DOCUMENT RESUME

ED 375 936 PS 022 572

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TITLE	Environmental Lead and Children's Health.
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PUB DATE	24 Jun 94
NOTE	7p.
PUB TYPE	Information Analyses (070)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	*Child Health; Comparative Analysis; Environmental Influences; *Environmental Standards; Foreign Countries; Gasoline; Government Role; *Lead Poisoning; *Public Policy; State Government
IDENTIFIERS	*Australia (New South Wales); Lead (Metal)

ABSTRACT

This paper discusses the threat to children's health posed by environmental exposure to lead, focusing on public policy issues surrounding lead exposure in New South Wales (NSW), Australia. In Australia, the current blood lead level at which there is a health concern is at or above 25 micrograms per deciliter (ug/dl) of blood for infants and toddlers, well above the level of 10 ug/dl in the United States. The major sources of environmental lead exposure are leaded petrol emissions, leaded paint, lead in dust or dirt, and lead industries. Leaded petrol is a particular concern in Australia, since it is still used on a widespread basis (unlike in the United States and Canada, where it is virtually banned) and contains higher levels of lead than leaded petrol in Western Europe. Lead exposure's health risks to and effects on young children are examined, and policy proposals advanced by the NSW Department of Health to reduce environmental lead exposure are discussed. The paper calls for: (1) a reduction of lead in petrol; (2) the lowering of the ug/dl blood level of concern; (3) the development of consistent strategies for action when levels of concern are reached; and (4) the reduction of other sources of lead exposure. (MDM)

Environmental Lead and Children's Health

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Environmental lead contamination and the occupational hazards for lead workers have been known for many years. Lead poisoning of children with high blood lead levels has also been widely documented. However, in the past five years there has been growing evidence that blood lead levels formerly thought of as safe, may not be. Researchers have found that by studying children in groups, there is a high correlation between even low blood lead level and deleterious developmental and behavioural effects on children. It is also disturbing that there are no noticeable symptoms of low blood level lead toxicity.

This issue is of importance to us because the group most vulnerable to lead toxicity is young children between the ages of 9 months to 4 years.

1 BLOOD LEAD LEVELS IN CHILDREN

The level of lead is measured in **micrograms per decilitre** of blood and is symbolised as **ug/dl**. In Australia, the current level of concern is 25ug/dl. Since the mid-60's the level of concern has been gradually lowered from 60ug/dl, and the present level is now under review.

In the USA, the level of concern is 10ug/dl with 15ug/dl being considered the level at which further action should be taken. The Centres For Diseases Control(CDC) has set the lower levels following recent studies which indicated that lower blood lead levels than previously thought, could be harmful to children. The CDC has also introduced a multi-tier approach where different action is recommended for different levels.

2 SOURCES OF LEAD CONTAMINATION

There are a number of sources of lead contamination, but the four major sources are:

- *Leaded petrol emissions*
- *Leaded paint*
- *Lead in dust and dirt*
- *Industries such as smelting and refining of lead*

Other sources include other metal smelters; burning of coal and oil; electrical power stations; industrial incinerators; lead in food and water, water pipes in old buildings and lead in pottery glazes and lead crystal.

Lead is a heavy metal that doesn't biodegrade, therefore it remains potent for many, many years.

♦ *Leaded Petrol Emissions*

The United States Environment Protection Agency has singled out the reduction of lead from fuel as the most effective measure which can be taken to reduce lead concentrations in children.

The Australian Academy of Science published a report noting that 90% or more of lead in the air was derived from petrol and this was in **1981.**

While unleaded petrol has been available in Australia for many years, the levels of lead still present is well above those in other OECD countries. Lead in petrol is measured in **grams per litre** and is symbolised by g/L.

