LEAD Action NEWS

The journal of The Lead Education and Abatement Design (LEAD) Group Inc
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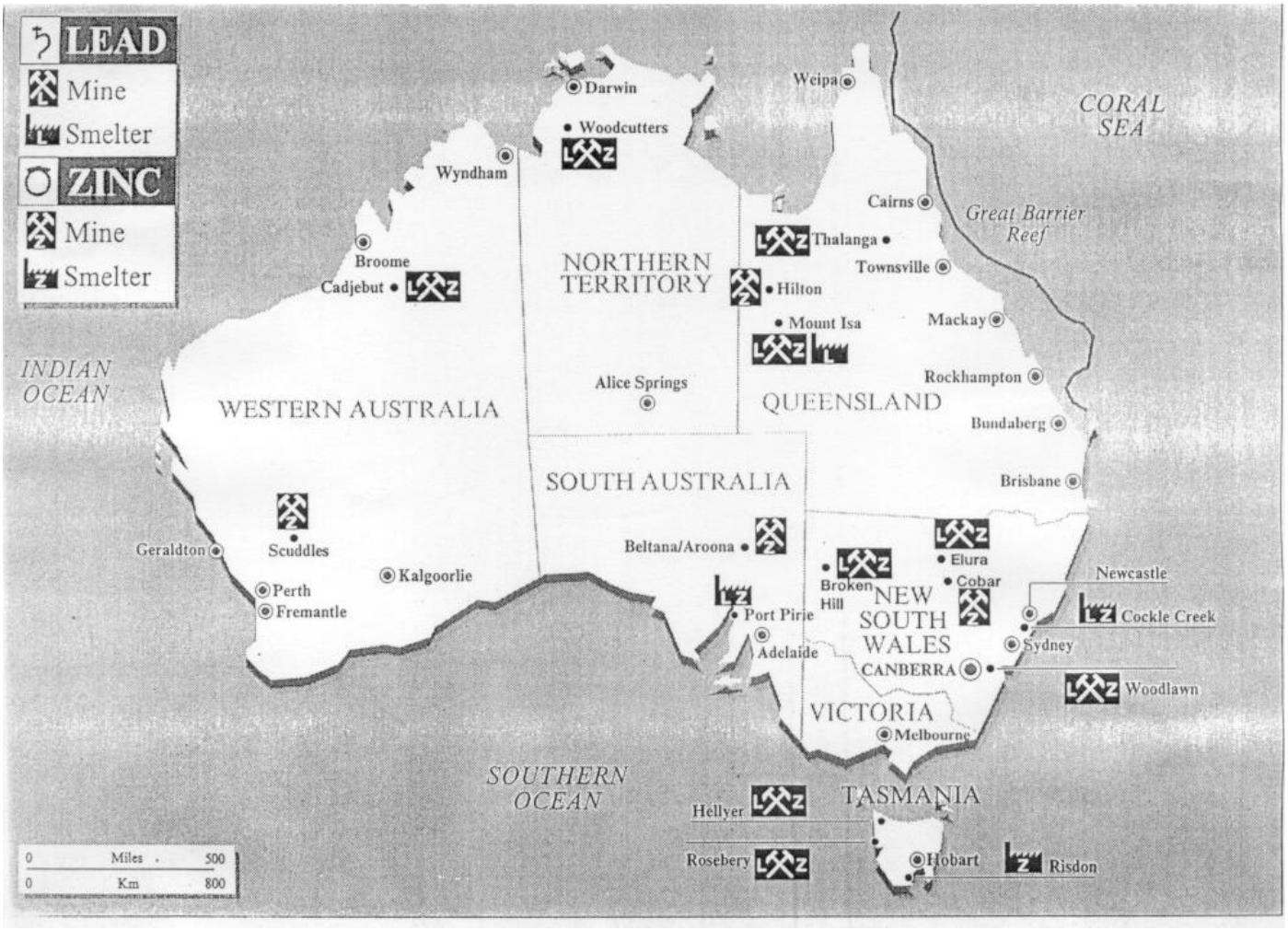


Editorial

by Elizabeth O'Brien

First the bad news - The United States Environmental Protection Agency (US EPA) knocked back funding on the Asian/Australian Training Institute for Lead-Based Paint Hazard Abatement, after Australia's shocking stance at the OECD (see p3-4) in June 1994.

Now for the good news - "A court directive has required the US EPA to establish soil lead criteria to facilitate court actions on contaminated site issues." (Ref. NSW Lead in Soil and Dust Working Group). On page 5 we print what will probably be used as Australia's guidelines for several years before our own are developed.

Now for the bizarre news - the adulteration of paprika in Hungary - what can 1 say? (See p6)

This issue of LEAD Action News focuses on a wide variety of health effects of lead.

Lead and delinquency - US lead researcher Dr Ann-Marie Krocetti says possibly 40-50% of delinquents are lead poisoned. When will we see intervention strategies for these youths which take lead into account and more importantly, when will we learn that prevention is the best cure.

More reasons to get lead out of petrol - sniffing and a 1993 article by Julian Cribb with some fascinating statistics on lead's effect on blood pressure. You are more likely to die from a lead-induced heart attack than in a car accident.

Even if the petrol doesn't get you via heart attack, it seems people who work with the lead additive in petrol are twice as likely to suffer from skin cancer as workers not exposed to the lead additive. Brain and respiratory cancer are also possibilities for these workers while workers exposed to inorganic lead can get stomach and lung cancer according to a review of studies involving 2402 deaths from cancer in workers.

No wonder doctors are being urged by the AMA to join the environmental debate (see p9).

Prof. Gulson and Fred Salome of The LEAD Group's Technical Advisory Board have provided an excellent summary of health effects (p 10) and Brian explains why hair lead testing is not interpretable (p 1 3).

