LEAD Action News

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Lead and steel, old and new ammunition - the problems

Calling all artists, craftspeople, photographers…

The 2013 Volcano Art Prize is open for entries! Just create an artwork that has a lead-safety message and you could be a winner. All 30 finalists receive a mug with their artwork, and **13 winning entries** will be printed in the **2014 Lead-Safe World Calendar.** The Award Ceremony will be held during the **Inaugural International Lead Poisoning Prevention Week of Action - 20-26 October 2013.**

Volcano Art Prize

Contents

Editorial

This Newsletter has a strong focus on land contamination and environmental risk arising from ammunition materials. The main article, Dr Peter J Hurley's – Cylenchar Limited UK presentation, details the corrosion and subsequent potential impacts of lead and lead-based alloys on the environment are examined before a comparison to steel shot is made. The conclusion made is that steel shot is not a 'non-toxic' alternative to lead, Dr Hurley leaving with the message that a holistic approach is required if we are to prevent any undesired environmental consequences. This main article is followed by a supporting article in which the risks of lead poisoning while using and handling firearms are discussed, detailing possible ways lead particulates can be transferred to the body.

Another significant issue in this Newsletter is contamination in communities surrounding lead manufacturing and mining areas. Lead industry towns Mount Isa, one of the largest mining sites in Australia, and Sandringham, Victoria, where Dunlop lead acid battery manufacturing factory was located, are discussed in order to portray the fact that areas where lead industry is or was located have increased levels of lead contamination.

Also of interest is the article *What should I test this with* which makes recommendations regarding which testing method is best for which material: paint, ceramics, metal etc, as well as the cautionary article *Keep leaded six leggeds out of FAO edible insect strategy* which warns of the potential leaded content of edible insects and the implications of lead for pre-conception health in the included excerpt from the book *Planning For A Healthy Baby* by Belinda Barnes & Suzanne Gail Bradley.

Finally various emails highlight some of the current efforts to raise awareness about lead poisoning and promote partnerships around the world. As a result of such action there has been exciting progress in the lead prevention world, the World Health Organisation's announcing that the

Inaugural International Lead Poisoning Prevention Week of Action will take place from 20-26 October 2013.

We at The LEAD Group wish Shristi Lohani well in her travels to Nepal and the U.S where she will get married. We are extremely thankful for her vast contribution to the LEAD Group over the last few years. We'll especially miss her as part of this editorial team.

Environmental Risks Arising from Changes in Ammunition Materials'

 Dr Peter J Hurley – Cylenchar Limited UK

The following article is a summary of '*Environmental Risks Arising from Changes in Ammunition Materials*' presentation, delivered at the XXIV European Shooting Confederation General Assembly, in Moscow 17 May 2013.

Risk!

Risk is a combination of the probability, or frequency of occurrence of a defined hazard, and the magnitude of the consequences of that hazard. We have to understand that 'Risk' itself, is not 'Hazard'. Poisons are hazardous. Having a poison safely contained and locked up, whilst being a hazard, poses little risk.

In the context of land contamination, and environmental risk, we have to understand the concept of "pollutant linkage". Essentially it's the chain of criteria that must be in place for a 'hazard' to become 'risk'. There are 3 essential components to the pollutant linkage chain:

- Firstly, A **contaminant**- The substance that is in, on or under the land that has potential to cause harm or to cause pollution of controlled water
- Secondly, a **receptor**, i.e. a body that would potentially be harmed by the hazard, in general terms, something that could be adversely affected by a contaminant, such as people, an ecological system, property, or a water body.
- Thirdly and most critically there has to be a **pathway** or route by which the hazard can impact the receptor. No matter how b**ig the** hazard, if there's no potential pathway, there's no risk.

The Contaminants – Metallic Lead?

In terms of sport shooting on ranges, let's consider our risk model by first addressing the hazard represented from potential pollutants. I don't think we can reasonably argue otherwise that there is a massive amount of data to suggest that lead and many of its compounds can be harmful to humans, animals and the environment. The data to suggest that birds ingest lead shot and as a consequence are poisoned is unequivocal. Risk is greater if lead becomes soluble or mobile. That is not to say that lead in all its forms represents equivalent risk to the environment. Risk is greater from lead's

corrosion products through the fineness of their physical form. Soluble lead compounds such as lead sulphate pose significantly more risk, principally because of their ease of transport and ingestion. Lead metal is generally stable. Archaeological Lead above pH 6.5 exhibits a corrosion rate that would equate to 2,000 to 3,200 years for European shot sizes 7 to 9 to corrode. Practical experience of shot in ranges indicates shot corrosion within circa 200 years – even in neutral soils. Why the difference?

