

Elevated Blood Lead Levels - Response Protocol for

- **Public health priority:** Routine
- **Public Health Unit (PHU) response time:** Respond to confirmed cases within 3 working days. Enter confirmed cases on Notifiable Conditions Information Management System (NCIMS) within 5 working days.
- **Case management:** Ascertain source where possible, and recommend risk reduction measures. Notify SafeWork NSW, where appropriate, of cases from occupational exposure.
- **Contact management:** Consider identification of other persons affected by the same source or the transfer of contaminant to other household members.

NSW Public Health Units

1. Surveillance Objectives

- To identify cases and recommend appropriate risk reduction measures.
- To monitor the epidemiology to inform the development of better risk reduction strategies.

2. Case Definition

A confirmed case requires:

- A person with a venous blood lead level of ≥ 5 $\mu\text{g/dL}$ ($0.24\mu\text{mol/L}$)

3. Notification Criteria and Procedure

Elevated blood lead level is to be notified by:

- Laboratories on diagnosis (electronically or by routine mail to the local Public Health Unit).
- Only confirmed cases should be entered onto NCIMS.

4. The Disease

Causative Agent

Lead is a naturally occurring metal found in the earth's crust. It has a wide variety of uses in manufacturing due to its properties of being soft, malleable and corrosion resistant. Australia is one of the world's major lead-producing countries.

Most people in Australia live in places where there are very small amounts of lead in food, drinking water, air, dust, soil and consumer products. Exposure to higher than background levels of lead may occur in areas where there are industrial sources of lead or through exposure to lead-containing paint. However, people's exposure to lead has substantially reduced in recent decades due to national initiatives which have restricted the addition of lead to paint and petrol, and the use of lead in consumer goods (e.g. toys, cosmetics and cans). In addition, lead management programs in endemic areas, such as Broken Hill, have resulted in a steady decline in blood lead levels in children.

Lead and lead compounds are not beneficial or necessary for human health, and can be harmful to the human body.

Mode of Absorption

Elevated blood lead levels usually derive from the ingestion of lead-containing substances, the inhalation of lead-containing dust and transfer from mother to foetus. Less commonly, some forms of the metal can be absorbed through the skin. Young children (under 5 years) and pregnant women are especially vulnerable to environmental exposure to lead, but adults engaged in particular occupations and hobbies are also at risk.

The average blood lead level among Australians is now estimated to be below 5 micrograms per decilitre (5 µg/dL or 0.24 µmol/L). A blood lead level greater than 5 µg/dL (0.24 µmol/L) suggests that a person has been, or continues to be, exposed to lead at a level that is above what is considered the average 'background' exposure in Australia.

Note that in communities that are at risk of known excess lead exposure due to industry (such as Broken Hill), Public Health Authorities run specific programs to monitor and reduce lead exposure.

Clinical Presentation

Health effects as a result of lead exposure differ substantially between individuals. Factors such as a person's age, the amount of lead, whether the exposure is over a short-term or a longer period, and the presence of other health conditions, will influence what symptoms or health effects are exhibited. Lead can be harmful to people of all ages, but the risk of health effects is highest for unborn babies, infants and children under 5 years.

It is well established that blood lead levels equal to or greater than 10 µg/dL (0.48 µmol/L) may have harmful effects on many organs and bodily functions. Effects such as increased blood pressure, abnormally low haemoglobin, abnormal kidney function, long-term kidney damage, behavioural problems, cognitive impairment and abnormal brain function have been observed at blood lead levels between 10µg/dL and 60 µg/dl (0.48-2.89 µmol/L) in adults and children.

Encephalopathy—which is characterised by irritability, agitation, poor attention span, headache, confusion, uncoordinated walking or movement, drowsiness, convulsions, seizures or coma—can occur at blood lead levels of 100–120 µg/dL (4.82-5.79 µmol/L) in adults and 70–100 µg/dL (3.37-4.82 µmol/L) in children. In extreme situations, irreversible brain damage or even death can occur at these blood lead levels.

A comprehensive review of the health effects of lead by the National Health and Medical Research Council (NHMRC) in 2015 found an association between blood lead levels below 10 µg/dl (0.48 µmol/L) and health effects in some population groups. However there was insufficient evidence to conclude that lead at this level caused any of the health effects observed.

