

Heavy Metal Contamination – why should we care?



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Little Things Matter: The Impact of Toxins on the Developing Brain



<http://youtu.be/E6KoMAbz1Bw>

Take home message:

There is no safe level for a range of neurotoxic metals

Sources of lead and other metals in our gardens & parks



Why are metals a potential problem?



- Environmental metals and metalloids easily absorbed into the human body.
- Exposure occurs in 3 main ways:
 - Consumption of produce grown in contaminated soil
 - Ingestion of soil, dust, paint
 - Inhalation of soil and dust
- Young children most at risk - higher absorption; more hand - mouth activity.
- Can cause adverse neurocognitive and behavioural outcomes.

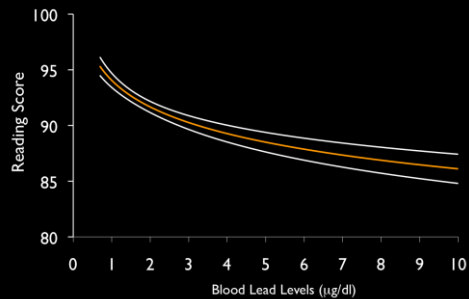
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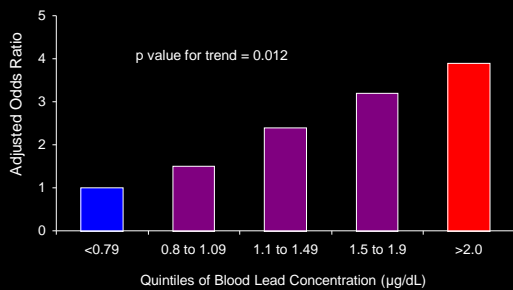
Is Lead Associated with Cognitive Deficits at low blood Lead Levels?

Reading Scores by Blood Lead Levels in US Children, NHANES III, 1998-1994



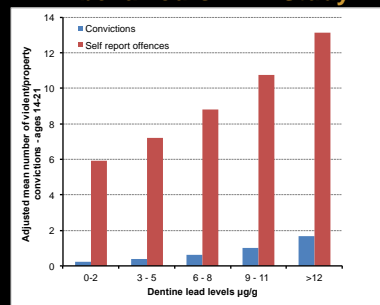
Adapted from Lanphear BP, et al. Public Health Reports 2000;115:521-529

Risk of ADHD by Blood Lead Levels in US Children, 4 to 15 years, NHANES 1999-2002



Braun J, et al. EHP 2006;117:500-505.

Link between tooth lead levels and criminal behaviours – NZ Study

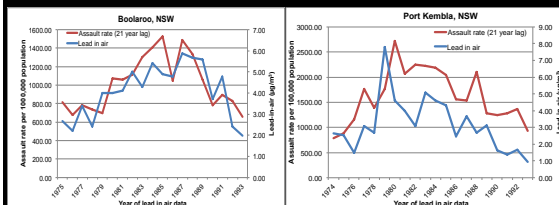


Fergusson D, et al. 2008. J Epidemiol Community Health, 62, 1045-1050. Data adjusted for SES, maternal education, ethnicity, family conflict, maltreatment, maternal smoking during pregnancy, parental criminal offending and parental alcoholism.

NSW lead and crime data

Lead-in-air concentrations explains ~ 21 % of the assault rates in 6 NSW cities 21 years later even after taking into account:

- % population aged 15-24 years of age
- % of population who have finished year 12
- Median income levels



NHMRC 2015 – Blood Lead

Evidence for health effects occurring as a result of blood lead levels less than 10 µg/dL (100 ppb) is less clear.



Australian Government
National Health and Medical Research Council

NHMRC STATEMENT: EVIDENCE ON THE EFFECTS OF LEAD ON HUMAN HEALTH

- Blood lead levels >10 µg/dL - harmful effects on organs and bodily functions.

BUT

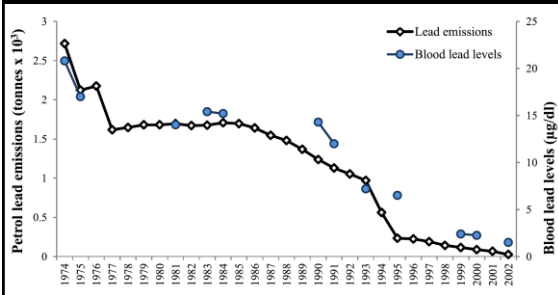
- Blood lead levels <10 µg/dL associated with reduced childhood IQ, academic achievement and behavioural issues.