Metallic Lead Corrosion

Corrosion of metals is primarily an electrochemical or 'redox' process. Usually it requires a sacrificial metal or compound and an electrolyte. Typically where dissimilar metals or compounds are in contact, one will be oxidised and the other reduced. The lower the pH, the better the electrolyte and the faster the reaction will proceed. Every drop in pH by one unit can be expected to increase the corrosion rate by a factor of 10. In many cases this corrosion is slowed or halted by a build up of surface corrosion products, effectively breaking the electronic circuit. In the cased of lead, its corrosion crust does not slow the process. Once initiated, corrosion is linear in nature. Lead corrosion products form a felt mat of needle shaped crystals. They do not bond tightly to the surface of the corroding lead but can be easily flaked away, and as such the corrosion scale does not create a barrier to contact with an electrolyte. If anything it serves to keep moisture in contact with the metal's surface.

Soil comprises the corrosion product of rock and is essentially iron alumina-silicates plus the oxides and alumina-silicates of many other metals, including other heavy metals; copper, zinc, chrome, cadmium, etc. As such, soil is usually abundant in sacrificial metal compounds. In the absence of sacrificial materials lead is highly resistive to acid attack. That's why the roof of the pantheon is still in good order after 500 plus years. Essentially there is no corrosion cell established, merely acid rain metal interaction. Soil free study, indicates pure lead shot will corrode at a rate 5 times slower than buried antique lead. However, today shot and bullets are usually made from ballast or secondary lead, whose principal source is lead-acid batteries.

Antimony was introduced into batteries to improve what chemist's term the 'electron yield'. To the lay person; to make the lead corrode faster, and by doing so, yield up its electrons faster and improve the amp rating of the battery. Only a small proportion of antimony significantly changes the picture. 1.25% antimony in lead alloy increases corrosion rate 22 fold compared to pure lead.

This would indicate without the influence of soil electrolytes a projected corrosion time of 1,200 years. But add iron oxides from steel shot corrosion and this reduced to 190 years.

Add in the effects of soil electrolytes and other sacrificial compounds, and we can quite easily understand rapid corrosion of lead shot in-situ in range soils.

So, given what we have learned, It should be apparent that in managing lead we have to manage the other metals it incorporates or comes into contact with. Which begs the questions: What's in our shot? What's already in our range soil? What effect will steel shot have on our range? It might be a surprise to some, but what you regard as 'lead' isn't just simply metallic lead. There are up to 5,300 categories of Lead recognised by distinct UN identification codes. Why so many designations? Quite simply, they all have quite different properties and uses.

Unified Numbering System (UNS) designations for pure lead grades and lead-base alloys.

Pure leads L50000 - L50099
Lead - silver alloys L50100 - L50199
Lead - arsenic alloys L50300 - L50399
Lead - barium alloys L50500 - L50599

Lead - calcium alloys L50700 - L50899
Lead - cadmium alloys L50900 - L50999
Lead - copper alloys L51100 - L51199
Lead - indium alloys L51500 - L51599
Lead - lithium alloys L51700 - L51799
Lead - antimony alloys L52500 - L53799
Lead - tin alloys L54000 - L55099
Lead - strontium alloys L55200 - L55299

Pure lead is extremely valuable. Antique pure lead free from radio-nucleotide contamination sells for 10 times the price of commodity grades, for application in electronics solders, where radioactive decomposition of trace contaminants usually present in fresh mined lead would otherwise cause spontaneous microelectronic pulses. Purer leads in ancient times were prized for being soft leads and used to line roofs of buildings and for construction of piping. Plumbing of the Roman baths at Bath are still in place 1,700+ years. The present lead roof of the pantheon in Rome is still intact after its restoration in the Renaissance some 500+ years. The lead clad drum tower of Ely Cathedral still up after nearly 700 years. Pure lead exposed to the elements is durable.

At the other end of the spectrum, lead-silver alloys are still used as sacrificial metals in larger seagoing vessels and they are purposely made to be unstable. A 20Kg block bolted to a ship's hull might corrode in only 25 years, but in doing so protect the steel hull from corrosion.

Naturally occurring lead-arsenic alloys were historically used as 'hard lead' to frame and hold stained glass windows. Very stable to corrosion, shot made from this material should survive more than a few thousand years. Owing to its durability, and antifouling qualities, today it's still the material of choice for sheathing sub-sea cables.

