the interior was assessed may be found in Figure 1.

Figure 1

Mercury Vapor Concentration - Interior Halls (n=34)



A total of 128 aggregate measurements reported as the average concentration for each floor (excluding vestibules) of 34 buildings were made. The distribution of mercury vapor concentration across all measurements may be found in Table 3. The distribution is similar whether one averages across all floors or takes the average readings for buildings.

There were significant differences among floors (Table 4), but it is premature to ascribe this to any real pattern.

Table 3. Mercury Vapor Concentration for hallways (n=128) and buildings (n=34)

Percentile	Building	Hallways
25 th	5	4.3

50 th	10.5	10.8
75 th	14	16.8
95 th	80	73

Table 4. Mercury concentration for different floors

	N	Mean
1 st	34	16.1
2 nd	35	40.9 {14.8} ^a
3 rd	35	25.4
4 th	23	20.8
5 th	5	12.2

.a NOTE: The 2nd floor mean would be 14.8 without a single outlier.

Buildings with only the vestibule assessed (n=33)

The mercury vapor concentration in vestibules in buildings in which the vestibule only was assessed (n = 33) was as follows:

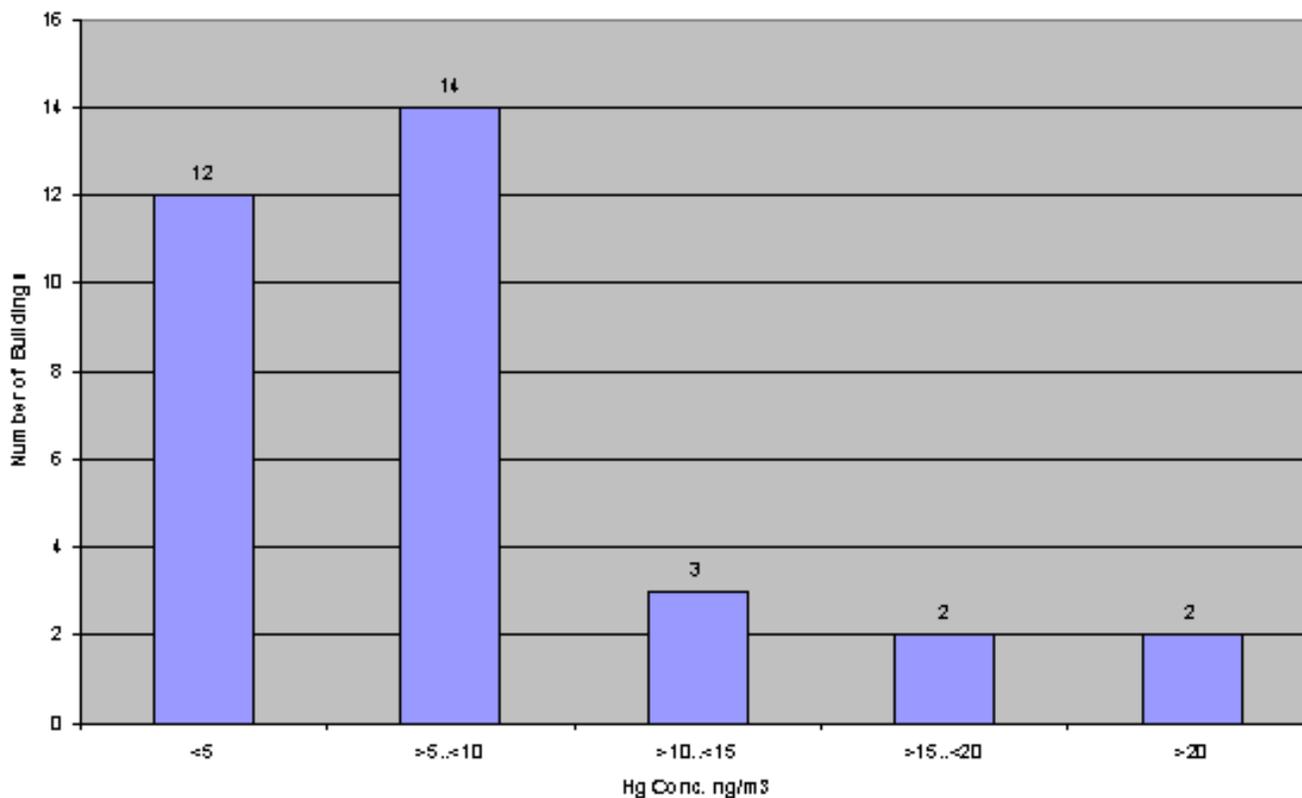
Mean 7.5 ng/m³ .(95%CI 8.7, 25.1)

Median 5.3 ng/m³

Minimum 0.7 ng/m³

Maximum 29.0 ng/m³

Mercury Vapor Concentration - Vestibule only assessed (n=33)



Repeat visits:

Two buildings were visited on more than one occasion. These were site 102 and site 121. A comparison of mercury vapor concentration by floor by visit date may be found in Table 5.

