2.0 Steps in Secondary Prevention of Lead Exposure

"Secondary prevention aims to reduce the impact of a disease or injury that has already occurred. This is done by detecting and treating disease or injury as soon as possible to halt or slow its progress, encouraging personal strategies to prevent reinjury or recurrence, and implementing programs to return people to their original health and function to prevent long-term problems" (Institute for Work & Health 2015).

Secondary Lead Exposure Prevention is mainly aimed at identifying people with a blood lead level above the target level and stopping further lead exposure by identifying what in the individual's environment is the probable source/s of the person's current exposure to lead and removing or safely abating the source/s until the blood lead level falls below the target level.

Secondary Lead Exposure Prevention deals with people at an individual level. It is about identifying groups of persons likely to be at risk of elevated blood lead levels and encouraging individuals who fit into such groups to have a blood lead test. These people will be identified - from either a national blood lead level survey, blood lead level research, or individual blood lead results uploaded into the National Blood Lead Surveillance System.

Having determined that the person has, or is at high risk of having, an elevated blood lead level, Secondary Lead Exposure Prevention is about preventing further exposure, by either removing the source of the lead from the person's environment or removing the person from contact with the source of the lead and to use proven nutritional intervention as relevant (see 2.6, below).

Responsibility for identifying individuals who need Secondary Lead Exposure Prevention is broad – it includes anyone who might suggest a blood lead test for an individual or laboratory lead testing of appropriate samples collected from the home environment (including backyard eggs and traditional medications), hobby studio or workplace, shooting range, etcetera.

For example:

- A teacher or learning intervention professional who notices behaviour associated (not necessarily exclusively) with high blood lead levels, such as hearing loss, poor handwriting, poor coordination, learning difficulties, ADD or ADHD, and delinquency
- A doctor or other health professional who, through questionnaires and/or detailed case history, identifies a patient who is:

2023 Volcano Art Prize Entry. Artists: Jayne Bentivoglio and Jo Miskle
Title: NSW Parliament House Protest
Lead-Safety Message: Our health, water, air, land and tourism are under threat! Protect Mudgee Region from toxic metal mining! Protect our greenfield agriculture! Lead poisoning is forever!
Description of Work: iPhone photos of protesters from Mudgee Region Health Alliance and Mudgee Region Action Group during International Lead Poisoning Prevention Week of Action 2023.

https://volcanoartprize.com/portfolio-item/nsw-parliament-house-protest/

- At risk of lead exposure or is presenting with lead-related symptoms of at-risk individuals (listed at iv, above)
- Exhibiting lead-related learning behaviours or difficulties
- Is the playmate, housemate or sibling of a child with an elevated blood lead level
- Trying to conceive, or is pregnant, breastfeeding, perimenopausal or menopausal
- Presenting with hypertension, hearing loss, balance problems, bone fractures, loss of bone density or osteoporosis, cardiovascular disease, kidney disease, essential tremor, Parkinson's Disease, Motor Neurone Disease, early onset dementia or other lead-related health conditions

➢ A veterinarian who recognises a likely lead exposure in a pet or backyard poultry and advises the family to test the blood lead levels of their other animals and children

➢ A lead advisor, occupational hygienist or site assessor who recommends blood lead testing on the basis of elevated lead levels in soil, dust, degraded paint, drinking water, backyard eggs, Ayurvedic medicines, or any other lead source in a home, school, work, leisure or hobby location

2.1 Include progress steps and graphs in the National Blood Lead Surveillance System for individuals who have second and further blood lead tests or bone lead XRF scans

The National Blood Lead Surveillance System will incorporate blood lead series result tracking for individuals as well as information from their medical practitioner as to what lead abatement or other interventions (including the timing, dose and other relevant details) have been instituted, blood lead results and dates of steps taken can be graphed (by the pathology provider). This is then a useful tool in reducing blood lead levels for other patients and populations.

Whilst blood lead monitoring over time is invaluable (see ii, above), when the first blood lead result is highly elevated for an individual (due to inadequate levels of awareness of the need to conduct blood lead testing) bone lead x-ray fluorescence (XRF) machines will be used to assess the total body burden of lead in order to make decisions on treatment. If bone lead XRF machines are currently not available in each country, governments will ensure that they are imported and ready for use both for individuals and research study cohorts (see 3.2, below).