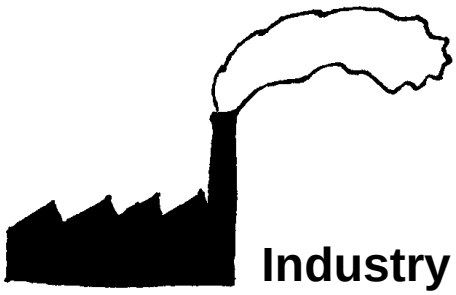
Robin Mosman has provided a summary of feedback on the LEADLINE Project, to keep you up to date (p16) and this edition ends with some great lead poems (p 1 8).

Acknowledgments

The LEAD Group Inc. acknowledges the commonwealth Environment Protection Agency (EPA) for the commitment and vision in granting The LEAD Group on June 1st, 1995 a one-year one-off grant totalling $150,000. The grant is to set up the LEADLINE Project - a national lead information and referral service (see feedback on p16-17 or request a copy of our fact sheet "About The LEADLINE Project.") 1 would hope that after 31st May 1996 we are able to continue this successful partnership between The LEAD Group and EPA. It was a momentous day when David Ratcliffe (full-time volunteer office manager for the past 2½ years) and myself (full time volunteer lead counsellor and community advocate for the past 4½ years) received our first pay packets.

The LEADLINE grant has allowed The LEAD Group to employ myself full-time National Coordinator as well as six part-time staff. Michelle Calvert, Robin Mosman and Ann Gethin (Project Officers) and David Ratcliffe, Carol Bodle and Adrian Hill (Administration). So for the first time, I would like to thank the staff for being such a great team, and as always I'd like to thank all the volunteers who create this newsletter especially Carol Bodle and Fred Salome.

Elizabeth **O'Brien**



Industry Blocks International Ban

by Tara Patel, Paris
The following article appeared in the New Scientist on 15 July 1995.

Canada and Australia have blocked an OECD agreement to reduce the amount of lead in the environment. At a meeting in Paris last month, they rejected a plan backed by the majority of OECD members that would have phased out lead in products such as petrol and paint.

Ellen Silbergeld of the Environmental Defense Fund in Washington DC, a member of the US delegation, says that she is "shocked" at the failure to reach agreement. "If the OECD can't take action on lead then it is unlikely it can take action on anything", she says.

The clampdown on lead, which was proposed by the US and the European Commission, would have restricted imports of lead soldered cans from developing countries. Officials say a deal would set an important example to other countries.

As part of the OECD's programme to reduce the health risks from five toxic chemicals, the European Commission and the US wanted to win a commitment from other members on reducing exposure to lead. They hoped that OECD environment ministers would be able to sign an agreement next February to phase out lead in petrol, virtually eliminate lead in products intended for use by children, such as lead-painted toys, stop the use of lead solder in food and drinks cans, and reduce exposure to lead in paint, ceramics and crystalware.

About 64 per cent of the world's lead is produced by OECD countries. Australia is the largest producer, followed by the US. Officials from the Commission and the US say that the talks on lead have not broken down completely, and there is still a chance a deal can be struck before the ministers meet.

But officials from the European Commission and the US say that this is not enough. They say they would accept a voluntary plan only if it is part of a stronger political agreement that would require member states to at least recognise the need to take steps to reduce exposure to lead. Industry, on the other hand, with strong backing from Canada and Australia, warned in Paris that it would finance a voluntary plan only if this demand was dropped.

A spokesman for the Canadian Department of Foreign Affairs said a voluntary plan involving industry "is the best way to bring about the action we are looking for".

Table 1 - Major Lead Producing Countries, 1993 (metric tonnes)

Ores and Concentrates	
1 Australia	521,000
2 USA	364,000
3 China	357,000
4 Peru	218,000
5 CIS	203,000
6 Canada	182,000
7 Mexico	141,000
8 Sweden	111,000
9 South Africa	100,000
10 Morocco	75,000
World Total	2,763,000

Source: Lead and Zinc Statistics (TLZSG): July 1994

Australia's Leaden Approach To The Environment

The following article by Ian Lowe appeared in New Scientist on 22 July 1995

On the international stage, Australia claims to be one of the more enlightened countries when it comes to environmental matters. But its record of late suggests otherwise. In April, at the climate change conference in Berlin, Australia joined a handful of industrialised countries opposing a target date for the reduction of carbon dioxide emissions. Now we have blocked a move to phase out lead in petrol, paint, toys, food tins and other products.

Australia's stance on the use of lead has gone unrecognised in the country's daily press, but it was reported in last week's *New Scientist. 1* made some calls to Canberra this week to find out more. To say people are tight-lipped and running for cover is an understatement. This is obviously a sensitive issue within government departments.

Perhaps a reason for the sensitivity is the potential embarrassment of the issue for the Department of Foreign Affairs and Trade which is already reeling over the way opposition to the French tests at Muroroa atoll was handled. One can only speculate.

This is the story as I understand it. Last month in Paris, at a meeting of OECD countries, Australia and Canada blocked a plan, supported by the US and the European Commission, to reduce the amount of lead in the environment. The Australians and Canadians advocated a so-called "voluntary action plan" whereby industry would finance a database on lead use and health risks and advise governments accordingly. Research would be conducted to find out ways of using lead that were not environmentally harmful.

I have a number of problems with this approach. It promotes short-term profits at the expense of health, and encourages wasteful use of a limited resource. It would be business as usual while more data are collected. Why do we need more research when the choices are already well known?

Lead should be kept for constructive purposes which preserve its useful characteristics. Lead-acid batteries, for example, allow storage of electricity from sources like the sun and wind. But when lead is blended into petrol or paint, it is dispersed and effectively lost, as well as being a health hazard.

Adding to the confusion is Australia's contradictory role. Long-term research at Port Pirie, a lead smelting town in South Australia, linked lead exposure with retarded intellectual development of children. As a result the Australian government moved quickly and responsibly to reduce the use of leaded petrol with a new tax structure to reward drivers who switch to unleaded fuel.

Why the change of heart overseas? The problem, 1 believe, is a bureaucratic one. Australia's international relations, long the province of the Department of Foreign Affairs, now comes under a combined Department of Foreign Affairs and Trade. Australia is the world's largest exporter of lead. Its use is an issue which could easily lead to conflict between these two branches. In terms of Foreign Affairs, there is no reason for Australia to block international moves to protect young people. But the Trade section still promotes economic development by exporting minerals. That line doesn't make economic sense in a world of failing commodity prices.

