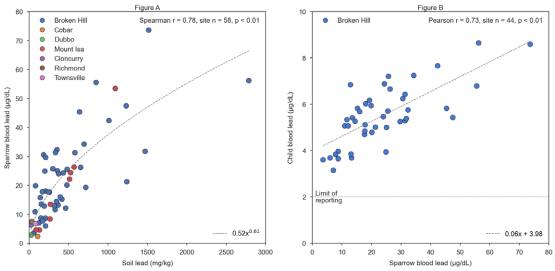
Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.15672

Getting the canary out of the coal mine: an avian bioindicator of lead exposure in children

MAX M GILLINGS[1], TIARNE HARRIS[1], RICCARDO TON[1], MARK PATRICK TAYLOR[1,2] AND SIMON C GRIFFITH[1]

[1]Macquarie University
[2]Environment Protection Authority Victoria
Presenting Author: max.mclennan-gillings@mq.edu.au



Animal bioindicators are now integral to our understanding of environmental health. Their relevance to human health, on the other hand, remains largely focused on monitoring the transfer of contaminants through food chains. This is partly due to the difficulty of linking biomarkers of exposure to different contaminants in human and animal populations. Here we demonstrate the effectiveness of the globally ubiquitous and human commensal urban bird, the house sparrow (*Passer domesticus*), as a bioindicator of lead contamination and exposure risks across Australian towns and cities with varying degrees of mining and smelting activity.

Across the studied towns and cities, sparrow blood lead concentrations reflected local and regional differences in soil lead contamination related to the proximity and presence of lead mining and smelting operations (Figure A). Using blood lead isotopic compositions, we were able to identify shared sources and pathways of lead exposure in sparrows and children, with strong links to mining and smelting emissions.

To demonstrate how the measurement of animal bioindicators can inform our understanding of human health risks, we spatially linked blood lead measurements from sparrows to those from neighbouring (< 300 m) children (aged 1 to 4 years). While the geometric mean blood lead concentration in sparrows (21 µg/dL) was higher than in children (5 µg/dL), the measurement of sparrow blood lead provided a spatially robust indication of lead exposure in children (Figure B). Children were at higher risk of exceeding the 5 µg/dL blood lead intervention level when sparrow blood lead concentrations exceeded 16 µg/dL.

We also compared our data to historical child blood lead measurements and found that sparrow blood lead concentrations were most strongly associated with those of children living in years prior to interventions targeting lead exposure in the studied communities. We posit that these interventions have increased the spatial complexity of lead exposure in children and have contributed to a decoupling of blood lead concentrations in sparrows and children over time.

These findings demonstrate the largely unrealised potential of human commensal species to inform the identification and management of lead contamination and exposure risks in mining and smelting impacted urban environments.