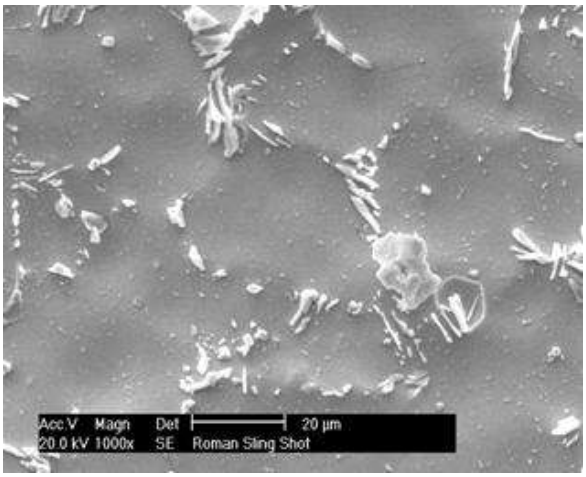
Lead-antimony alloys are a major component of secondary lead, the source of the majority of ballistic lead. Secondary lead from the 1970's was perhaps 4% antimony. Owing to its tendency to corrode shortening the lifespan of lead acid batteries, it has gradually fallen out of favour. Secondary lead generally contained circa 2% antimony in 2000. Today the average antimony content in secondary lead is below 1%. However, antimony is still added to many ballistic lead alloy grades to improve hardness and melt flow characteristics.

Quite clearly the composition of secondary or ballast lead has been changing over the last 100 years as its primary feedstock moved from being recycled roofing sheet and plumbing, to battery lead and then again as car batteries have evolved to use different alloys, with widely differing qualities. So quite simply 'lead shot' isn't just lead, and has varied significantly in its content and potential 'contaminant' behaviour over the last 100 years. Thus, any attempts to examine historic lead corrosion in-situ in ranges and extrapolate future corrosion rates would be problematic to say the least.

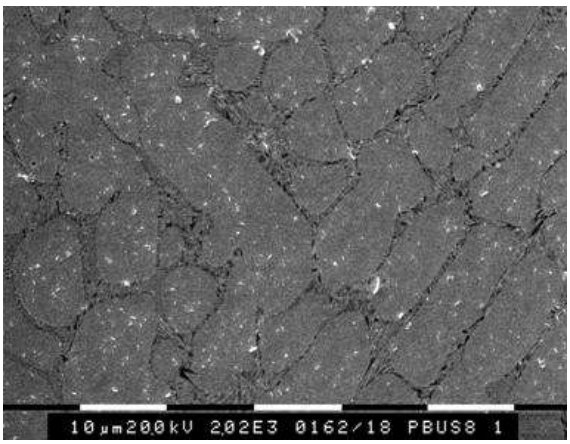
What's in your shot and bullets 'now' and what's antimonial lead being replaced by? Lead-tin, lead-calcium, lead-aluminium, lead-copper and lead-selenium alloys. Both selenium and antimony are more tightly regulated than Lead. Discharge limits for selenium are typically half to 1/5th that of lead. Selenium has recently been added to the US-EPA hit list for control. Discharge limits from industrial sources are now set at 1ppm. There is possibly 100,000 tonne of lead shot fired in Europe annually, which now might comprise of 1,000 tonnes plus of selenium.

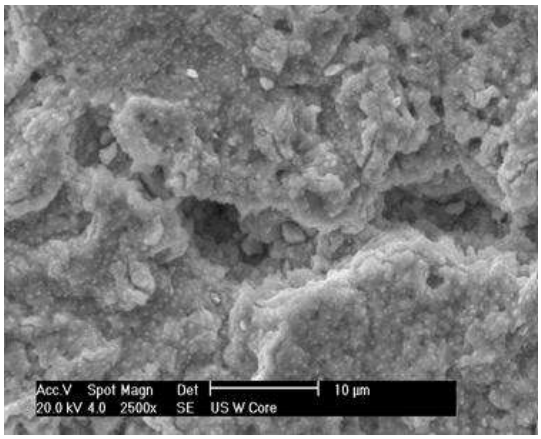
The Contaminant – Metallic Lead?

In ancient times, hard lead was used for the first lead bullets. These illustrated are circa 1st Century BCE Roman peltast bullets from the Danube valley. They are quite common and usually found in an excellent state of preservation. Take a close look at lead projectiles in the form of polished and un-etched cross-section through an electron microscope, below and we see the polished section shows a metallic shine. The alloy is a 'unitary' Lead 4% arsenic alloy. The large crystal grains are only just evident through the presence of a thin layer of arsenic and lead oxides. Not bad for an alloy of circa 2,000 years age.



In comparison, lead antimony does not form a unitary alloy, and as such creates the potential for internal redox cell formation and accelerated corrosion. If we examine current shot manufacture (e.g. left, a South American brand, circa 2% antimony but containing circa 5% oxide), we can see it has a somewhat matt texture with a porous dendrite structure. In enlargement, shrinkage porosity is fully evident (as black areas) caused by withdrawal of molten antimony rich eutectic during cooling and solidification. The larger elongated nodules are less rich in antimony, and contaminated with speckles of lead oxide and sulphate (the white components). The oxide originates from lead acid batteries.





