

Toolkit for Establishing Laws to Control the Use of Lead in Paint

# Module A

## The Problem With Lead Paint



# Outline

- Background
- Paint basics
- What components of paint can contain lead?
- Why lead paint is a problem?
- Summary
- References
- Point of contact



# Background

- Lead paints contain lead compounds that are added to give certain properties to the paint.
- Lead paints are still widely available and used in many countries.
- Uses include decoration of interior and exterior surfaces in homes and public buildings, on roads and bridges, and also on toys, furniture and playground equipment.
- Water-based paints rarely contain intentionally-added lead.

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



# Paint basics - categories

- Paint is sometimes categorized by its solvent base:
  - water-based paint - commonly called latex paint
  - organic solvent-based paint - commonly called alkyd paint.
- Paint is sometimes categorized by its intended use, e.g.:
  - decorative paints
  - industrial paint
- Some paints are categorized by their finish, e.g.:
  - enamel paint - hard, glossy and opaque finish.

# Paint basics - ingredients

- Pigment and fillers
  - Provide colour, hiding power and control gloss.
  - Fillers are special pigment materials are sometimes added to provide opacity and thickness to the paint.
- Resin
  - Functions as a binder to hold the pigment particles together and provide adhesion to the surface painted.
- Solvent
  - Acts as a carrier for the pigments and resin.

# Paint basics - ingredients

- Drying agent (drier)
  - The drying agent is added to some solvent-based paints to catalyze the reaction resulting in hardened cross-linked polymer networks that bind the pigment to the painted surface.
  - The result is often a dried paint with a hard, glossy surface.
- Other additives
  - A variety of substances can be added to the paint to enhance the paint's properties, such as ease of brushing, scuff resistance, sag resistance, corrosion resistance and increased durability.

(Reference 1)

# Lead compounds have a range of functions in paint

- **Pigments** - The most commonly used lead pigments are lead chromates and lead molybdates which are bright yellow, orange or red in colour.
- These pigments can also be used in a mixture with other pigments to produce bright colours such as green and purple.
- Lead carbonates and lead sulfates can be used as white pigments, but are rarely used since lead-free alternatives perform better.



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# Lead compounds have a range of functions in paint

- **Drying agents and catalysts** - e.g. lead naphthenate and lead octanoate.
- **Corrosion resistance agents** - Added to paints used on metal surfaces, e.g. lead tetroxide (also called red lead or minium).
- **Unintentional contamination** - Trace quantities of lead may sometimes be present in the fillers and other earth-based ingredients that are used in paint formulation.
- Alternative, non-lead compounds can perform as well as lead-based ones and the paint is of equivalent quality (see module E).



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# Contribution of components to the lead content of paint

- Concentration is expressed in terms of the proportion of lead to the weight of the total non-volatile part of the product, or of the weight of the dried paint film.
- A range of units may be used e.g. ppm, %,  $\mu\text{g/g}$ , mg/kg
  - $10 \text{ ppm} = 0.001\% = 10 \mu\text{g/g} = 10 \text{ mg/kg}$
- Lead-based pigments may contribute around 1500 to  $>100\,000$  ppm, depending on whether they are mixed with other pigments or used alone.
  - Red and yellow paints may have particularly high lead content.



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# Contribution of components to the lead content of paint

- Lead-based driers may contribute around 1200 to 6000 ppm or more, depending on whether they are mixed with other driers.
- Where there is unintended contamination, this typically contributes  $\leq 90$  ppm, though sometimes more – thus 'lead-free' paints may still contain a small amount of residual lead (it is not possible to have paint with 0 ppm of lead).

(Reference 2)

- Information on the actual lead content found in country-based studies of paint is presented in Module F.



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# Types of paint that may contain lead

- **Decorative paints** (also called 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, floors, windows and trim.
- **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?

- Lead paint is a source of lead exposure during its manufacture, application and removal.
- Lead paint breaks down over time, fragmenting into flakes and dust that can contaminate the domestic environment.
- Lead is persistent in the environment, and when released can remain there indefinitely.
- Lead paint can leave a legacy of potential human exposure for many years into the future – **children are particularly vulnerable.**



# Why is lead paint a problem?

- **Lead paint** that is peeling, chipping, chalking or cracked is a health hazard, however, intact lead paint in good condition is usually not a hazard.
- **Lead dust** is created when lead paint is scraped, dry sanded, heated or burned, or when painted surfaces rub together. Lead chips and dust can settle on surfaces and objects that people touch. Settled lead dust can re-enter the air when people vacuum, sweep, or walk through it. Dust from lead paint can contaminate soil.
- **Lead in soil** can be a source of exposure when children play on the ground, or when people bring soil into the house on their shoes. Plants can absorb lead from the soil and lead can enter the food chain. Lead present in soil may also migrate into underground water in certain circumstances.



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# Why is lead paint a problem?

- 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.
- Lead released into the environment is readily transported through air and water and has toxic effects on both terrestrial and aquatic organisms

See Modules B.i. and B.ii. for more information on the health and environmental impacts of lead

# 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, such as colour, corrosion resistance etc
- Eliminating lead paint provides a net benefit to society and public health

# References

1. Eliminate lead paint: protect children's health. African lead paint elimination project. IPEN; 2015  
([http://ipen.org/sites/default/files/documents/Eliminate\\_Lead\\_Paint\\_Protect-Childrens\\_Health\\_Africa\\_Feb\\_2015.pdf](http://ipen.org/sites/default/files/documents/Eliminate_Lead_Paint_Protect-Childrens_Health_Africa_Feb_2015.pdf), accessed 9 February 2017)
2. Lead in enamel decorative paints. National paint testing results in a nine country study. Nairobi: United Nations Environment Programme; 2013  
(<http://wedocs.unep.org/handle/20.500.11822/8280>, accessed 9 February 2017)



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