Globally - Clear statement that there is no safe level

- WHO
- German Biomonitoring Commission
- US Centers of Disease Control
- US EPA
- Health Canada

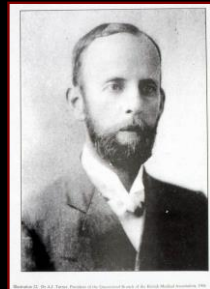
Sources

Blood lead and petrol lead emissions, NSW



Lead emissions from NSW sales of leaded petrol and Sydney blood lead levels, Kristensen, 2015.

Lead paint – a known risk since 1909



"Prevention is easy. Paint containing lead should never be employed ... where children, especially young children, are accustomed to play.....The curative treatment consists essentially in removing the child from the source of the poison."

A.J. Turner, 1909 Br. Med J., 1 895-897.

Exposures

Soil



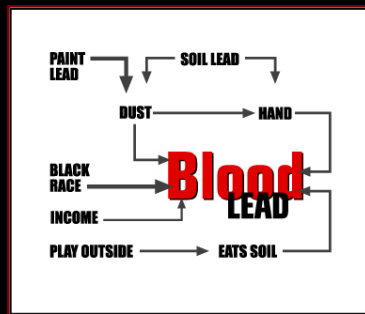
Dust



Paint



Pathways of Childhood Lead Exposure



Measures on Australian city children

- Fremantle 2005 study – 8% (8/100) > 5 µg/dL
- Sydney 2006 study - 7.5% (8/107) > 10 µg/dL
- Overall estimate - 100,000 (7.4%) children > 5 µg/dL

The problem is much improved, but has not 'gone away'

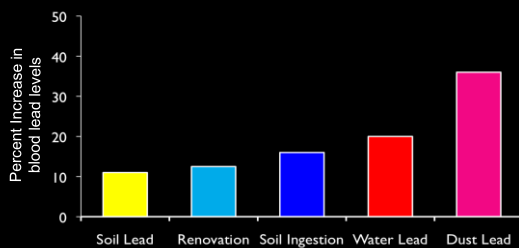
Summary of Effects < 10 µg/dL

Health effects of low-level lead concentrations in children		
The level of evidence linking various health effects in children		
Lead concentration level in blood	Level of evidence	Health effects
< 5 micrograms per decilitre	Sufficient	<ul style="list-style-type: none"> • Decreased academic achievement • Lower IQ scores • Attention-related behaviours • Anti-social behaviours
	Limited	<ul style="list-style-type: none"> • Delayed puberty • Decreased kidney function in children ≥ 12 years
< 10 micrograms per decilitre	Sufficient	<ul style="list-style-type: none"> • Delayed puberty • Reduced postnatal growth • Decreased hearing
	Limited	<ul style="list-style-type: none"> • Hypersensitivity by skin prick test
	Inadequate	<ul style="list-style-type: none"> • Asthma and eczema

Source: Adapted from US National Toxicology Program 2012, [www.ntp.niehs.nih.gov/ntp/36443](http://ntp.niehs.nih.gov/ntp/36443)

What is the Most Important Source of Lead Intake for Children?

The Rochester Lead Study



Adapted from Lanphear BP, et al. Journal of Pediatrics 2002;140:40-47.

Links and take home advice

Keep children safe by:

- Test soils and household dusts
- Soil screening
- Remove flaking paint (use a specialised professional)
- Advice to parents/teachers:
 - Wash hands
 - wet wipe surfaces
 - reduce dust
 - Remove flaking paint
 - use a HEPA vacuum cleaner.

Links

- Test soils and household dusts. Use a NATA accredited service: www.nata.com.au
- Soil screening: VegeSafe - <http://research.science.mq.edu.au/vegeseafe/>
- Remove flaking paint (use a specialised professional): www.painters.edu.au
- Advice to parents:
 - Wash hands, wet wipe surfaces, reduce dust, flaking paint, use a HEPA vacuum cleaner.
- Links to reliable sources of information:
 - www.cdc.gov/nceh/lead
 - www2.epa.gov/lead
 - <http://www.nhmrc.gov.au/health-topics/lead-blood-levels>
 - www.lead safeworld.com/solutions
- Link to easy to read articles:
 - <https://theconversation.com/profiles/mark-patrick-taylor-11394/articles>