Lead acid batteries are somewhat misnamed. They derive their electrical properties principally from conversion of lead (II) dioxide to Lead (I) sulphate, which are held in the battery as pastes supported on lead alloy plates. Lead oxides and sulphates comprise approximately half of the weight of the lead in the battery. When battery lead is reprocessed, it undergoes a primary melt and treatment with lime, yielding a molten emulsion of lead metal and lead oxide. In order to convert this material to metal, the smelter must add carbon, (in the form of crude oil, petroleum coke, coke or even old tyres) to obtain a

reductive burn. Incomplete processing leaves lead oxides and sulphates in the final product. Naturally, we would expect the degree of residual oxide to compromise alloy stability, as it is after all, part corroded already. This grade illustrated above by no means represents the worst on the market.

Right is material, from a new manufactured bullet core, its circa 20% plus PbO and is evidently unrefined solid lead metal/oxide emulsion. The polished cross-section doesn't even resemble metal at this magnification. It looks more like a crumbly grain biscuit marketed as a 'hob-knob' in the UK. Quite clearly we wouldn't expect this product to have the same impact and corrosion characteristics as refined lead alloy.

How does such material appear on the market? To be blunt - probably for environmental - and ultimately for economic reasons. In the secondary refining process, initially melting batteries gives rise very little pollution. However, the reductive burn to reduce the oxides back to metal results in copious discharges of hot lead contaminated CO_2 to atmosphere. Within Europe and North America, with ever tightening restrictions on such discharges and very high costs of installing and running suitable scrubbing facilities, a significant amount of secondary lead processing has been offshored to the developing nations. From the secondary lead processor's point of view it would be convenient if he could just sell his primary melt material, which is conveniently metallic looking, even if a little paler and pearlescent in appearance than metallic leads. It is after all of comparable density and ballistic performance. That's if you don't consider its inferior mechanical properties – especially on impact, and of course it's questionable corrosion characteristics.

Today, effectively what we have in our projectiles as a contaminant is not so much metallic lead as a destabilised lead alloy composite, peppered with oxides and sulphates – essentially comprising a discharged battery plate. If provided with an acidic environment and an electrolyte we will get re-initiation of the electrochemical process and associated physical changes being manifested as accelerated corrosion.

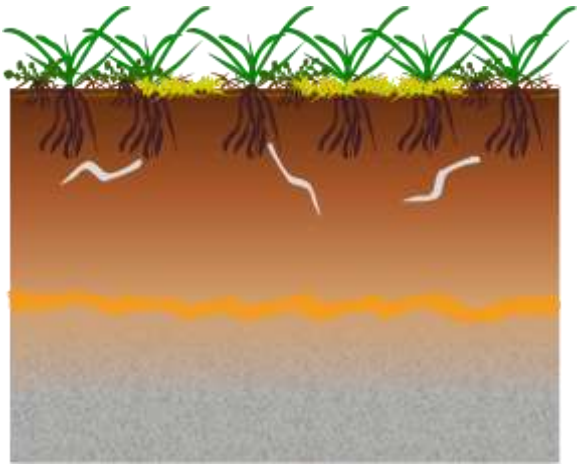
Does Steel Shot Reduce Environmental Risk?

Having considered the nature of the hazard from our potential contaminant, let's consider the wider issue of application to our range with regard to risk. There have been several studies of the behaviour of lead in ranges. Worldwide data suggests that on mature ranges legacy lead in surface soils can reach levels of 10 gram per Kg. Early studies had concluded that lead shot could survive in the soil conditions for 10,000 years and be largely retained on-site. However, experience tells me that at such levels of lead unless the surface is permeable and subsurface geology is clay rich, lead migration problems are likely to occur.

Steel has been widely promulgated as a 'non-toxic' alternative to lead. And in some cases, local regulators have, perhaps naively, insisted that ranges cease firing lead altogether. I am not a shooter. I'm an environmentalist and a scientist. I fully believe that lead is harmful and that lead shot poses a significant risk to waterfowl, but I have grave reservations of the universality of the switch to steel and other lead alternatives in all shooting applications.

Let's take a closer look at the impact of shooting steel, and in particular at shooting steel over lead. Illustrated is a shooting range situated in Florida. The range is circa 50 years old and unfortunately sited adjacent a wetland wildfowl reserve. The local regulator has imposed a mandatory prohibition on shooting lead. The photo, whilst not an empirical study, illustrates the overview of anecdotal observations of range owners. Whilst both lead and steels shot types, when concentrated in principal region of shot fall, will adversely impact vegetation, where steel is used we do observe greater impact. Here we can see from the grass rhizomes that normally run within the soil thatch, are now fully exposed and shrivelled. As this is from the centre of the shot fall region I think we can take it that we are not observing wear from a high level of foot fall. Whilst the particular picture does not have a detailed scale (apart from the ubiquitous dropped pen), we can see the obviously corroding lead and steel shot. We can also just make out that some of the lead shot has corroded to below 1mm. (NB: The narrow gold band on the pen is circa 1.5mm wide.) It is evident that lead is corroding at a very significant rate. The increased lead shot corrosion is fully expected and we can understand the mechanisms of the shot interaction, but what's happening in the soil? I would like to put to you a summary of what we believe is happening on this site, and likely happening on very many other sites where steel is now being fired over legacy lead, with consideration of the likely impact on environmental risk…