2023 Volcano Art Prize Entry. Artist: Drishti Jonchhe
Title: Mirrored Palm Trees
Lead-Safety Message: Mirrors are painted on the back with lead paint so don't let your little brother or sister eat mirror backing paint.
School: Creative Einstein
Age: 7
Description of Work: Colouring pencils on paper

https://volcanoartprize.com/portfolio-item/mirrored-palm-trees/

2.2 Create legislation and awareness campaigns to prevent further lead exposure of individuals

National government responsibility also consists of creating appropriate legislation for intervention to prevent further lead exposure to individuals whose blood lead level exceeds the current action level and raising awareness through information programs directed at local councils, state agencies, landlords and realtors, teachers, doctors and health professionals, veterinarians, employers in industries where lead exposure is probable or possible and so on.

For example, the national government will set up a fund (perhaps using lead- and fossil fuel-mining royalties or diverted fossil fuel subsidies) to assist people particularly in lead-smelter and mining towns (and communities with zinc, copper, tin, silver, gold, aluminium and fossil fuel facilities), in public housing, Indigenous communities and poorer rural or inner-city areas, to:

- Pay for laboratory lead testing of soil, dust, paint, water, backyard eggs, Ayurvedic medicines, and other consumer products
- Provide interest-free grants or other financial support aimed at identifying and safely addressing sources and pathways of lead exposure and reducing the blood lead levels of those individuals.

Although some individuals will be able to afford laboratory testing of environmental samples themselves, in terms of social equity, testing and abatement costs will be covered by the government for those who are unable to meet these financial demands or who reside in public housing/government controlled housing.

2.3 Identify persons at risk using known risk factors and set action blood lead levels to prevent further lead exposure in each of the sub-populations for which target blood lead levels have been set

The action blood lead level is the level at which the government will intervene, or in the case of Secondary Lead Exposure Prevention, create regulations which require others (e.g., landlords, employers, state or provincial agencies) to take action, to bring down an individual's blood lead level.

The information (in educational materials) provided by a health department or health professional in an effort to determine or test for lead sources in the individual's environment will be specific to the country and indeed the region as local sources can impact hugely on case management.

Some of these local sources and personnel include:

2023 Volcano Art Prize Entry. Artist: Elizabeth O'Brien
Title: Indigenous Lead Safety
Lead-Safety Message: Indigenous Lead Safety Policy needs to be developed in Australia urgently to help Close the Gap in health, housing, incarceration rates and education.
Description of Work: Microsoft Powerpoint collage of images created at https://imvoting.yes23.com.au/download and https://forms.gle/Kmxh8pEDchoM2Vs6A

https://volcanoartprize.com/portfoli

- Lead, zinc, copper, tin, silver, gold and aluminium mines and smelters
- Fossil fuel mining and processing facilities and fossil fuel-burning power stations
- Lead manufacturing plants
- Trucking, shipping and wharf workers responsible for the handling, storage and transport of Tetra Ethyl Lead (TEL), AvGas, raw heavy metal materials between locations (such as from the mine/s to storage or processing facilities, refineries, smelters)
- Maintenance personnel working on the handling, storage and transport equipment for Tetra Ethyl Lead (TEL), AvGas, raw heavy metal materials who are not manufacturing plant personnel
- Lead-acid battery, e-waste and/or vehicle recycling plants or sites
- Bone and metal *bhasma* manufacturing sites
- Sites including homes and streets contaminated with lead, or painted or soldered lead contaminated reuse items or sites where leaded waste is illegally mined, processed, recycled, salvaged or used to make ammunition, fishing sinkers, jewellery, arts, crafts, and other DIY projects, and so on
- Uncontrolled waste dumps
- Ex-leaded petrol/gasoline service station sites
- Incinerators
- Crematoria
- General aviation airports (while leaded AvGas remains in use)

In order to prevent further lead exposure, any child or adult, including workers, with a blood lead level above the target level will be eligible for source and pathway identification/environmental testing, and nutritional and other interventions using the Hierarchy of Control for Managing Risk of Materials of occupational exposures.

Recent research into lead-related health effects makes clear that there is no longer any justification for accepting a higher blood lead level in an adult than in a child (Roberts *et al* 2020).

A good Secondary Lead Exposure Prevention strategy would prioritise those people with the highest blood lead levels.

2023 Volcano Art Prize Entry. Artist: Mavis Zhou
Title: Flamingo
Lead-Safety Message: A million birds die in Europe each year from eating lead shot used by hunters. Ban lead shot and clean up the waterways!
School: Creative Einstein
Age: 6
Description of Work: Colouring pencils on paper

https://volcanoartprize.com/portfolio-item/flamingo-3/

2.4 Undertake isotopic fingerprinting research on individuals who do not have identified lead sources or exposure pathways

Individuals who have been identified through the National Blood Lead Surveillance System as having elevated blood lead levels and yet do not have clearly identifiable lead exposure pathways will be offered isotopic fingerprinting research (as mentioned in xii, above) to pinpoint their current lead sources and exposure pathways.

