

The problem with lead paint



World Health
Organization

Outline

- Background
- The use of lead in paint
- Exposure and health impacts
- Summary

Background

- Lead paints contain lead compounds that are added to give certain properties
- Wide range of uses
- Water-based paints rarely contain intentionally-added lead

The term paint is used to also include varnishes, lacquers, stains, enamels, glazes, primers, and coatings

Lead compounds have a range of functions in paint

- **Pigments** - The most commonly used are lead chromates and lead molybdates which are bright yellow, orange or red
- Pigments can also be mixed with others to produce bright colours such as green and purple
- Lead carbonates and lead sulfates can be used as white pigments, but are rarely used
- Pigments may contribute ~1500 to >100 000 ppm of lead

Lead compounds have a range of functions in paint

- **Drying agents and catalysts** - e.g. lead naphthenate and lead octanoate
 - driers may contribute ~1200 to >6000 ppm of lead
- **Corrosion resistance agents** - Added to paints used on metal surfaces, e.g. lead tetroxide (also called red lead or minium)
- Alternative, non-lead compounds can perform as well as lead-based ones and the paint is of equivalent quality

Completely lead-free paint is not possible

- Trace quantities of lead may be present in the fillers and other earth-based ingredients
- Typically contributes ≤ 90 ppm, though sometimes more

Types of paint that may contain lead

- Decorative paints (architectural paints, home or residential paints)
 - used on the exteriors of buildings such as houses, schools and commercial premises, and on interior surfaces such as walls, ceilings, windows etc
- Coatings
 - used in the manufacture of toys, pencils, furniture and other household items
- Glazes
 - used on pottery e.g. food containers, cups, bowls, cooking pots



Photo credit: IPEN

Types of paint that may contain lead

- Rust and corrosion resistant paints
 - used on metal structures e.g. on school playground equipment, bridges, oil rigs
- Industrial paints
 - e.g. used as coatings for automobiles, equipment, plastic components, painting road markings etc
- Artist's paint
 - specialized oil paints containing lead pigments, usually exempted from regulatory controls

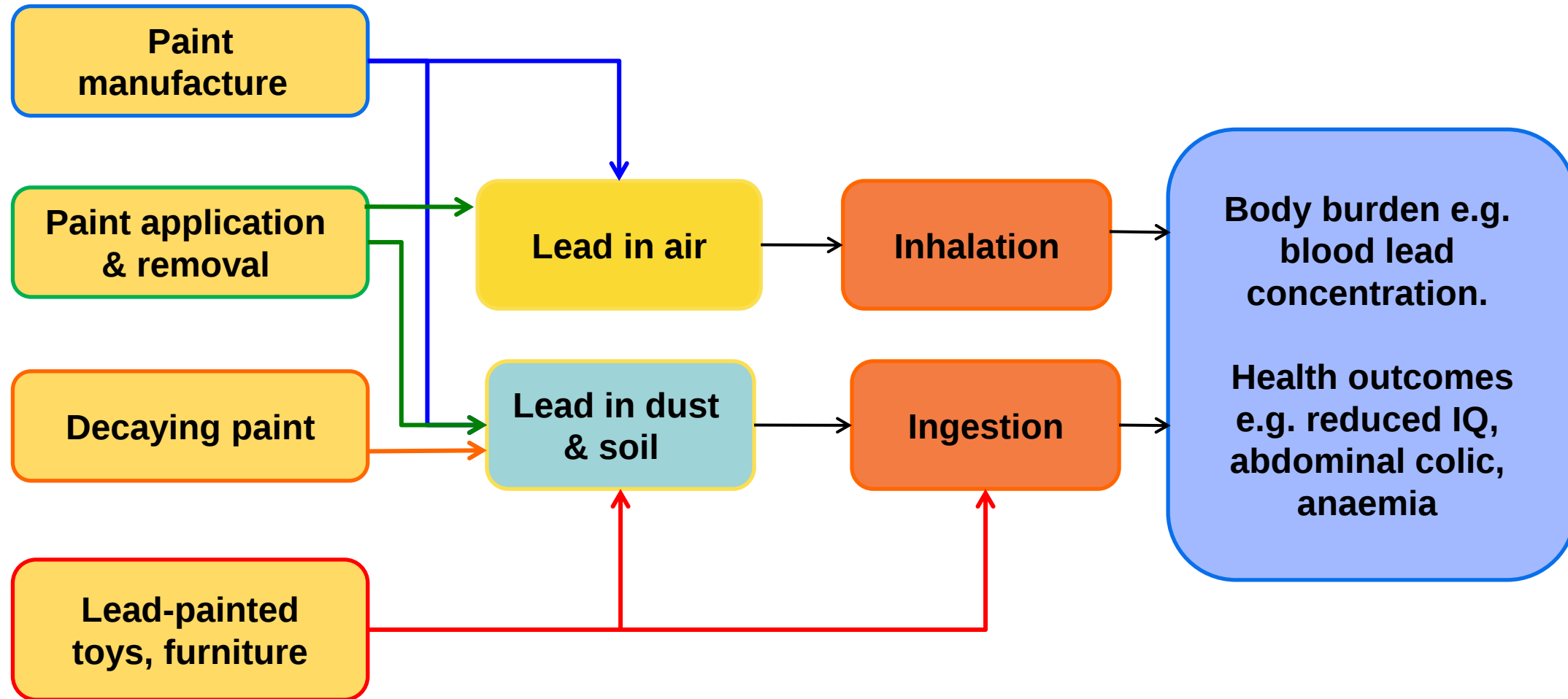


Photo credit: Dr Venkatesh Thuppil

Why is lead paint a problem?