5. Managing Single Notifications

Response Time

Investigation

Within 3 working days of notification of a confirmed case, begin follow-up investigation.

Data Entry

Within 5 working days of notification enter confirmed cases on NCIMS.

Response Procedure

The response to a notification should be carried out in collaboration with the case's health carers and/or SafeWork NSW. Regardless of who does the follow-up, PHU staff should ensure that action has been taken to:

- Confirm any symptoms associated with exposure, including onset date
- Confirm whether the case or relevant care-giver has been provided with the results before beginning the interview
- Seek the doctor's permission to contact the case or relevant care-giver
- Review case management
- Identify household contacts who may also be at risk of elevated blood lead levels

Response protocol for single elevated blood lead level notifications in non- endemic areas

[For endemic areas, refer to existing local protocols and programs for managing lead notifications in children].

The protocol outline below is for **new** notifications. If the notification relates to follow up from a previous notified blood lead level within the last 12 months (BLL), the PHU response can be modified according to the circumstances of the case.

Level	Blood lead level	Age	PHU Response
1	Greater or equal to 5 but less than 10 µg/dL (≥0.24 - <0.48 µmol/L)	Under 5 years	<ul style="list-style-type: none"> • Information: Consult treating doctor. Standard letter to case's parent/guardian and NSW Health's factsheet 'Lead exposure in children'. • Risk management: If requested by the doctor or the family offer counselling on risk reduction/contact management to case's parents/guardians. • Blood test: Household members may need to be tested particularly young children and pregnant women.
		5 years and above	<ul style="list-style-type: none"> • Information: Consult treating doctor. Standard letter to case's parent/guardian and NSW Health's factsheet 'Lead exposure in children'. • Risk management: Not routine. At the discretion of the PHU. • Blood test: Household members may need to be tested particularly young children and pregnant women.
2	Greater or equal to 10 but less than 25 µg/dL (≥0.48 - < 1.2µmol/L)	Under 5 years	<ul style="list-style-type: none"> • Information: Consult treating doctor. Standard letter to cases parent/guardian and NSW Health's factsheet 'Lead exposure in children'. • Risk management: Offer counselling/home risk assessment to case's parents/guardians as appropriate. • Blood test: Household members may need to be tested particularly young children and pregnant women. Retest BLL after 6 months or earlier if clinically indicated.
		5 years and above	<ul style="list-style-type: none"> • Information: Consult treating doctor. Standard letter to case. If non occupational exposure provide lead factsheet on risk identification and management to requesting doctor or case as appropriate. • Work related exposures: Suggest case or treating doctor advise patient to discuss BLL with employer in the case of occupational exposure. Inform SafeWork in case of a cluster of cases. • Risk management: Offer counselling/home risk assessment to case as appropriate. • Blood test: Household contacts may need to be tested particularly young children and pregnant women.
3	Greater or equal to 25 but less than 45 µg/dL (≥1.2- <2.2 µmol/L)	Under 5 years	<ul style="list-style-type: none"> • As for level 2, plus • Environmental assessment: Conduct preliminary environmental assessment, including home visit, exposure pathways and sampling if source not obvious. • Expert advice: Seek expert advice from clinical toxicologist for future BLL retesting.
		5 years and above	<ul style="list-style-type: none"> • As for Level 2, plus • Environmental assessment: Conduct preliminary environmental assessment, including home visit, exposure pathways and sampling if source not obvious. • Work related exposures: Strongly suggest case or treating doctor consult SafeWork NSW for further advice on occupational exposure, if appropriate.
4	Greater or equal to 45 µg/dL (≥ 2.2 µmol/L)	All ages	<ul style="list-style-type: none"> • As for level 3, plus • Medical treatment: If BLL of or above 45 µg/dL (2.17 µmol/L) in a child ensure treating doctor is aware of result when received as BLL at these levels may require urgent medical treatment (chelation). • Medical treatment: If BLL above 70 µg/dL (3.37µmol/L) requesting doctor is aware of the result as BLL at these levels in an adult may require urgent medical treatment (including chelation).

Management

a. Investigation and Treatment of Cases

The main treatment for adults and children involves:

- Reducing or preventing the case's exposure to lead sources
- Reducing the impact of exposure or eliminating it
- Ensuring that exposure to other sources does not occur.

