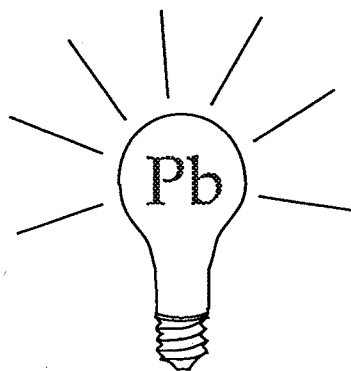


A THOUSAND POINTS OF LEAD - AN ATTEMPT TO SHED SOME LIGHT

LESSONS FROM A STUDY OF LEAD IN SOIL AND DUST



by

Michael Müller

Thesis

**Submitted in partial fulfillment of the requirements for the Degree of Bachelor
of Science from the Department of Chemistry and the Degree of Bachelor of Arts
from the Center for Environmental Studies at Brown University**

December 1992

ABSTRACT

Lead poisoning has been recognized as the number one environmental threat to the health of children in the US. Close to 50% of the children in RI have blood lead levels in excess of what is considered harmless by the Centers for Disease Control. Air, water, food, dust and soil have all been implicated as pathways of early childhood exposure to lead. Dust and soil, however, have emerged as the primary culprits in recent years.

The 1991 Lead Poisoning Prevention Act requires the RI Department of Health to write regulations that will establish a comprehensive environmental lead program. This thesis set out to supply some of the information that was missing on the prevalence, the distribution and the behavior of lead in dust and soil.

Almost 650 samples were collected in 67 locations in Upper South Providence and on the East Side. Older, recently painted, tenant-occupied houses were identified as the highest risk areas whereas playgrounds and empty lots offered the least threatening environment. The average median lead level for occupied houses was 2,000 ppm in both neighborhoods. About 85% of all occupied houses displayed maximum concentrations of more than 1,000 ppm and close to 30% had maximum levels beyond 10,000 ppm.

A case study of uncontained removal of exterior lead-based paint resulted in an 8-fold increase of lead levels in outside and inside dust. Soil or dust on one side of a house can exceed the average or maximum lead levels on the other sides by hundreds of percent. The distance of an area to the source of the lead often determines the magnitude of the contamination. Attempts to fit the data to a model, however, remained unsatisfactory because of low correlation coefficients. Even areas where all the factors that introduce variations in lead levels are controlled for show high fluctuations around their mean.

The proposed sampling strategy integrates the collection of samples required for the analysis addressing the concerns of two distinct questions or tiers. Tier one asks whether a location is lead-safe while tier two provides the data on where to remediate in case the measured concentrations don't meet the required standards. Many of the phenomena that were observed make sense given some knowledge of the history of a particular site. The resulting strategy, therefore, was guided by an attempt to balance the need for flexibility and the requirements for unambiguous standards.

The potential for acid rain to leach even minimal amounts of lead from soil into groundwater is negligible at current levels of acidity. The conditions found in a human stomach, on the other hand, extract almost all the lead contained in soil which is then available for absorption into the blood stream. Consequently, any effort to remediate lead in urban dust and soil should focus primarily on the threat lead poses to the human body directly. Ingestion of lead contaminated soil endangers young children far more than the potential of indirect exposure from lead leached into the groundwater by acid rain.

The enforcement of the abatement process is likely to be aided by the pressure the insurance industry is expected to exert on landlords. Abatement, however, costs money and will force some of the landlords to raise rents to a level where renters can no longer afford housing. The city should use federal dollars to rehabilitate abandoned houses and later return them to the market.

Education about lead can serve as a catalyst for social change in general. Once people care about lead the focus is on the quality of life of their children. Now anything that affects this quality might be reconsidered and people question what other risks they could reduce - if only they tried.