

# THE POTENTIAL FOR CHILDHOOD EXPOSURE TO LEAD FROM HOUSE PAINT IN SOUTH AFRICA: A CASE STUDY



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## INTRODUCTION

The toxic effects of lead have been known for centuries. Its many useful properties gave rise to a dramatic escalation of lead use around the time of the industrial revolution, when lead poisoning was common amongst workers in the smelting, painting, plumbing, printing and other industries. With the advent of motor vehicles early in the 20th century, and the use of lead in petrol, environmental lead contamination increased substantially. Lead continues to be widely used, especially in developing countries, for example in petrol, paints and pigments, ammunition, cabling, television sets, computers, protective gear, ceramics and cosmetics, and many other ways (Tong et al 2000).

Children are at particularly high risk of exposure to environmental lead, because of their elevated rates of development, ingestion and metabolism, and because of their developmental and behaviour patterns (Landrigan 1999). Hand-to-mouth activity, as part of normal play and development, constitutes the main pathway of childhood exposure to lead-rich dust and soil. Children with a tendency to pica may

be at particular risk of lead exposure. Even at relatively low concentrations, lead has been shown to interfere with human biochemical pathways, causing wide-ranging health effects. At levels around 10µg/dl biochemical and neurobehavioural effects (such as decrements in intelligence scores, shortened concentration spans, reading and language problems) have been demonstrated. Other health effects associated with elevated lead levels include anaemia, hearing loss, and abnormal development of tissues and organs, such as the kidneys, heart and brain. At extremely high levels of exposure, ataxia, cerebral oedema, paralysis, coma and death may result (Goyer 1993, Needleman & Bellinger 1991, Hammond & Dietrich 1990).

Several epidemiological studies undertaken in cities over the past two decades indicate that large proportions (over 90%) of South African children have had, and in some areas continue to have, unacceptably high blood lead levels.

## RESULTS

In a blood level survey conducted in 2002 amongst 383 grade one children attending schools in the Johannesburg suburbs of Alexandra, Soweto, Westbury, Riverlea and an inner city area, the mean blood lead level equalled 9.4µg/dl. Around 42% of children were found to have blood lead levels equalling or exceeding the internationally accepted blood lead level of 10µg/dl. In impoverished areas, such as Alexandra, as many as 62% of first grade children had elevated blood lead concentrations.

The highest blood lead concentration (44.4µg/dl) was determined in a 7-year old female subject. Analysis of a repeat blood sample taken one month later showed an increase in the blood lead concentration to 51.5µg/dl; more than five times higher than the internationally accepted action level of 10µg/dl.



Fig 1



Fig 2

During follow-up home interviews conducted with the parents, it emerged that the girl was often observed to ingest putty, paint from indoor and outdoor walls, and soil from around the apartment building in which they lived. Concern over their daughter's pica tendency and health had previously prompted the parents to take her to a local hospital for investigation. However, over-exposure to lead had not been considered at the time.

Subsequent analyses of lead concentrations in samples of paint, putty, soil and water taken from the girl's home and surrounding areas showed that lead levels in water were below detectable levels, while soil lead concentrations ranged from 11.4 to 87.5µg/g. The levels of lead in paint samples taken from the walls of the girl's home were high (up to 3940µg/g), as was the lead concentration in a paint sample taken from a classroom of the school she attended (2601µg/g). A subsequent medical examination revealed evidence of microcytic anaemia.

Figs 1 & 2: Paint and putty removed and ingested by the study subject

## CONCLUSIONS

This case study illustrates the potential vulnerability to lead exposure amongst South African children with a pica tendency, living in older housing developments, or attending schools in which lead-based paint has been used. Preliminary data from the current MRC survey indicated that around 9% of children in the Johannesburg phase of the study were ingesting paint, cigarette ends, cement, sand or other non-food items.

Given the health effects associated with even relatively low blood lead concentrations (10µg/dl and below), including hearing loss (Schwarz et al 1987), hyperactivity, shortened concentration spans, reductions in IQ, poor school performance (Burns et al 1999), the emergence of aggressive/violent behaviour (Nevin 2000), as well as anaemia at higher concentrations, it is important that South Africa follow the example of many other countries around the world in taking wide-ranging actions to address the preventable risk of childhood lead exposure.



Fig 3: Peeling paint in degraded housing stock

In respect of aspects associated with lead in paint specifically, these actions should include appropriate research and surveillance programs to identify high risk settings and groups, improved public access to information on the risks associated with lead exposure, the development and enforcement of standards for childhood blood lead levels, as well as for maximum permissible concentrations of lead in paint used in housing and school buildings, and in consumer products such as children's toys and furniture, be these locally produced or imported. Landlords may need to be obligated to alert prospective tenants to the presence of lead-based paint in dwellings.

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