Even the amount of lead in petrol varies from state to state in Australia. The following tables show the varying levels between the Australian states and how these compare to other OECD countries

State	Metropolitan Limit (g.Pb/L)	Country Limit (g.Pb/L)
New South Wales	*0.40*	*0.84*
Victoria	*0.30*	*0.30*
Australian Capital Territory	*0.40*	*0.40*
Queensland	*0.40*	*0.84*
Tasmania	*0.40*	*0.40*
Western Australia	*0.65*	*0.65*
Southern Australia	*0.65*	*0.65*
Northern Territory	*0.84*	*0.84*

(Source: Australian Institute of Petroleum, 1992)

LEAD IN PETROL STANDARDS FOR SOME OECD COUNTRIES

Canada	*no leaded fuel for highway use (ex. Trucks) since 1990 unleaded fuel 0.005g/L (heavy trucks, ag/marine equip 0.026g/L*
Norway	*0.15g/L*
Sweden	*0.15g/L*
Switzerland	*0.15g/L*
United States	*no leaded fuel for highway use (ex. trucks) since 1991 unleaded fuel 0.01g/L heavy trucks, ag/marine equip 0.026g/L; 1995 a total ban on leaded gasoline and leaded gasoline additive will be in place for highway use*
Belgium	*0.15g/L*
Denmark	*0.15g/L*
Germany	*0.15g/L*
Italy	*0.15g/L*
Netherlands	*0.15g/L*
United Kingdom	*0.15g/L*

This indicates that there are significant differences between the states (as well as differences between urban and rural areas!) and that Australian states have more lead in their petrol than other major developed countries. The recent NSW Government initiative is to reduce lead levels to 0.3g/L by 1994. However, there has been indications that the Queensland Government will unify the metropolitan and country limit by 1994 – but to date no further overall reduction.

Further, the lack of public awareness means that 30% of the 64% of cars that still use leaded fuel **can** use unleaded.

Canada was able to reduce the level of lead in petrol within two years and the USA has recorded the mean(average)blood lead level in pre-school-aged children in 1976 (when unleaded petrol was introduced) at 14.7ug/dl to the mean level in 1993 of 3.8ug/dl.

- ***Leaded Paint***

While lead in household paints has been reduced to very small quantities, modern steel structures such as bridges, farm machinery and whitegoods are still painted with lead compounds.

However, homes that where built prior to 1970 and which may have been renovated by sand blasting, heat torch or other practices that dispersed accumulated dust during the renovation, will probably have high lead content in the surrounding soil.

The soil retains lead virtually 'forever' so even if such renovations where carried many years ago, soil contamination would still be an issue, if the original soil was not replaced.

Leaded paint is also 'sweet' and so children who engage in pica (eating of non-food substances) are attracted to flaking paint that can be eaten.

- ***Lead in Dust and Dirt***

The lead particles from predominantly old leaded paint that is peeling and motor vehicle exhaust emissions, settle into the soil around buildings and homes as well as forming dust particles within these premises. The level of concern of soil contamination is 300 ppm **(parts per million)**.

Many young children play outside and so they often ingest lead during their normal "hand-to-mouth" activity. Inhalation of leaded dust can occur both indoors and outdoors.

- ***Lead Industries***

Lead industries such as smelters (or even past sites) create both air and soil contamination. Other industries such as industrial incinerators, battery breaking yards or cars being stripped of lead-based automotive paint can also generate lead in the air, but to a lesser degree than heavier industries.

3 WHY ARE YOUNG CHILDREN SO VULNERABLE?

There are a number of reasons why young children, especially toddlers, are at an increased risk of lead toxicity.

Young children are particularly vulnerable to the effects of lead because –

- *they absorb lead more efficiently than adults (40–50% compared to only 10% in adults) once it is ingested or inhaled*
- *their brain and nervous system is still developing and thus more sensitive to lead*
- *they engage in behaviour such as hand-to-mouth; pica (eating non-food items); outdoor play and contact with soil and dust; poor hygiene skills*
- *children eat and drink more per unit of body weight than adults*
- *lead effects the blood and nervous system at lower levels in children than adults*
- *nutritional deficiencies in calcium and iron are more common*

4 WHERE DOES THE LEAD GO?

Once lead enters the body and the blood stream, it is rapidly distributed throughout the body. The absorbed lead ultimately deposits in the bones and teeth – the unabsorbed lead is excreted through the urine or faeces.

We all have amounts of lead in our bodies and bones that can remain in an inert form for many years with no toxic effect.

The testing of blood lead levels will be indicative of recent exposure. Testing of the dentine (teeth) indicates if exposure has been more longer term.

