TESTING LEAD CONCENTRATIONS IN PAINT AND SOIL

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Used in tool formation in ancient Egypt, as a sweetener for wines in the Middle Ages, and to make pipes for transporting the water of ancient Rome, lead has been throughout history a cause of disease and death (Gordon et al., 2002). Lead poisoning was finally classified as an occupational disease in Britain in the nineteenth century, but lead-based paint remains a high source of exposure for children, despite its ban in the United States and published health effects. According to the Agency for Toxic Substances & Disease Registry (ATSDR), the consumption of a chip of lead-based paint provides greater short-term exposure than any other source of lead. However, direct ingestion is not the only way exposure occurs. Dust and soil can also become contaminated with the lead from the paint, which can then be ingested. The weathering of such paint contributes to the amount of lead in the air and dust. Inhaled lead is absorbed into the blood nearly 100%. Less lead, approximately 20 to 70% of that ingested, is absorbed in the gastrointestinal tract (Sanborn et al., 2002). Children, on the other hand, absorb five to ten times more lead than adults, due to a larger air intake in proportion to their smaller body size and a 50% absorption rate over the entire gastrointestinal tract (Gordon et al., 2002).

Typical lead content in soil, although it can vary, is less than ten to thirty micrograms per gram of soil. However, according to the ATSDR, soils adjacent to buildings that have lead-based exterior paint can have concentrations of lead of greater than 10,000 micrograms per gram of soil (Levitt, 1999). This significant increase introduces numerous health effects to the people who live and work in and around these buildings, including impotence, vomiting, convulsions, coma, and death. Contamination from lead-based paint is highly concentrated over a limited area, but when that area is the daily living and working environment, there are consequences for the people exposed. This is especially true for children who crawl on the ground and put things in their mouth, such as paint chips and dirt. Given these concerns, the main goal of this study was to assess potential health risks by analyzing soil and paint samples for lead concentrations in San Carlos, Belize.

Methods

Onsite, seven sampling locations were identified by choosing the most weathered surfaces on houses and then collecting for both soil and paint. Before traveling back to Defiance, the soil samples were tested using the quick-test system LeadCheck. This test provided a color reaction, which detected lead levels in the soil sample of greater than 400 ppm (maximum safe limit, EPA). After returning to Defiance College, each sample was further analyzed using EPA-approved methods by atomic absorption spectrometry.

Results

The results of the LeadCheck test were all negative for a lead concentration greater than 400 ppm. While all of the soil samples from Hillbank Research Station showed some level of lead content, none were over the accepted limit. Only two of the sites tested in the village of San Carlos produced any detectable lead concentrations in the soil samples. Interestingly, all but one of the paint samples gave results of zero, and that one came from an abandoned house in the village of San Carlos. The concentration of lead in the paint was found to be 0.1426%, a percentage over twice the allowable limit (EPA).

Conclusion

There were no previous baseline data about lead levels in the paint of houses and surrounding soil in the Rio Bravo Conservation District. Data showed that the levels of lead in last year's samples collected from agricultural fields and at logging sites were not above the limit. However, the concentration levels increased when tested closer to the source of lead (e.g., house with lead paint). Therefore soil testing was conducted around a school building and houses, one of which showed significant lead levels. To disseminate knowledge of the danger, the adults and children of San Carlos were told to stay away from the abandoned house. Furthermore, the toxic paint must be taken care of, perhaps by using the overcoating method (i.e., paint over the old paint) because proper lead abatement is cost prohibitive (DaSilva, 1997).

Reflection

Beyond the scientific challenge of testing for lead concentrations, Belize transformed me personally. I fell in love with the country the second I stepped onto the airport tarmac. I loved everything from the smiles on children's faces to the wave of the palm trees. When I returned home, my eyes and ears had been opened to everything around me. Walking to my car the morning of my first day back, I heard a bird chirp. Such an everyday thing stopped me in my tracks and I smiled. I suppose that I did not pay attention to the beauty all around me until I saw the beauty that is Belize. Now, in wonder, I seek to understand.

REFERENCES

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