MECHANISMS OF ENTRY OF LEAD-BEARING DUSTS INTO HOUSES IN PORT PIRIE.

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THESIS ABSTRACT

The world's largest single-line lead smelter situated at Port Pirie in South Australia has continued its smelting operation for more than 100 years. This has resulted in a continuous distribution of lead in the form of dust into the local environment. Clearly, an environmental problem of disturbing proportion has existed for perhaps a century, this being manifest in the context of human/lead contact, with sinister health sequelae for populations at risk. Accepting the role of lead-bearing dusts as being the vehicle for carriage of the toxin to, primarily, children, research was directed toward demonstrating spatial variability in dust lead contamination patterns both statically and dynamically within the confines of vacant test houses, thus eliciting specific entrance pathways.

Contaminant levels in existing house surface dust, depositing dust and air-suspended dust both indoor and outdoor were examined as also home soils proximate to the dwelling structure. For such research, some novel sampling equipment was designed and utilised, evidence being presented to suggest the appropriateness of use of such sampling equipment. Lead levels in dust and soil are high, particularly house dust (eg >6,000$\mu g.g^{-1}$). This contamination by lead-bearing dust at household level appears widespread within the areas investigated, the source of the dust and the lead present being closely related. Test houses appear to be easily penetrated by contaminant dust, and further, appear to retain such dust, representing a focus of contamination. The bulk of the dust-contained lead within the house lies in the hand-adherent particle size range.

Within-house lead level spatial variability is apparent, windows and external doorways being demonstrated as major contaminant entry points. Rooms with open fireplaces are slightly more contaminated than those without, although fireplaces *per se* appear not to be major entry points for leaded dust. Houses exhibit almost an order of magnitude greater lead-bearing dust deposition rates under open windows and doors format than closed, hallways revealing the greatest levels of room contamination.

Surface soil contamination appears to be more a recent and on-going phenomenon rather than an historical artefact, spatial variability at home level reflecting this contemporary nature and also, as for deposited house dusts, suggesting source directionality. Lead levels in air and depositing dust appear largely independent of soil lead levels, soils being suggested as a poor indicator of inside home contamination levels. Contaminated depositing dusts within the home appear to be more newly-entering and contemporary than simply re-entrained and historical.

The bulk of surface dusts sampled in the vacant houses would appear to have deposited there during the house vacancy period, previous foot tracking being suggested as a minor pathway for home contamination in both vacant and occupied houses. Rates of leaded dust deposition in "de-dusted" houses are very similar to control uncleaned houses soon after house cleaning. Thus the value of comprehensive systematic house de-dusting as part of a community lead intervention program would appear to be questionable.