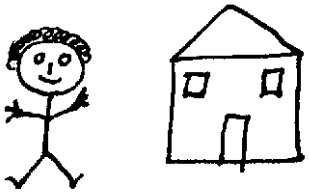
The Canberra bureaucrats tried to persuade me that disagreement in Paris was just over the best tactics to reduce exposure to lead. We won't have to phase out lead, they suggested, if its use can be restricted to applications which pose no health risk. Maybe, but the rest of the industrialised world sees the issue as far more urgent and one requiring immediate action. Ministers from OECD countries meet again in February. The government has some serious thinking to do in the meantime.

US Responses to Leaded Soil

United States Environmental Protection Agency (US EPA) Recommended Response Activities for Lead Contaminated Bare Soil:

1994 interim soil guidelines on lead for:

1. Areas expected to be used by children, ie



◊ residential backyards \
◊ daycare/school yards
◊ playgrounds, parks
◊ other areas where children gather

Bare Soil Lead Concentration	Recommended Response Activities
400-5000 ppm	Interim controls to change use patterns and establish barriers between children and contaminated soil including: ◊ planting ground cover or shrubbery to reduce exposure to bare soil, ◊ moving play equipment away from contaminated bare soil ◊ restricting access through posting, fencing, or other actions, and ◊ controlling further contamination of the area. Monitor condition of controls. Public notice of contaminated common areas by local agency
above 5000 ppm	Abatement of soil, including removal and replacement of contaminated soil and permanent barriers. Public notice of contaminated common areas by local agency

2. Areas where contact by children is less likely or infrequent

Bare Soil Lead Concentration	Recommended Response Activities
2000-5000 ppm	Interim controls to change use patterns and establish barriers between children and contaminated soil including: ◊ planting ground cover or shrubbery to reduce exposure to bare soil, ◊ moving play equipment away from contaminated bare soil ◊ restricting access through posting, fencing, or other actions, and ◊ controlling further contamination of the area Monitor condition of controls. Public notice of contaminated common areas by local agency.
above 5000 ppm	Abatement of soil, including removal and replacement of contaminated soil and permanent barriers. Public notice of contaminated common areas by local agency.

Adulteration of Paprika in Hungary

The following article appeared in Analysis Europa in December 1994. Thanks to Bill Stavropoulos of Amdel Limited for pointing out this article.

The Hungarian Government is desperately trying to restore consumer confidence in one of the country's most famous products - ground paprika - after large quantities of the popular spice were found to be contaminated with lead oxide.

The scandal stunned all Hungarians and was quickly followed by the arrest of individuals believed to have Mafia links. Government officials believe that, with the help of food analysis, they have the problem fully under control. Professor Erno Pungor, of The Institute for General and Analytical Chemistry in Budapest, says "There has been much embarrassment over the issue."

"The Hungarian Ministry of Agriculture found that 5.8 per cent of a batch of 3,432 random samples had been adulterated with Pb_3O_4. Not only did it enhance the colour of the paprika but it also added to the weight, increasing the profit to unscrupulous dealers."

Unfortunately, the discovery came too late for some. Several people have died through consuming the contaminated paprika and dozens have been taken ill. Nevertheless professor Pungor praised the rapid response of his Government once it became clear there was a problem.

"The Government strictly controls the export of paprika and believes that no contaminated spice has been exported to EU countries or elsewhere." In recent weeks the same controls that apply to export have been applied internally and it is hoped that all contaminated supplies will be identified and destroyed.

Paprika has always been a much sought after spice - it is used generously in Hungarian goulash - but there is an unpleasant history of adulteration with red lead.

Other tricks include the use of white pepper, curcuma, barium sulphate and even brick powder.

Since 1917 the control and marketing of paprika has been in the hands of the state but some people link the emergence of contamination problems with the advent of more free market policies.

Some of the latest analytical techniques are being used including AAS and inductively coupled plasma spectroscopy. The methods provide a quick and accurate means of distinguishing between normal pigment red 1 and pigment red 3, which are added legally to improve the colour, and illegal additives.

A spokesman for one of London's finest Hungarian restaurants, *The Gay Hussar said* proudly: "We know our supplier and are 100 per cent confident that our paprika is perfect."

CORRECTION

Please correct the following major error in the previous issue of LEAD Action News (Vol 3 No 2 Autumn 1995). Instead of saying that a fire at a battery factory in Sydney's western suburbs was allegedly responsible for 5-10 tonnes of lead being emitted from the plant, our report on page 4 should have said that 5-10 kilos of lead may have been emitted during the fire.

Lead and Delinquency

by Robin Mosman

In 1979, Dr. Herbert Needleman *et al* reported in the New England Journal of Medicine that evidence existed of a lead-behaviour-learning triad, after 2,146 school children's shed teeth were examined.

The study by Boston's Children's Hospital Medical Center and Harvard Medical School concluded that "the impaired function of children with high lead levels, demonstrated in the neuropsychologic laboratory, mirrored by disordered classroom behaviour, appears to be an adverse effect of exposure to lead".

Behaviours common to the higher lead children were:

- Distractibility
- lacking in persistence
- Constantly dependent and clinging
- Impulsiveness
- Easily become frustrated
- Daydreaming
- Fail to follow simple directions
- Fail to follow sequence of directions

The lead levels found to affect the school children's behaviour were below the levels usually considered to be toxic - in 1979 in the USA the safe standard was 30 µg/dL (micrograms of lead per decilitre of blood).

A follow-up study by Needleman *et al (1*990) reported that the educational success of a group of young adults was significantly linked with the amount of lead in the teeth they shed as small children. In this study, tooth lead levels above 20 ppm (parts per million) were associated with a seven-fold risk of not graduating from high school, a six-fold risk of having a reading disability, deficits in vocabulary, problems with attention and fine motor coordination, greater absenteeism and lower school class ranking.