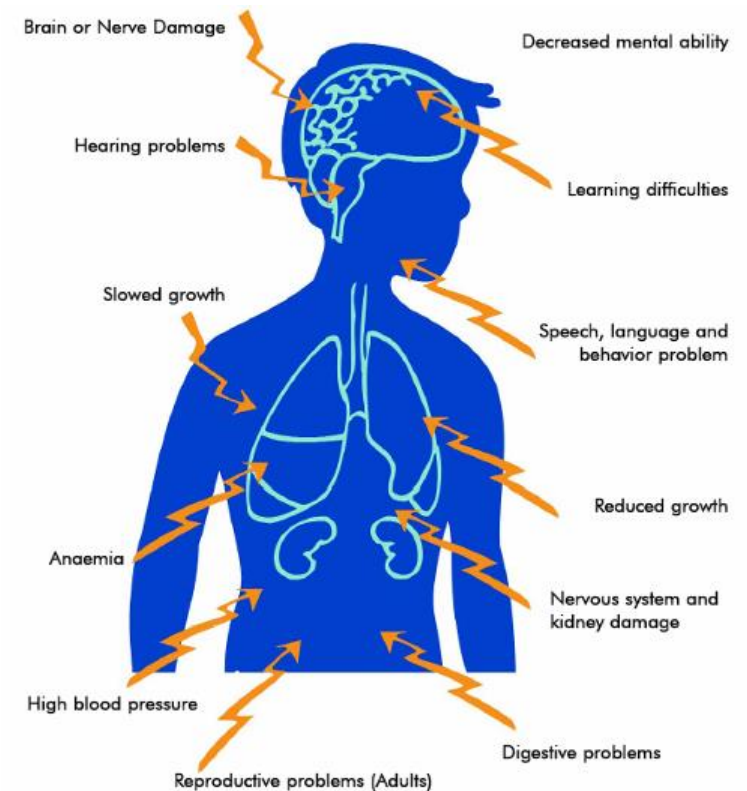
- Source of exposure to lead during manufacture, application and removal of paint
- Paint breaks down over time, fragmenting into flakes and dust that contaminate the domestic environment and soil
- Lead is persistent in the environment, and when released can remain there indefinitely
- Leaves a legacy of potential human exposure for many years into the future – especially to children

Multiple pathways of exposure to lead from paint



Children are highly vulnerable

- There is no known level of lead exposure that is considered safe
- Children can be highly exposed because they spend time on the ground and frequently put their hands to their mouths
- Childhood lead exposure can damage the brain and nervous system resulting in decreased IQ and behavioural problems
- Lead also causes a significant burden of disease through other long-term impacts on health



Children may suffer serious poisoning from lead paint



Figure 2 – A large quantity of lead paint chips can be seen in this radiograph of the abdomen and pelvis of a 2-year-old boy with lead poisoning.

Pregnant women are vulnerable

- Pregnancy mobilizes lead stored in bone, releasing it back into blood where it can be circulated to maternal tissues and the fetus
- Further exposure from the environment raises the blood lead concentration even higher
- Increased risk of hypertension during pregnancy
- Exposure of pregnant women can result in exposure of the fetus – may cause reduced fetal growth

Lead causes significant burden of disease

Institute for Health Metrics & Evaluation estimations (2017)

- 540 000 deaths from long-term effects
- 13.9 million disability adjusted life years (DALYs)
- 64% of the global burden of idiopathic intellectual developmental disability
- 6% of the global burden of hypertensive heart disease
- 3% of the global burden of stroke

<https://vizhub.healthdata.org/gbd-compare/>

Economic costs of lead exposure are high

- Estimated economic losses due to reduced IQ from preventable lead exposure is ~1.2% of global GDP
- Largest economic burden is borne by low and middle income countries.
- Economic losses by region (in international dollars):
 - Africa: I\$ 134.7 billion
 - Asia: I\$ 699.9 billion
 - LAC: I\$ 142.3 billion
 - USA: I\$ 50.9 billion

Attina & Trasande. 2013 <http://dx.doi.org/10.1289/ehp.1206424>

Costs of not banning lead paint are high

- Lead-painted homes are an important source of lead exposure for children
 - In France, 74% of children with elevated blood lead concentration live in homes with lead paint
- Estimated costs of remediating lead-painted homes:
 - France: US\$ 194 – 499 million
 - USA: US\$ 1 – 11 billion
- Cost-benefit of remediation significant
 - each US\$ 1 invested in lead paint hazard control yields return of US\$ 17–221

Pichery et al 2011. <https://ehjournal.biomedcentral.com/articles/10.1186/1476-069X-10-44>

Gould 2009. <http://ehp.niehs.nih.gov/0800408/>

Summary

- Lead paint can contain a range of lead compounds for different purposes
- Lead paint can cause a long-lasting hazard to health in all age groups, however, children are especially vulnerable
- There is no known safe level of exposure to lead
- Paints are available that do not contain lead compounds while still having the required properties
- Eliminating lead paint provides a net benefit to society and public health

Regulatory toolkit



<http://www.unep.org/chemicalsandwaste/noleadinpaint/toolkit>