If no current lead source is identified and the person is now living or working in a different region or country, utilising this research method, lead in the blood can be matched to lead sources in other regions or countries that they were exposed to earlier in life.

This could result in opportunities for Tertiary Lead Poisoning Prevention in other people who lived or worked in the same region or country (see 3.0, below).

Given the expense of this form of research, nzthis will be funded by national governments, perhaps sourcing these funds from lead mining royalties and diverted fossil fuel subsidies.

2.5 Ensure ongoing blood lead monitoring to achieve Secondary Lead Exposure Prevention

When the first blood lead result is above the target blood lead level, ongoing blood lead monitoring is essential following the initial identification of lead sources and pathways and nutritional intervention for the individual, particularly in lead-smelter and mining towns, in public housing, Indigenous communities and poorer rural or inner-city areas.

Whilst lead workers will be informed via up-to-date occupational lead safety legislation that is enforced, hobbyists such as leadlighters, leaded glass makers, ceramicists, ammunition-makers, sinker-makers, shooters, jewellers and so on will be regularly informed by government of the need for ongoing blood lead monitoring and the available assistance should they return an elevated blood lead level.

Additionally, national medical protocols will be reviewed and updated to include a recommendation for blood lead testing if a child or adult presents with any of the signs and symptoms of lead exposure (listed at iv, above).

All blood lead results above the target level will be followed-up until re-testing determines that the blood lead level has fallen below the target for that sub-population.

2023 Volcano Art Prize Entry. Artist: Mia Chau
Title: Pandas
Lead-Safety Message: Just like pandas are black and white… with lead-safety and climate-safety you're either part of the problem or part of the solution!
School: Creative Einstein
Age: 6
Description of Work: Colouring pencils on paper

https://volcanoartprize.com/portfolio-item/pandas/

2.6 Research nutritional and other interventions which may decrease lead absorption, increase lead elimination or overcome lead-induced deficits

Individuals with very high blood lead levels may require chelation treatment at the time of the lead exposure.

It is essential to establish whether non-traditional chelators, nutritional and/or other interventions can either decrease the rate of absorption of any lead encountered in future or increase the rate of lead elimination from the body.

As well, research into interventions will examine the lead-induced deficits and whether the intervention addresses these.

For example, slow handwriting, poor maths and reading ability, inability to sequence and follow instructions.

In their editorial about a preschooler blood lead survey, Taylor and Lanphear (2020) point out the need to evaluate the impact of behavioural changes, as opposed to merely legislative changes, in reducing blood lead levels. In other words, to research the efficacy of education and awareness campaigns which aim to impact behavioural changes, such as lead-safe renovation practices, and hygiene measures.

The results of isotopic fingerprinting (as discussed earlier in xii and 2.4), could be used to identify groups of people with current lead exposure who may benefit from these interventions.

2.7 Incorporate any learnings from the above steps in Secondary Lead Exposure and Lead Poisoning Prevention into educational materials and media campaigns

All learnings from steps taken to this point in Secondary Lead Exposure Prevention will be incorporated into lead education and media campaigns (including social media) funded by government and carried out by government and a range of NGOs (see xiii, above and Addendum 1, below).

For example, once a cohort of lead-poisoned people who take Ayurvedic medicines containing metal *bhasmas*, has been identified and action taken to remove the lead containing products from the market through compulsory recalls,

2023 Volcano Art Prize Entry. Artist: Freya Jing Feng
Title: Dragon Melissa
Lead-Safety Message: Art can help create a Lead Safe World.
School: Highgate Public School
Age: 9
Description of Work: Wood box painting
https://volcanoartprize.com/portfolio-item/dragon-melissa/

media campaigns will raise awareness that previously sold lead-containing medications should be discarded and not used.

Another example could be to incorporate lead exposure prevention messages in cigarette packaging and quit smoking programs.

Public awareness campaigns will be evaluated to ensure return on investment, including by repeat blood lead surveys after education/awareness campaigns in targeted sub-populations and, where relevant, the provision of lead testing kits with instructions for environmental sampling, comments and interpretation of the results (see vii, above).

2023 Volcano Art Prize Entry. Artist: Christopher Nguyen
Title: Orange Dragon
Lead-Safety Message: Dragons and volcanoes should be the only natural smoke producers, let's not be one too.
School: Creative Einstein
Age: 11
Description of Work: Non-toxic colour pencils on paper

https://volcanoartprize.com/portfolio-item/orange-dragon/