Although tooth lead levels do not correspond in any simple way to blood lead levels, the available preschool blood lead levels of the more highly exposed children averaged 35 µg/dL.

In his book, "Diet, Crime and Delinquency", published the year after the Needleman study in 1980, Alexander Schauss takes this information further to make a link between lead and delinquency.

Data from the Clinical Ecology Treatment Program of the San Luis Obispo County Juvenile Probation Department in California showed that among 20 medically and educationally screened juvenile delinquents, 70 percent were found to be learning disabled and 60 percent had tooth lead levels above 11 parts per million (ppm). Virtually all of the learning disabled clients had tooth lead levels ranging from 11 ppm to 35 ppm.

Increased tooth (in this case circumpulpal dentine) lead levels (>16 ppm) have also been linked to higher rates of learning disabilities in a recent Danish study (Lyngbye *et al.,* 1990).

Schauss states "The bottom line is that the learning-disordered and behavioural-disordered child is less receptive to the usual social sanctions and rewards of our society and, therefore, develops an increased susceptibility for criminal behaviour".

References:

Alexander Schauss
"Diet, Crime and Delinquency" (book) Published by Parker House, 1980
Professor Derek Bryce-Smith (of the University of Reading in England)
"Lead, Behaviour and Criminality" (paper)
CDC "Preventing Lead Poisoning in Young Children - A statement by the Centers for Disease Control (US)". Oct. 1991.

The Human Cost of Leaded Petrol

Toxic lead deaths overtake road toll

The following article, written by science and technology, writer Julian Cribb, appeared in p3 of The Australian on Wednesday, September 8th, 1993

More Australians may be dying from heart attacks linked to toxic lead in the bloodstream than are being killed in motor vehicle accidents on the nation's roads, a new medical study has indicated.

The lives of up to 2655 heart-attack victims could possibly be saved each year if lead levels in the blood of adult Australians were halved by eliminating lead from petrol, the investigation by Dr John Wlodarczyk of the Newcastle Environmental Toxicology Research Unit found.

The link between adult cardiac deaths and high blood pressure was outlined in a report to the National Health & Medical Research Council.

It is expected to add to public concern over the effect of lead on children's mental development.

There is "reasonably consistent evidence" of an association between blood pressure levels and blood lead levels in adults, the study says.

If the elimination or reduction of lead from petrol could lead to a halving of blood lead levels it would reduce average blood pressure levels by 1 to 2 points.

This meant about 12,000 fewer people would need treatment for hypertension annually, there would be between 6000 and 12,000 fewer heart attacks (fatal and non-fatal) and up to 2655 lives a year would be saved among people aged from 35 to 64 years.

The number of lives saved compares with the road accident toll of 2221 deaths for the calendar year 1991 and represents about one cardiac death in every 10.

"The study has only considered effects in 35 to 64-year-olds. The estimated effect would increase dramatically if older age groups were included in the analysis," the report says.

The Minister for the Environment, Mrs Kelly, said yesterday the study emphasised the fact lead was a poison that had to be removed from Australia's atmosphere.

"Till now the whole emphasis has been on impact of lead on children's development - but this study shows it has a far wider effect," she said. "It's going into people's lungs and into their bloodstream."

The federal Coalition went on the attack over the lead issue yesterday; claiming the latest NHMRC studies had highlighted the lack of a government strategy to eliminate lead pollution.

The Coalition's spokeswoman on the environment, Ms Chris Gallus, said the NHMRC was correct to highlight how preventable the problem was.

"While other countries were telling their oil companies to get the lead out of petrol, the Australian Government sat complacently by."

Boys burned sniffing fuel

The following article appeared in the Daily Telegraph Mirror on Tuesday, July 25th, 1995 p 18.

Two teenagers were seriously burned when petrol they were sniffing ignited and set them on fire, police said yesterday.

The boys, 13 and 14, were in intensive care at Alice Springs Hospital with third degree bums.

The two were found burning near Yuendumu on Sunday night after an explosion.

Locals doused them with water and sand.

"They had been sniffing a mixture of Avgas and petrol from a Jerry can inside a disused water tank", police said.

"The petrol ignited and exploded."

Lead Linked to Cancer

by Robin Mosman

Recent epidemiological evidence supports an association between stomach and lung cancer, and exposure to lead.

A study by H. Fu and Dr P. Boffetta reviewed and summarised the epidemiological evidence on the carcinogenicity of workers with heavy exposure to inorganic lead, and to organolead compounds. In all 16 studies involving 2402 deaths from cancer were reviewed. It showed a significant excess risk of overall cancer, stomach cancer, lung cancer, and bladder cancer. One study found that workers exposed to the lead additive in petrol (tetraethyl lead) were nearly twice as likely to suffer from skin cancer than non-exposed workers.

Another study observed a small number of brain and respiratory cancers in workers who manufactured tetraethyl lead. Workers were from the following industries - battery manufacture, smelter, lead and zinc chromate pigment manufacture, printing and glassworks.

A separate analysis of studies of heavily exposed workers provided slightly increased relative risk ratios for cancers of the stomach and lungs.

Reference: Hua Fu and Paola Boffetta. Cancer and occupational exposure to inorganic lead compounds: a meta-analysis of published data. *Occupational and Environmental Medicine* 1995. 52:73-81.

AMA Supports Lead Action

Call for medics to enlist in the green fray

The following article by Gareth Soreham in Canberra appeared in the Newcastle Morning Herald on p2 on June 6th, 1995.

Australian cities were so heavily polluted with lead that their residents were increasingly suffering central nervous system problems and intelligence deficiencies, the Australian Medical Association said yesterday.

The association's new head, Dr David Weedon said yesterday that even those who had been only slightly exposed to lead pollution were experiencing significant health difficulties.

Dr Weedon called on doctors to take a greater role in the green debate, because global environmental deterioration meant sicker patients.