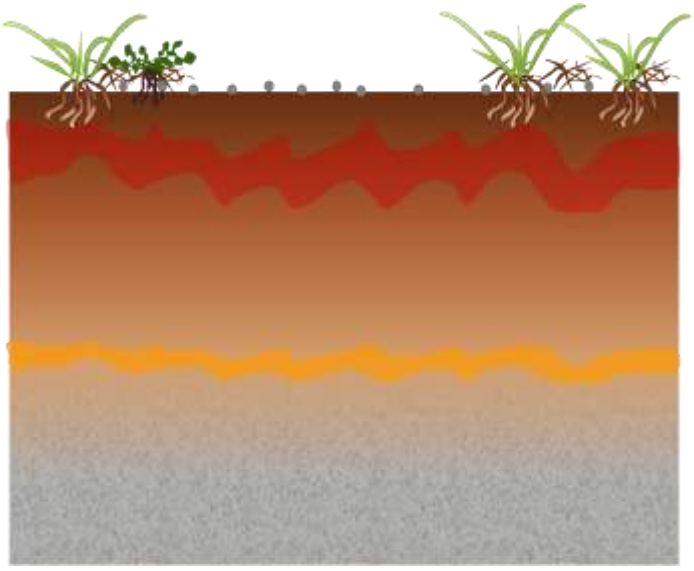
European Soils – Typical Profile and Predicted Impact of Steel Shot



If we consider a hypothetical 'typical' European soil, as we might find on a shooting range, we usually see: Organic rich horizons descending into less organic rich layers of weathered soils, overlying un-weathered substrata and parent rock. Grasses, herbs, mosses and lichens; rooted in and underlying thatch and dark organic rich horizon. Surface conditions are typically pH 5.5-7.5. Some upland areas may be 1 pH unit lower and some Mediterranean coastal fringe soils a unit higher. We usually find soil invertebrates. Iron banding from natural weathering is commonly found above less oxygen rich regions.

Add steel shot and what is likely to happen? Steel is not simply an alloy of iron and carbon. Corrosion will also liberate colloidal oxides of nickel and manganese in addition to iron. These elements are naturally present in most iron ores and carry through, or are added to finished steel products. Accelerated corrosion of legacy lead, and liberation of other heavy metals naturally present in the soil will occur through redox corrosion and iron oxide catalysed oxidation. This is an important point as even if you put pure iron onto the range, such is the power of iron and its oxides as oxidation catalysts, they will induce breakdown and leaching of previously stable background metal minerals. In

other words: Put a significant amount of iron on your range and even if you hadn't a heavy metals leaching problem, subject to background mineralogy, you are very likely to create one!



Most corrosion by-products adhere to colloidal iron oxides, surface clays and biomass. Initially you might see a reduction in heavy metals leaching. Iron corrodes to produce alkaline iron (II) compounds which then go on to acidic iron (III) compounds. Leading to adverse impact on surface soil pH, swings from 9.5 to 3.5 in days. The overall effect is a long term increase in site acidity and net increase in metals leaching. We anticipate and observe pH swings, and the act of corrosion in the soil 'in and of itself' takes oxygen out of the soil raising the level of the soil's zone of anaerobic horizon and reducing the zone in which soil invertebrates can thrive. Iron (II) salts are sold as herbicides, specifically to deter moss. So, how can you expect steel shot through is corrosion products not to have the same effect on range soils. We can anticipate the demise of soil invertebrates due to pH changes and oxidative stress, with consequential further deterioration in sub-soil drainage. Reduction of intolerant herbs and deterioration in grass quality and cover will occur. Formation of secondary a 'iron-pan', leading to deterioration in soil texture (with iron concretion) will further impede sub-soil drainage, leading to an increase in surface run-off. The natural consequence of the above is loss of surface biomass and soils.

Site Risk! - Added Contaminants

Contrary to labelling of 'Steel Shot' cartridges, not being lead does not make them 'Non-toxic'. Steel is not non-toxic. If an animal is shot and wounded with it, its survival prospects are at the very least no better than with current lead ammunition types.

Colloidal Iron oxide is: An Irritant. Its not classified as a human carcinogen - but is an equivocal tumourigenic agent by RTECS criteria. (i.e. yields tumours at site of application in rats.) It is also a herbicide and aquatic pollutant, being toxic to insects and invertebrates.

Steel shot contains both manganese and nickel. These elements occur naturally in almost all iron ore deposits and result in low parts per thousand to low single figures percent as background contaminants in iron and steel products. Safe concentrations of these elements in soils have not yet been established.

