World Health Organization

Donate

Lead poisoning

27 September 2024

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Key facts

- **Exposure to lead can affect multiple body systems and is particularly harmful to young children and women of child-bearing age.**
- **Lead is distributed to the brain, liver, kidney and bones. It is stored in the teeth and bones, where it can accumulate over time. Human exposure is assessed through the measurement of lead in blood.**
- **Lead exposure was attributed to more than 1.5 million deaths globally in 2021, primarily due to cardiovascular effects.**
- **Lead in bone is released into blood during pregnancy and becomes a source of exposure to the developing fetus.**
- **There is no level of exposure to lead that is known to be without harmful effects.**
- **The harmful impacts on health from lead exposure are entirely preventable.**

Overview

Lead is a naturally occurring toxic metal found in the Earth's crust. Its widespread use has caused extensive environmental contamination, human exposure and significant public health problems globally.

Important sources of environmental contamination include mining, smelting, manufacturing and recycling activities, and lead use in a range of products. Most global lead consumption is for the manufacture of lead-acid batteries for motor vehicles. Lead is used in many products, including pigments, paints, solder, stained glass, lead crystal

glassware, ammunition, ceramic glazes, jewellery, toys, some traditional cosmetics, and some traditional medicines. Lead can contaminate drinking water through plumbing systems containing lead pipes, solders and fittings.

Young children are particularly vulnerable to the toxic effects of lead and can suffer permanent adverse health impacts, particularly on the development of the central nervous system. Lead causes long-term harm in adults, including increased risk of high blood pressure, cardiovascular problems and kidney damage. Lead exposure during pregnancy can cause reduced fetal growth and preterm birth.

Sources and routes of exposure

People are exposed to lead through occupational and environmental sources. This mainly results from:

- **inhalation of lead particles generated by burning materials containing lead, for example during smelting, recycling, stripping leaded paint and plastic cables; and**
- **ingestion of contaminated dust, soil, water or food.**

Young children are particularly vulnerable to lead poisoning as they may absorb up to 4–5 times as much lead as adults from an ingested dose. Moreover, children's innate curiosity and their age-appropriate and frequent hand-to-mouth and object-to-mouth behaviours increase their risk of exposure to lead-contaminated dust, soil and paint. Children who engage in pica, the compulsive, habitual consumption of non-food items, are at particularly high risk. Exposure to lead-contaminated soil and dust resulting from battery recycling and mining has caused outbreaks of mass lead poisoning, including deaths in young children, in some countries.

Once lead enters the body, it is distributed to organs including the brain, kidneys, liver and bones. Lead is stored in the teeth and bones, where it accumulates over time. Lead stored in bone may be released into the blood during pregnancy and expose the fetus. Malnourished children are more susceptible to lead as they absorb more lead if other nutrients are deficient, especially calcium or iron.

Health effects in children

Lead exposure can have serious consequences for the health of children. Exposure to very high levels of lead can severely damage the brain and central nervous system causing coma, convulsions and even death. Children who survive severe lead poisoning may be left with permanent intellectual disability and behavioural disorders. At lower levels of exposure that may have no obvious symptoms, lead can lead to a spectrum of injury across

multiple body systems. In particular, lead can permanently affect children's brain development, resulting in reduced intelligence quotient (IQ), behavioural changes including reduced attention span and increased antisocial behaviour, and reduced educational attainment. Lead exposure also causes anaemia, hypertension, renal impairment, immunotoxicity and toxicity to the reproductive organs.

There is no known safe blood lead concentration; even blood lead concentrations as low as 3.5 µg/dL may be associated with decreased intelligence in children, behavioural difficulties and learning problems *(1)*.

Burden of disease

Lead exposure causes a significant burden of disease. The Institute for Health Metrics and Evaluation (IHME) estimates that more than 1.5 million deaths globally were attributed to lead exposure in 2021, primarily due to cardiovascular effects *(2)*. Additionally, lead exposure was estimated to account for more than 33 million years lost to disability (disability-adjusted life years, or DALYs) worldwide in 2021 *(2)*.

WHO response

WHO identifies lead as one of 10 chemicals of major public health concern requiring action by Member States to protect the health of workers, children and women of reproductive age. WHO publishes a range of resources on lead, including information for policy-makers, technical guidance, training materials and advocacy materials.

In 2021, WHO published Guidelines on clinical management exposure to lead. The guidelines recommend that for individuals with blood lead concentration equal to or greater than 5 µg/dL, the source of lead exposure should be identified, and appropriate action taken to terminate exposure.

Lead paint is a major source of exposure globally. WHO and UNEP lead the Global Alliance to Eliminate Lead Paint. It aims to encourage all countries to develop legally binding laws to control the use of lead in paint. As of January 2024, 48% of countries have legally-binding controls on lead paint.

WHO is preparing guidelines on prevention of lead exposure, which will provide policy-makers, public health authorities and health professionals with evidence-based guidance on the measures to protect the health of children and adults from lead exposure.

References

1. CDC updates blood lead reference value. Atlanta: US Centers for Disease Control and Prevention; 2024 (https://www.cdc.gov/lead-prevention/php/news-features/updates-blood-lead-reference-value.html).
2. Institute for Health Metrics and Evaluation. Lead exposure-Level 3 risk. Seattle: University of Washington; 2024 (https://www.healthdata.org/research-analysis/diseases-injuries-risks/factsheets/2021-lead-exposure-level-3-risk).