Singers' Corner

A verse of "Power in a Union "
by Billy Brag

Well the lessons of the past were all learned with workers blood
Mistakes of the bosses, we must pay for
From the cities and the farmlands, to trenches full of mud
War's always been the boss's way, Sir

Distribution and Effects of Lead

by Prof Brian Gulson and Fred Salome

The following is an extract from the Workshop Manual for the Lead Paint Management training programme being offered in 1996 by Macquarie University Graduate School of the Environment in conjunction with CTI Consultants. The authors have granted permission for this extract to be reproduced.

After lead is absorbed from the gastrointestinal tract or the lungs, it enters the blood stream. At first, lead attaches to proteins in the blood that carry it to different tissues or organ systems in the body. Blood has a fluid portion, called plasma, and a cellular portion. The cellular portion is made up of red blood cells (or erythrocytes) and white blood cells. Most of the lead present in the blood is bound to the red blood cell. Doctors can tell how much lead a person has been exposed to by measuring the amount of lead in the blood. These amounts are reported as a quantity per unit of volume. (Usually micrograms µg per decilitre.)

Lead is distributed to many tissues and organ systems of the body. It's important to remember that lead cannot be destroyed or changed to something else in the body. The amount of lead stored in the body has been described as the "body burden" of lead. Among adults over 95% of the total body stores of lead are found in bone. For children about 70% of lead is stored in bone. This lead is not simply stored away in bone forever, but moves in and out as the body functions normally. For example, as children grow their bones restructure to permit normal shapes as they develop.

The amount of lead in important organs such as the brain, the blood forming system and the kidney are signs of the damage produced by lead accumulation. Several factors must be looked at in order to find the harmful health effects produced by lead:

- How much lead is present in the organ system?
- How long has the lead been present?
- Is the organ system at a time in its development when it can be affected by lead?

Lead is a cumulative poison. Unlike acute poisons, such as chemicals that can kill quickly by attacking the lungs, lead poisoning happens slowly. The lead that is taken in daily mounts up in the tissues, especially the bones. Blood lead levels mainly show recent exposure (for example, the past few months of exposure) however; lead that is removed from bone is also present in the blood. It is quite possible that a person can have higher amounts of lead in his or her body than looking at the blood- lead level would tell us. Because bone is not easily available for measurement of lead, the usual way to tell how much lead exposure a person has had is by chemically measuring the level in the blood.

The body gets rid of lead in the urine and through the gastrointestinal tract. However, many people (and most occupationally exposed workers) are unable to get rid of as much lead as they take in. That is why the "body burden" of lead increases over the decades. Until late in life, most persons are steadily getting more and more lead in their tissues. Only among the elderly, for example those 70 to 80 years old, does the body lead burden begin to get less.

Sometimes bone releases its lead. This may be when the person has a disease, for example osteoporosis, or sometimes during pregnancy and lactation. During pregnancy lead is transferred from the mother to the developing infant. Because lead freely crosses the placenta, the mother's blood lead

amounts determine how much lead reaches the foetus. The infant's blood lead at birth is about 85-90% as high as the mother's blood lead level. The tissues of the developing infant, including the brain, take in lead during gestation. The lead taken in during this time has special importance because the developing brain is extremely vulnerable to the harmful effects of lead.

Damage does not occur to one organ system (for example, the nervous system) while not harming other organs at the same time. In humans, the central nervous system, especially of developing infants and very young children, is affected by lower amounts of lead than are other organs such as the kidneys. For this reason much of the focus of recent studies on the effects of lead has been on the harmful neurological effects of lead.

Nervous System Effects of Lead

It has only been understood during the past decade just how much the nervous system is affected by lead. That means, earlier recommendations on "safe" amounts of lead in blood were dangerously close to levels now considered very likely to cause mental retardation in children. Because the past ten years has been a period of very rapid change in understanding of the toxicity of lead, much that has been written (either older pamphlets, medical articles, guidelines for occupational health, etc.) is out of date as to harmful effects that occur at low levels of lead exposure. In the 1960's blood lead levels $\geq$60 µg/dL concerned medical care providers. By the 1980's this level was lowered to 25 µg/dL. The Centers for Disease control has recently (October 1991) reduced the level at which interventions are recommended to 10 µg/dL. (See section on NH&MRC).

In 1990, the US Public Health Service established the national goal of eliminating, by the year 2000, all occupational exposures that result in worker blood lead levels greater than 25 µg/dL (DHHS, 1990). The mean blood lead level for males in the United States during the period from 1976 - 1980 was 16 µg/dL and this has now decreased in 1988 - 1991 to 4 µg/dL in the latest National Health and Nutrition Examination Survey (NHANES III). In addition, the American Conference of Governmental Industrial Hygienists has proposed that worker blood lead levels be controlled to 20 µg/dL.

Effects in Adults

At very high lead exposures adults also can develop what is called "acute lead encephalopathy". This can occur suddenly. Warning signs include irritability, headaches and hallucinations, and dullness. With very high exposures the person could go into convulsions, paralysis and even die. Blood lead levels that cause these effects are well above 150 µg/dL among adults. A more typical picture of nervous system damage in the adult shows harmful effects of lead on various nerves such as the motor nerves. This damage, in advanced cases, results in "wrist drop" or "foot drop" (the inability to maintain the hand or foot in a normal position due to weakness of muscle tone because of nerve damage).

At lower exposures asymptomatic (without symptoms) effects on the peripheral nerves occur. This means that changes are present that are detectable only by special diagnostic techniques. Workers having blood lead levels lower than 70 µg/dL have been found to have slowed movement of nerve impulses. In adults exposed to lower amounts of lead, some changes typically reported are increased occurrence of fatigue and short-term memory loss, decreased functioning of the nervous system for activities that depend on visual intelligence, and visual-motor coordination.

Effects in Infants and Children

The clinically evident effects of lead on the nervous system differ for children and adults. For children blood lead concentrations of about 100 to 160 µg/dL and higher are associated with severe damage (encephalopathy). When this happens there is swelling of the brain. This increased pressure severely limits the brain's functioning. Before chelation therapy (administration by injection of organic acids that bind or chelate lead, so that it can be eliminated) was begun in the 1960s, lead poisoning this severe resulted in about a 65% rate of death for children. In current practice, these cases are rare. When properly diagnosed and appropriate chelation therapy used, the death rate is considered to be about 1 or 2%. Although lead exposures this high are rare in the United States today, they are encountered in industrialising countries that have not tried to control lead exposures. Children surviving an episode of lead encephalopathy frequently have permanent brain damage, including retardation and severe behavioural disorders.