5 HEALTH RISKS TO CHILDREN

Lead has no biological value to the human body and its presence in children particularly has been of concern for a number of years. High lead toxicity can affect major organs such as the kidneys, bones, central and peripheral nervous systems. The most recent concerns however, have focused on the subtle effects of even low blood lead levels.

Alperstein et al (1991:407) indicate that *"there is considerable evidence that lead is still prevalent in significant quantities in the environment, and that even a very low blood concentration of lead may have a deleterious effect on foetuses and young children"*. The research they refer to has found that even lower blood lead levels can cause a range of neurological concerns. These can include hyperactivity; poor attention span; overall poor functioning

and a reduction in intelligence points of 4 to 5 IQ points (CEH, 1987; Goyer, 1986; Davis & Svensgaard, 1987 in Alperstein et al). The foetus can also be effected by the mothers blood lead level as lead can be directly transferred across the placenta. Effects such as reduced gestational age, lowered birth weight and elevated hearing thresholds have also been reported (Dietrich et al, 1986; Davis & Svensgaard, 1987, in Alperstein et al).

What is of even further concern is that some of the noted detrimental effects of low blood lead levels in infancy on later cognitive development are often sustained until the teen years and are possibly permanent. (Needleman et al, 1990; Shukla et al, 1991).

At a conference convened by the Federal Department of Community Services and Health in October, 1992 there was strong evidence that a deficit of 2 to 3 IQ points was possible with each 10ug/dl increase in blood lead levels. For children who may be operating at the lower end of the IQ scale, the consequences of this deficit effect can not be ignored.

Without even considering the additional costs of remedial education, school failure rates etc the cost to children's health and their consequent development must be met by a greater government commitment to solving this public health problem.

6 WHAT ACTION HAS BEEN/IS BEING TAKEN?

The Environmental Health Section of the NSW Department of Health and the Environment Protection Authority have prepared a document called **NSW Government-Lead Issues Paper.** These departments have recognised that early childhood lead poisoning has re-emerged as a major public health issue that requires urgent investigation and action.

The four key strategies developed from the Issues Paper are -

- *To implement a comprehensive strategy for the reduction of lead from its many sources focussing on: lead in petrol; air; paint; food; water and waste water.*
- *To implement a comprehensive strategy for the continuing reduction of historical lead contamination (e.g. Broken Hill)*
- *To assess the performance of the Lead Reduction/Management Campaigns*
- *To develop and coordinate the Government's response to the multifaceted lead issue, through the establishment of an Interdepartmental Lead Taskforce.*

This taskforce has been established and working groups will have community and interest group involvement. These groups are soon to have their first meeting. There is no similar taskforce currently in Queensland.

The NSW State Government has also set a longer term target of 0.15g/L. This will bring NSW in line with the majority of OECD countries, but at a slower rate than is needed.

7 STRATEGIES TO MINIMISE CHILDREN'S EXPOSURE TO LEAD

The following material was supplied from the Eastern Sydney Public Health Unit. Centres can ask for copies of such materials from their local Public Health Unit Department/Unit.

This information is useful for evaluating and/or implementing health and hygiene practices within the centre and to provide a resource to parents. The testing of soil is a complicated and expensive exercise. Information can be obtained from the State Health or Environment Departments.

8 WHAT ELSE CAN BE DONE?

While it is necessary to inform parents and the community at large about the effects of lead contamination in young children, an educative approach is only one strategy.

Governments, both State and National must accept the responsibility and some liability for this public health risk, and take action to remediate it.

Therefore you and others need to take action by lobbying your local, state and federal member to take action on a national, as well as state level on: –

- *reduction of lead in petrol*
- *lowering of the ug/dl blood lead level of concern*
- *developing consistent strategies for action that needs to be taken when levels of concern are reached.*
- *removal/reduction of other sources of lead contamination*

The Federal Minister Ros Kelly is holding a meeting on 29 July with the Environment Ministers from each state, petrol company and community group representatives. The main aim of this meeting is to establish a national strategy on leaded petrol.

For further information contact your local Health and Environment Authorities for information or contact the L.E.A.D. Group, a community lobby/information group.

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(24 June 1994) (ML:gw\415)