Education

The case or relevant care-giver should be informed about the effect of the blood lead level and the likely causes. In particular, emphasis should be placed on minimising the exposure of young children and pregnant women to sources of lead.

Information for community members and health care professionals is available from PHUs.
<http://www.health.nsw.gov.au/environment/factsheets/Pages/lead-exposure-children.aspx>

The Office of Environment and Heritage Pollution Line, telephone 131555 or internet site
<http://www.environment.nsw.gov.au/pollution/>

Other information on lead is also available from
<http://www.epa.nsw.gov.au/pesticides/lead.htm>

Exposure Investigation

The case or relevant care-giver should be asked about sources of lead contamination such as:

- Lead paint on houses built before 1970 (including the case's and neighbouring houses), and in particular (i) any renovation or demolition of these houses and (ii) whether a young child is known to engage in eating soil and paint (pica).
- Involvement in high risk occupations, including lead mining and smelting, metal repair or foundry work, painting and decorating, automotive (including radiator) repairs or breaking down old car batteries
- Engaging in high risk hobbies involving lead or lead paint, including casting metal sinkers, antique furniture restoration, lead soldering, lead lighting and indoor shooting
- Living in an area associated with large and small lead industries or areas with historic high traffic flow
- Household pets which may provide an exposure pathway for lead dust
- Use of traditional medicines such as Ayurvedic or Burmese remedies.
- Infants who regularly chew or suck on painted toys, cots, window sills, paint chips, etc.
- Other potential sources such as sandpits, vegetable gardens or domestic poultry

Further information on occupational sources of lead can be obtained from SafeWork NSW on 13 10 50 or
<http://www.safework.nsw.gov.au/>

Isolation and Restriction

None

Environmental Evaluation

If the source of the exposure is not clear after the initial investigation has taken place, the PHU should arrange for an environmental assessment of the residential area if the case's blood lead level is in excess of 25 µg/dL (1.2 µmol/L) and/or the implicated source may affect the broader community.

Environmental Control measures

The Public Health unit response to any exposures identified will need to be tailored to the specific risks identified. General advice can be provided by telephone or the provision of information such as factsheets, or advice on managing lead paint in the home (for example refer to Lead Safe Blitz video)
<https://www.youtube.com/watch?v=q1zkvJGH1uA>

In some instances an EHO may provide an assessment through a home visit. Householders (or the landlord of the property) may also be advised to engage the services of an independent assessor or remediator to advise or assist with exposure risk reduction.

b. Contact Management:

Identification of Contacts

Contacts can be defined as all persons exposed to the same source as the case (see case definition), or who have secondary exposures (e.g. children of persons who bring lead dust home on their clothes).

Investigation and treatment of Contacts of Confirmed Cases

Blood lead testing should be recommended for:

- Children under 5 years and pregnant women if another household member has a blood lead level ≥ 5 $\mu\text{g/dL}$ (0.24 $\mu\text{mol/L}$).
- Children aged 9 to 48 months who live in or visit older dilapidated housing with peeling paint
- Children aged 9 to 48 months who have been present during renovations of older housing painted before 1970
- Children who have siblings with elevated blood lead levels
- Children with pica, particularly if living in lead contaminated environments
- Children aged 9 to 48 months whose parents may be occupationally exposed or who are living near lead smelters, battery breaking yards, lead ore bodies or near highways or main roads with historic heavy traffic
- Children exposed to less common pathways such as lead hobbies or alternative medicines containing lead.

Education

Advise susceptible contacts (or parents/guardians) of the risk of elevated blood lead levels. In particular, emphasis should be placed on minimising the exposure of young children and pregnant women to sources of lead.

Isolation and restriction

None

6. Managing special situations: Cluster of notifications

Multiple notifications relating to individual workplaces should be referred to SafeWork NSW for further follow-up and management. Further advice can be sought from Environmental Health Branch, Health Protection NSW.

In circumstances where there appears to be geographical clustering of non-occupational cases, excluding known lead endemic areas (especially in children under 5), and the source is unknown, further investigation may be warranted. Further advice can be sought from Environmental Health Branch, Health Protection NSW.

7. Appendices

- A. Fact sheet: Lead Exposure in Children