Table 5. Two sites – Repeat visits (Hg. in ng/m³)

Site	Visit Dates					
	102		121			
Floor	6/8/2002	6/10/2002	26/17/2002	28/13/2002	28/14/2002	
1	35	2	70	57	43	
2	933	14	428	51	56	
3	85	29	185	5	8	
4	142	2	74	5	9	

Site
121

Visit Dates

Floor8/13/20028/14/2002

1	17	12
2	73	14
3	388	16
4	21	16
5	38	14

The data on repeat visits reveals both consistencies and inconsistencies. It is gratifying that there is a tendency for high readings to be reduced on subsequent visits, reflecting regression to the mean. Both building selected for re-visits had high initial readings, hence we cannot identify the frequency with which buildings with low readings would have experienced high readings at another time.

Montclair Control Sites (Total n = 5)

Buildings with all interior hallways assessed (n=2)

These buildings averaged 4.9 and 24.4 ng/m³, respectively. The highest measurement set was 36 ng/m³ on the first floor of the latter building (Control 5). Anecdotally, a “shaman” allegedly lived in this building.

Buildings with only vestibule assessed (n=3)

These buildings had an average mercury vapor concentration in the vestibules of 14.4 ng/m³. (13 – 16.3)

Miscellaneous Sites – North Hudson

Mercury vapor concentrations were measured at several other locations (Table 6). Data from botanicas confirm that they can have high readings.

Table 6. Mercury Vapor Concentration – Miscellaneous locations – West New York

Location	Hg. ng/m³	Note
Botanica 1	482	Just inside door
Botanica 2	40	Just inside door – door open
Botanica 3	137	Just inside door
Commercial 1	61	Restaurant/market – adjoining botanica
Commercial 2	4.3	Restaurant Control

Commercial 3	76	Former botanica, now medical supply
Private Residence	3.8	No hx. of Hg use at least in past 15 yrs Same location near paints, metallic
Private Residence	22	paints

Discussion

The concentration of mercury vapor in the outdoor air in the study area is generally consistent with literature reports. Though no specific data exists for ambient concentration of mercury in New Jersey, our findings are consistent with prior reports citing outdoor mercury concentrations ranging from several nanograms per cubic meter to 20 ng/m³ with higher concentrations associated with urban/industrial areas (ATSDR 1999, NJ Mercury Task Force, 2001). Our study area is a densely populated urban area and it should be noted that in 80% of locations surveyed, mercury vapor concentrations were less than 6 ng/m³.

There are relatively few reports of “background” mercury concentration in indoor air in “non-contaminated” environments to which our results can be compared. In our evaluation, mercury vapor concentration is higher indoors as compared to outdoors ($p < .05$). This is consistent with the findings of Carpi and Chen (2001).

We found that 5 of 34 (14.7%, 95%CI 7, 30) of buildings we sampled had mercury vapor concentrations exceeding 50 ng/m³ in at least one area of their interior hallways. 4 of 34 (11.7%, 95%CI 5, 27) of buildings had an overall mercury vapor concentration exceeding 50 ng/m³. In one building the overall mercury vapor concentration in hallways exceeded the ATSDR minimal risk level on one inspection date. At present there are an insufficient number of control buildings to which our results may be compared.

The median mercury vapor concentration we noted (10 ng/m³) was lower than that noted by Carpi and Chen (23.9ng/m³) in residences. The highest average mercury vapor concentration we detected in a building (299 ng/m³) was also lower than that noted by Carpi and Chen (523 ng/m³). In the two sites in which repeat visits were conducted, mercury vapor concentration was at times greater than an order of magnitude different between sampling dates. Since the instrument met internal calibration specifications on both dates, we must consider this variation real, reflecting either a change in source or ventilation or both.

Our survey consisted entirely of spot measurements made in uncontrolled conditions. In the majority of buildings surveyed, at least one or more windows were open. This could lead to an underestimate of the “true” mercury vapor concentration present, particularly at other times of the year when windows would be closed and heat turned on.