Effects on the Blood-forming System

Lead impairs the synthesis (formation) of a substance called "heme" which is extremely important to human life because it carries oxygen to tissues of the body. Lead interferes with the production of this substance at several different steps. Lead-exposed persons can develop anaemia. In adults, anaemia is usually seen in severe chronic lead poisoning and blood lead levels of 70 µg/dL and higher are usually found.

Lead has a more severe effect on the blood-forming system in iron-deficient people. Generally young children and women of child bearing age are much more likely to be iron deficient than are adult men. Because the combination of iron deficiency and lead exposure cause more severe effects on the blood forming system than either condition alone, women and children tend to show more severe effects. These occur at lower blood lead levels in women and children than in men.

Effects on the Kidney

High exposures to lead that produce acute lead poisoning can damage the kidney in both adults and children. One of the functions of the kidney is to absorb certain substances which are filtered through the kidney. Lead interferes with these functions by altering the metabolism of the kidney. After lead levels are reduced the kidney is able to again do these functions. However, if the lead exposures in childhood continue for a long time and are high amounts, children may show kidney disease later in life as adults. Chronic nephropathy (kidney disease) in lead workers is now recognised as a separate disease. Chronically lead- poisoned workers can show elevated blood urea nitrogen. So far there is relatively little information on the renal (kidney) effects of exposure to relatively low levels of lead among either children or adults.

Hypertension

Long-term, high exposures to lead have been reported to be linked with high blood pressure and stroke. One researcher has followed two groups of workers occupationally exposed to lead (4,519 battery plant workers and 2,300 lead production workers from smelters) for a number of years. Both groups of workers have significantly more deaths than would be expected by hypertensive disease and chronic renal disease.

Reproductive Effects

Female workers with high lead exposures and the wives of male lead workers have a higher rate of miscarriages. Male workers with elevated lead exposures (e.g., blood lead levels of 50 µg/dL) have more abnormal sperm cells and lower sperm counts

Lead in Hair - Concern Over its Use as an Indicator of Non-Occupational Exposure

By Prof Brian Gulson
Graduate School of the Environment, Macquarie University, Sydney

With increasing public awareness of lead as a health issue, The LEAD group has received numerous calls regarding the availability and significance of lead measurements in hair and nails, but especially hair. Concern over the toxic effects of environmental factors such as heavy metals has also spawned an "Industry", promoting the use of trace metals in hair.

I was recently approached by a subject who had his hair analysed, informed that the lead was elevated and that he should undergo chelation therapy with EDTA. Brief details of this case are as follows.

Subject A is a 27 year old student who had experienced for at least the past three years symptoms which could be attributable to lead poisoning such as tiredness, sleep disruptions, disinterest in studies, indigestion and facial flushing. Discussions with the subject elicited no source 'of lead apart from the possibility of childhood exposure in Germany from petrol, because of the proximity of his residence to a busy thoroughfare.

A naturopath had suggested hair analysis, the results of which were 6.1 ppm Pb and 86 ppm Cu. The interpretation of the results was that both metal concentrations were high and it was *recommended by a medical practitioner that the subject undergo chelation therapy with EDTA, with no follow-up or even a blood lead analysis!* Hair analyses are not considered reliable indicators of lead exposure, as discussed below.

He agreed to a blood lead analysis prior to chelation. Blood lead analyses - despite the drawbacks associated with a single analysis - are accepted internationally as the main indicator of lead exposure. Duplicate analyses of a blood sample using the stringent CSIRO protocol, showed it to contain 5.6 µg/dL, half the June 1993 N~C recommended goal for all Australians. Furthermore, the lead isotopic fingerprint indicated a source of Australian lead, not from Germany, although given that the subject has spent the past 22 years in Australia, it was highly unlikely that German lead would be detectable.

It is medically irresponsible for this subject to undergo chelation therapy with EDTA given: (i) the internationally accepted indicator of lead exposure, blood lead, was not measured, (ii) the potential side effects of EDTA chelation, including depletion of essential elements such as Zn, Fe and Cu, and even mobilisation of lead from skeletal sources (CDC 1991; Mann and Travers, 1991).

Status of Hair Analysis

Lead measurements in hair are not considered reliable indicators for exposure because of the difficulty to distinguish what is in the hair from what is on it. These problems arise form: (i) the ease of external contamination (from air and dust, hair preparations (Fergusson, 1990; see table below)] because of the waxy nature of hair, and (ii) the difficulty in decontaminating hair prior to analysis.

The CDC document (1991 page 55) states: "The following tests are NOT indicated for the diagnosis or clinical management of lead poisoning:

Tests of Hair and Fingernails for Lead Levels."

After a thorough study of the literature, Taylor (1986) came to the following conclusions, summarised by internationally regarded experts, Ewers and Brockhaus (1991):

1. Modern analytical procedures enable sensitive, accurate, and precise measurements of trace element concentrations in human hair. Since inter-laboratory comparisons indicate that the results are not always reliable, *hair reference materials should be used throughout the analytical process to ensure accurate analytical data.* As far as I know, no international reference materials are available.

2. The interpretation of the analytical data represents a complex problem since trace element concentrations of human hair are influenced by numerous factors including age and sex of the subject, colour and growth site. Therefore, it is vital that reference levels should be selected carefully so that these factors are taken into consideration. Unfortunately, much of the experimental and investigative work have failed to do so, *and many studies are of doubtful validity.* In addition, the *contribution of external contamination of the trace element content of hair is very variable, and it is difficult or even impossible to control this factor.*

3. Even where it has been possible to control for these influences the most reliable experimental data indicate that the *trace element content of hair does not correlate with the trace element concentrations in metabolically important tissues.* Such large and variable discrepancies were found that it is difficult to accept how the elemental concentrations in hair could reflect the trace element status of a subject. *Those occasions* in which the concentration of trace elements in hair can be shown to reflect either body status or exposure are *essentially extreme situations, usually* with significantly increased concentrations and evidence of toxicity. In these situations parameters other than hair concentrations are more informative.