Nickel (I) compounds are former RED LIST materials and known human carcinogens. EU-WAC limits for nickel for land with unrestricted use, including agricultural use is only 100 mg/kg, i.e. half that of lead. For industrial commercial use 1,850 mg/kg is permitted, which is at the outer limits of tolerable in engineering and metalworking. Legacy lead on some range surface soils reached over 10,000mg/Kg. Unchecked, steel shot and its corrosion products would reach the same levels.

Manganese oxides are Harmful and reduce male fertility. Lead is a known neurotoxin. And disturbingly, there is a proven link with manganese–lead co-toxicity and human health, with epidemiological studies confirming the observed biological effect that manganese exposure causes a 3 fold increase in transference of lead across the blood - brain membrane barrier.

Adding steel to a range increases the level of potentially soluble lead and antimony pollutants by redox corrosion and increased acid corrosion of legacy metals.

Site Risk! - Added Pathways

A transport metal is a metal that forms insoluble compounds which have an ability to sorbe heavy metal compounds and can easily be transported by water. Iron oxides are just such materials. Iron has a density of 7.87g/cc. However, iron and its alloys corrode to produce colloidal hydrated iron oxides. Hydrated iron (III) oxide – Limonite, $FeO(OH)\cdot nH_2O$ has a density of 2.7 – 4.3 g/cc. In comparison, clays have a density on slightly lighter at 2.16-2.8g/cc . Limonite being colloidal in nature, given sufficient run-off or even a significant breeze, can easily leave a contaminated site. Colloidal iron oxides remain insoluble only where soluble iron in solution around them are in excess. Once transported beyond the zone of iron saturation they simply dissolve to become soluble hydrated iron. Naturally, any toxic cargo of heavy metals they have picked up en-route will also be dumped into solution. Transportation of heavy metals in this manner is termed 'facilitated transport'.

It is generally believed that facilitated transport of heavy metals by iron oxides, represents the greatest single cause of heavy metals migration. However, iron alumina-silicates and biomass can also perform the same role, sorbing heavy metals on a contaminated site, being carried away in surface run-off only to de-sorbe the soluble pollutants where they reach zone of un saturation.

With loss of surface cover in the form of vegetation and thatch, the elements that bind surface soils are lost. Thus, surface biomass and topsoil can be lost to erosion. These same eroded materials, owing to their proximity to the origin of contamination, are amongst the most contaminated materials on the site. If they are washed or blown away, they will carry contamination with them – And once in a region of low saturation they can dump any sorbed toxic heavy metals. Thus, migrating topsoil and biomass can facilitate the transport of heavy metal contaminants.

Drainage from a contaminated site can leave by one of 2 routes; as surface runoff or subsoil drainage. Where the ability of the soil to drain rainfall is impaired, naturally run-off will increase. Where drainage is through the site soils, there is at least the potential for soluble pollutants washed into the soil, to be sorbed and bound in the soil as moisture percolates through, thereby the potential pollutants can remain close to their source of origin.

Contaminants travelling in surface run-off have less potential of being sorbed and retained on-site. So, naturally an increase in surface run-off will increase the migration of soluble heavy metals from the site.

Mitigation of Site Risk

Knowing what is happening to the site chemistry and its physical consequences, mitigation of pollution risk becomes common sense.

- Don't shoot steel over legacy lead. The chemistry says it increases risk significantly so why do it?
- Or shoot 'better' lead. Makes sense to not use antimonial lead, and better grades are available at minimal cost uplift. Are birds at significant risk from range lead, if there is adequate site cover?
- Design ranges to better capture spent projectiles. By confining and concentrating the potential hazard we can better manage it.
- Ranges cannot be sustainable if spent shot is left in-situ. Whilst periodic removal a lead can be problematic, the one saving grace of steel is – its magnetic. Magnetic brooms are routinely used in the U.S. building industry and available from a variety of suppliers, and can be used to recover 'loose' steel shot…