In addition, the building hallways were used as a general screening tool to estimate whether mercury concentrations within a given building are higher than other buildings regardless of the source. We made the assumption that any source of mercury was not likely to be in the hallway, but more likely in an apartment or utility room. In a number of instances elevated mercury vapor concentrations could be tracked to identify the general source location. In those buildings with average hallway concentrations exceeding 50 ng/m^3 , the “source” could generally be tracked to a specific group of apartments. In only one instance was the source apparently on the floor itself within the hallway. In this case, the highest mercury vapor concentration was noted near the floor at the entryway door. Thus, if in most cases the actual source were within a given apartment, in the absence of a suitable model, one can only speculate as to the concentration within a given residential unit. However, it is reasonable to assume the mercury vapor concentration would be higher than that noted in the hallway.

Since the source of mercury emission was not identified in this survey an attempt was made to “rule out” spills in the basement of the buildings as might be associated with gas pressure regulators or manometers. Mercury vapor concentration was generally lower on the first floor compared to other floors, which is contrary to what one would expect if a source within the basement was present. Overall mercury vapor concentration did not differ significantly between floors in buildings using ANOVA analysis ($p = .8$).

In buildings for which both vestibule and interior hall measurements were available ($n=23$), there was a moderately strong association between the mercury vapor concentration in the vestibule and the average concentration for the building. (Kendall’s tau = 0.399, $p < .01$). A stronger correlation was present between the mercury vapor concentration in the vestibule and the maximum measurement in a building (Kendall’s tau = 0.499, $p < .01$). In this limited survey, a mercury vapor concentration of $\geq 20 \text{ ng/m}^3$ was predictive of 100% of buildings that had at least one measurement exceeding 50 ng/m^3 . No “false positives” were noted using this approach. Of the 33 buildings that had “vestibules only” screened 2 (6%) had mercury vapor concentrations $\geq 20 \text{ ng/m}^3$. The measurement of mercury vapor concentration in a building vestibule may be a useful screening tool when the remainder of a building is not accessible; however, further evaluation is necessary.

Limitations of these Data:

- The data are predominantly descriptive as only a limited control group was obtained for comparison.
- Sample size is limited.
- The data was predominantly obtained from one-time measurements in uncontrolled circumstances. Mercury vapor concentration may be subject to significant variability with ventilation, season, and source.
- The use of mercury vapor concentration in hallways to estimate vapor concentration within residential units may significantly underestimate exposure in some cases while overestimating it in others.

Significance of these Data:

- Outdoor ambient mercury vapor concentration appears to be consistent with general reference values in the published literature.
- A reasonable body of information has been assembled regarding mercury vapor concentration in multi-family buildings.
- The majority of buildings surveyed do not appear to have anomalously high mercury vapor concentrations.
- A small but not insignificant proportion of buildings appear to have mercury vapor concentrations that appear to be indicative of an anomalous source.
- The proportion of buildings in which the concentration of mercury vapor appears to be elevated is substantial enough to warrant further evaluation.



Conclusions

Based on these studies we conclude that

- 1) mercury is used in Santeria practices which involve spiritual healing.
- 2) Other reported uses of mercury including sprinkling in homes and cars, is not recommended by Santeros. It does appear to have a cultural relationship to the Dominican Republic, perhaps more than the Afro-Cuban traditions. It is labeled a cultural rather than spiritual usage.
- 3) Outdoor ambient air levels in West New York are generally within expected urban limits.
- 4) Most indoor samples were low, but about 17% of buildings had average air levels above 20 ng/m³, with one building average at 299 and a maximum internal reading of 2000 ng/m³.
- 5) The source of such elevated air levels has not been identified, but is possibly linked to sources in individual apartments, compatible with accidental spills or cultural practices.
- 6) Publicity has already driven mercury sales underground in West New York/Union City. Further regulation including banning sales of mercury, may criminalize the practice without reducing sales or usage.
- 7) An educational program is recommended to make the hazards known to practitioners, vendors, and users, and to minimize and contain use, and prevent spillage and long-lived residual mercury.
- 8) Santeros deny that they recommend the various reported uses of mercury attributed to Santeria. Nonetheless they are largely unaware of the hazardous nature of elemental mercury and are under the mistaken impression that skin contact rather than inhalation is the significant route of exposure.

Recommendations

Additional indoor air sampling is warranted to better characterize mercury distribution, particularly in apartments. Comparable sampling in non-hispanic areas would provide reference data.

An educational program aimed at those who sell mercury, recommend its use, or use it is essential. This should clarify the nature of the hazard from elemental mercury, emphasize the need to minimize its use, and demonstrate the necessity of keeping it in closed containers. Recommendations for disposal of mercury products and cleanup of spills is also

important, and is generally lacking.

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