4. With few exceptions mentioned above ***trace element analysis of hair is not a useful procedure, in many instances it provides data that may be misleading. The activities of laboratories which advertise and provide such analyses on a commercial basis can only be viewed with scepticism***

The concerns expressed above for many trace elements is exacerbated in the case of lead because of its ubiquity.

A table of hair lead analyses from Fergusson (1990; Table 13.4, page 478; references included) also illustrates the variability in lead concentrations (in parts per million; ppm) and futility in the interpretation of data at low concentrations.

Country	Mean (ppm)	Range (ppm)	Comments
Austria		0.97-44.9	Rural
Canada	10.1	0.5-25	Urban
	16.9	0.5-35	Near smelter
	45.2	10-350	Children, exposed
	7.7		Children, not exposed
	4.9,4.1		Adults, exposed
	12.0		Adults, not exposed
	3.4, 5.3		
Greenland	5.96		
Japan	13.4		
New Zealand	12.8	2.0-360	Levels relate to occupation
		1050-2410	
	10.4	1.2-111	City survey
	363	124-1381	Lead workers
	67.0	7-313	Lead workers families
	16.2		Children
USA	6.55		Adults
		7.6-107.1	Inc. exposure areas
	13.4*	21-100	Children
	12.2*	20-155	Adults
	36		Maternal scalp hair
	14		Maternal pubic hair
	13		Neonatal hair
Others	1.0	0.05-15.0	Near roots
		3-70	

*Geometric mean

Conclusion

If the community wishes to avail itself of the "metals in hair" services, that is their prerogative. However, if as an outcome of these services, recommendations are proposed which could potentially impact negatively on a person's health with no amelioration of their problems, it is irresponsible for the service providers to make these recommendations.

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Feedback from Users of the LEADLINE Project

In order to obtain feedback from users of the LEADLINE PROJECT, 11 enquirers in the month of June 1995 were contacted and 6 enquirers in the month of July 1995.

The representative sample of enquirers included parents (almost all mothers), home renovators, a childcare director, a trades- person, a lead assessment professional, an insurance assessor, a public servant with the NSW state Government, a scientific researcher and a journalist, who is also a parent and a renovator.

Information recipients were asked a range of questions aimed at establishing:

1. Whether the information provided to them had met their needs?

2. Whether any referrals made had been useful, and what sort of service had been provided by the person to whom they were referred?

3. Did they take any action as a result of the new information?

4. Did the information make them aware of possible lead contamination sources of which they had been previously unaware?

5. Did they have any specific suggestions for improvement, either of the service provided by Leadline, or by the referral subject?

In answer to the first question, information recipients indicated unanimously that the information provided had been very useful. As the information had to cater for such a wide range of needs, this was encouraging to hear. Comments included that the information was "all very helpful" (parent), "just what I need" (home renovator), "most useful, especially the more technical information perfect to take back to committees a lot of new information" (childcare director, "a great deal of use" (insurance assessor), "entirely satisfactory"

(public servant), "just what 1 wanted" (scientific researcher), and "excellent - especially appreciated that Elizabeth was always available, even at odd hours, to answer questions that arose - she was unfailingly helpful. It was great to have someone who could be quoted as saying something - that's often not possible with bureaucrats, they always have to cover themselves. Elizabeth seems to know everything about lead - others often only knew of one aspect." (Journalist).

The second question regarding referrals elicited only one response, because only one referral had been made to this particular sample of 17. The information already available to LEADLINE had been sufficient to meet the other sample enquirers' needs.

The lead assessment professional whose firm specialises in hazardous substances identification, was referred to the NSW Environment Protection Authority seeking information regarding standards for lead remediation.

He expressed considerable frustration about their response - "we need something stronger than guidelines - government won't legislate because it will cost them too much to comply - unless Australia will follow the USA example and legislate we're just chasing our tails - we still have only guidelines for asbestos after 15 years".

The third question about action taken as a result of the information supplied showed a very encouraging response. A parent of 2 children, aged 13 and 15, who have learning and behavioural difficulties and whose home was renovated when they were young, took the information to their Learning Ability Centre. Another parent took information to her Childcare Centre.

A third parent has "made a lot of changes" around lead-aware housekeeping and child supervision. Ale child-care director has "ordered a new HEPA filter to fit our industrial vacuum cleaner and changed sweeping practices in the Centre - we now vacuum lino instead of sweeping it". She has also arranged a meeting with the property management division of the church, which owns the premises to speak with them about lead issues.

The insurance assessor "is going to use the information in a speech he is preparing". The public servant "will be acting soon" - he "is now much better informed about what he needs to do". The scientific researcher "used some of the information in the paper he prepared".

The journalist wrote a 3-part article for the publications *Sydney's Child, Melbourne's Child and Brisbane's Child.* The first part of this series was published on 1 August and the response from it has been considerable - 40 callers from Sydney, 11 from Melbourne and 20 from Brisbane in the first two-thirds of August. The journalist however hadn't really changed her own behaviour - "we took off our shoes at the door for a week but it caused so much trouble that we stopped". Elizabeth used this particular feedback in the writing of the draft factsheet *Lead Aware Housekeeping and childcare.*

Responses to the fourth question, on awareness of other possible sources of lead contamination, included: "the information certainly made me much more aware of the ways in which I and my family have been exposed to lead" (parent), "it made me more alert - for example I noticed a cupboard where old paint was flaking" childcare director. However most of the respondents in this particular sample were very lead-aware already, either professionally or through reading whatever information had lead them to contact LEADLINE in the first place.

The last question, on suggestions for improvement, received unanimous responses of gratitude, appreciation and thanks for an excellent service that could not have met the enquirers' needs better than it did - "thank you very much!" (Parent).