- Treating the range with apatite or similar phosphate as a surface dressing can have a beneficial effect of immobilising lead in-situ. However, plants and other soil flora will see lead phosphate as a nutrient and will attack it liberating the lead once more. Life span of treatment efficacy 1 to 3 years.
- Precipitation on the site will exit by one of 3 routes; surface run-off, subsoil drainage and transpiration. We need to discourage surface run-off so we need to encourage soil drainage, that way lead is retained on-site and in-situ. Transpiration of plants, particularly trees and shrubs is also a pretty good way of getting rid of site water.
- Maintaining site cover is critically important. We must not to allow highly contaminated bald spots to persist. These are precisely the zones we need to manage.
- Monitor site soil permeability. We need to know if we're impairing site permeability. As an added note, apatite lime dressing, particularly with iron oxides makes for a pretty good soil aggregation agent or cement and can impair natural drainage.
- Counter 'iron pan' with mechanical intervention to assist surface drainage. Fork, till or in the last resort – plough.
- Install a range drainage system to capture all run-off and monitor run-off for potential contaminants. This makes sense especially if you have a contaminated site, you have a legal obligation to manage risk on that site. And by creating a fixed route for run-off we can intervene with premeditative treatment should it prove necessary.
- 'IF' intervention proves necessarily, I would recommend incorporation of a heavy metals reactive filter / barrier within the range drainage system and projectile traps. There are numerous suitable reagent systems. Sulphide based reagents are in my opinion the best in offering long term treatment. Apatite / lime and synthetic apatite, are probably the most widely used. As a slow sand reactive barrier fill they have greater durability than surface treatment because they're not available to be broken down by site flora, but phosphate treatment is not suitable for all heavy metals. Other agents can be incorporated to address other contaminants as necessary.

ANY FUTURE CHANGES – THINK HOLISTICALLY!

If I leave you with one message it is that for any future changes to ammunition materials to 'think holistically'. As a change intended to mitigate wild-fowl poisoning, if extrapolated beyond its immediate intended application can indeed have knock-on undesired environmental consequences.

Peter J. Hurley
Cylenchar Limited
May 18, 2013

http://www.cylenchar.com/ESCGA_Moscow_2013.pps

http://www.cylenchar.com/ESCGA_Moscow_2013_Notes.pdf

http://www.cylenchar.com/Article.pdf

Pathways for exposure to lead while using and handling guns and ammunition

By Elizabeth O'Brien, with additional research by Anne Roberts

According to Wikipedia (2011):

*An **air gun** (also **air rifle** or **air pistol**) is a rifle, pistol, or shotgun that fires projectiles by means of compressed air or other gas, in contrast to a firearm, which burns a propellant. Most air guns use metallic projectiles as ammunition. Air guns that only use plastic projectiles are classified as airsoft guns…*

The most popular ammunition used in rifled air guns is the lead diabolo pellet. This waisted projectile is hollowed at the base and available in a variety of head styles.

A .177 caliber "Wadcutter" pellet next to a stick of chewing gum.

(Wikipedia, 2011)

A forensic scientist who did his training in Tasmania, Dr Carl Hughes, has advised me (2010) that air rifle pellets used in Tasmania (and the rest of Australia) in the 1970s, 1980s and 1990s would have been almost entirely lead.

I have also advised numerous weapons instructors and police (who are required to practice shooting) about the pathways of exposure to lead while firing guns. Anne Roberts has put together the following information on that topic.

The following information is from 'RISKS OF LEAD POISONING IN FIREARMS INSTRUCTORS AND THEIR STUDENTS' (Gregory, 1990)

The article is about indoor shooting ranges, but the author has agreed that the information also applies to shooting outdoors (not simply in outdoor shooting ranges, which are partially enclosed), especially when the air is still.

'Lead can enter the body by breathing it in as a dust or vapor, by ingesting it, and to a lesser extend, by absorption through the skin. On the shooting range it tends to enter via all three routes. Every time you discharge a handgun a spray of lead erupts into the air around you. If you are shooting cast lead bullets, part of this lead is in the form of microscopic particles sheared from the bullet as it passes down the barrel. Down range, the bullet impacting on the armor plate emits a spray of fine lead particles. More importantly, the chemical commonly used in primers is lead styphnate, and detonating the primer discharges a cloud of molecular lead compounds. So the air on a shooting

range -- even an extremely well ventilated range -- tends to contain a lot of lead, both as dust, and as gas. It settles in large amounts on the floor, and on other horizontal surfaces as well. Even if the range passes OSHA standards for airborne lead contamination (which many don't), you will still often find yourself standing in a cloud of lead filled gun smoke as the air currents eddy around you. All the while you are breathing in lead, about 30-50% of which will dissolve from your lungs into your bloodstream. If you have any doubts about this, just blow your nose when you leave the range after a lengthy shooting session. That black stuff in the mucous is the residue of gun smoke, and it contains a lot of lead.'

The powder residue you get all over your hands also contains a lot of lead. Left on your hands, some of this can actually be absorbed directly through your skin. More importantly, if you eat with this residue still on your hands, you will contaminate your food with a significant amount of lead. You can also contaminate your food with residue from around your mouth, particularly if you have a mustache. Your breathing concentrates lead around your nose and upper lip, and a mustache will act as a filter to trap the particles and gases. Your sandwich or pizza will then carry those particles into your mouth. This is particularly important to realize, because although only about 10% of ingested elemental lead is absorbed, nearly 100% of ingested lead salts -- formed when you ignite the primer -- are absorbed. So ingestion is a very efficient way to absorb certain forms of lead.