Poems

Lead in the air

by John Griffin

The story of Lizzy and Robert:
she's in business, owns this video shop
Robert has good work on the wharves.
That is the end of the good news.

The bad news next: the children are
sick, and here in Port Pirie,
the lead in the air, in the dust,
in the bone, in the blood, in the brain
scares her like hell

They've got to get out!

She'll tell him tonight. He'll agree
they should go. She knows he'll agree
Pack up, sell up, get out.
For the sake of the two little girls.
In school now, and not doing well.

She'll tell him tonight. Tell him
how when the wind blows north,
east, west, south, the air fills,
the nose fills, the lungs fill
with death the invisible.

Even the tiny feet lift dust,
the sandpit itself grits with this
thing that settles and floats.
That wants to belong.

He knows about wind on the wharves.
He has seen men spitting themselves,
coughing to early skeletons, alive.

She's exhausted. She tidies the racks
of Westerns, moves on to horror,
nightmares on video, murder
by multiple out in the open.
Good little business, even the rack
at the back doing well, adult stuff.

She'll find something else.
A long way from here.
If she can sell. If Robert agrees.
If there's a buyer around,
someone in this flat grey town
who can see a future in video,
in family movies, nostalgia, love.

******

Where Do Your Children Play?

by Kim Creighton,
A Boolaroo (Lead Smelter Community) mother,
Newcastle, NSW, Australia

Come and five inside my home
The only one my kids have known
Bring your children bring your wives.
And then explain our different lives

The difference when they plant a seed
And watch it grow into a tree
And when the fruit is ripe and sweetened
Tell them why it can't be eaten

And then Sire won't you come down town
Each time the blood tests come around Dry
their tears and soothe their pain And then
Sire do it all again

And when the test results come in
Tell us where we should begin
We've cleaned the ceiling scrubbed the floor
I'm tired Sir won't you scrub my walls
And still their levels waiver high
Can't sell a house no-one will buy

So come and live inside my home
Don't bring your kids Sir, come alone
For you cannot protect them
See how it feels to live in fear

And never play in pits of sand
It's in their clothes it's on their hands
And tell me as you walk away
Where do all your children play?

Cradle to Grave

by Elizabeth O'Brien

Cradle to grave
Cradle to grave
Lead harms our children in the cradle
Puts lead workers in the grave

******

Acid Rain

by Kim Creighton

Acid Rain Falls From The Skies
Falling Down, It Burns My Eyes
Poison Soil Lays Under Me
Poison Fruit Upon My Trees.
The Clouds Are Black The River Brown
Acid Rain Keeps Falling Down.
Petals Maimed Beyond Repair
Things Are Dying Everywhere,
People Fleeing From Their Shores
Gone, And They'll Return No More
I Cannot With These Humble Hands
Find Peace In This Forsaken Land.
No Ill Intent Was Meant By Man
But Still The Acid Lines Their Hands For
What They Did Can't Be Undone
When Acid In The Rivers Run.

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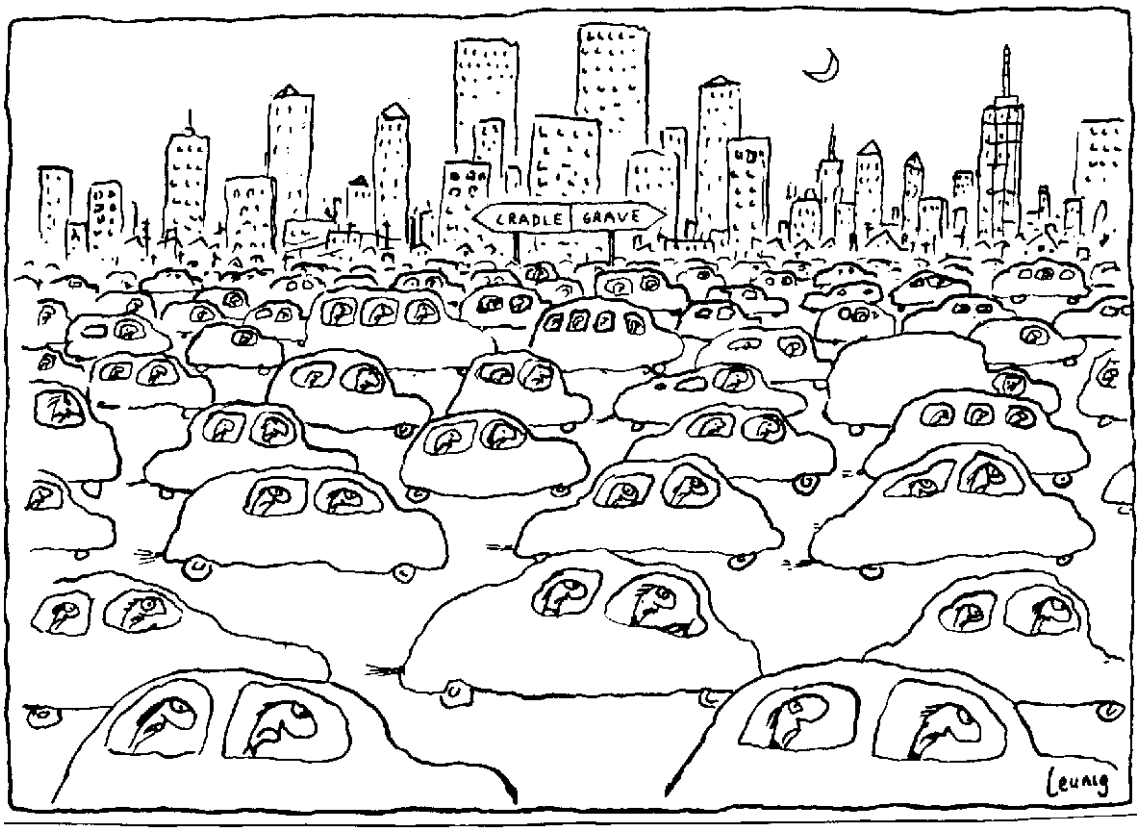

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