Handling fired brass can result in the same problem. The powder residue on fired brass also contains a lot of chemical and particulate lead. The author knows of one individual who didn't spend much time on the range, but who regularly sorted brass while munching snacks, and gave himself serious lead poisoning in the process.

If you have small children, it is also important to realize that you can carry lead residue home and contaminate your living quarters and car. You will get the dust on your shoes, on your clothes, on your shooting gear, and in your hair. It will then be tracked into and settle on the floor of your home. Children, of course, live on the floor and put everything into their mouths. And as we noted before, they are extremely susceptible to lead poisoning. In the course of the research for this article, the author was told by a local health official of a case where the children of one particular family were found to have elevated blood levels of lead, and the family car was so badly contaminated (from the family's clothing) that it simply had to be gotten rid of.

The exposure to lead on firing ranges (military or civilian) occurs as soon as a shooter pulls the trigger on a firearm. This action causes the primer of the cartridge in the weapon's chamber to explode, which - in turn - ignites the main powder charge. At this point, a respirable cloud of lead particulates is expelled from the cartridge primer into the air, with minute particles of lead dust spraying the shooter's hands, face, and clothing.

With exposed lead types of projectiles, minute lead particles also shear off from them as the projectile travels through the barrel of the weapon. In jacketed ammunition with exposed lead bases, minute particles are shed from the small exposed base area.

When the projectile leaves the barrel, a second cloud of contaminants, in the form of the muzzle blast, bursts into the air. These contaminants contain particles of lead and other chemicals from the projectile and the residue of unburnt powder and burnt powder gases. Then, as the bullet travels through the air and strikes the impact area, another contaminated cloud rises if the projectile strikes a solid object causing it to break up, releasing small particles of lead dust into the air.

When shooters inhale these various clouds of contaminants, lead particles travel directly into their lungs and are quickly absorbed from there into the bloodstream. The blood then transfers this inhaled lead into soft body tissue and bone. Heat from smoking, sweating, or physical activity accelerates this process.

Lead can also settle on the skin and hair, and in turn, be absorbed through the pores of the skin. If lead particles reach the mouth, they can be ingested directly into the digestive system.

Exposure increases when it is time for the individual to clean-up, because handling empty casings can result in lead being transferred to the skin, or to clothing and other garments from where it will eventually find its way into the body. The actual cleaning process for the weapon also removes much of the remaining lead in the barrel and lead particulates from other parts of the weapon and transfers it to the cleaner's hands. Oils and solvents used to clean and lubricate weapons cause the natural oils in the skin to evaporate, leaving dry skin and open pores through which the lead can more easily pass.

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Lead in Literature:

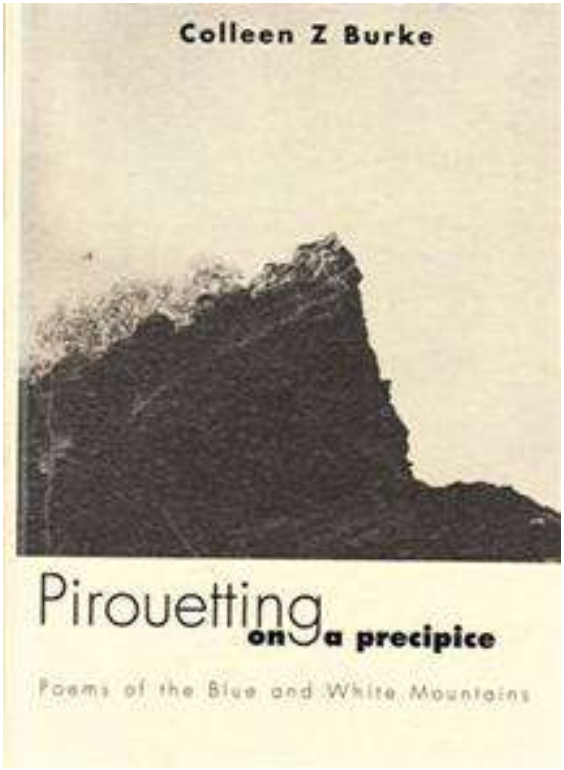
Poems on Ancient and Modern Hunting

By Colleen Z Burke. The copyright remains with Colleen Z Burke. Reprinted with kind permission. **Ravens croak no more, A permit to kill, The shooters** and **Towards the mountains** *were published in Colleen's poetry collection* **Pirouetting on a precipice: Poems of the Blue and White Mountains** (Seaview Press, 2000). *See Colleen's full list of published poems at http://colleenburke.com/publications.php - her books can be purchased Better Read Than Dead Bookshop and some of her poetry books can be purchased at Gleebooks.*

[Editor's note: The following kangaroo hunting poems were chosen because the hunting method involves lead shot, and the moth hunting poem was chosen to compare old and new hunting methods. Bogong moths, hunted for millennia by Aboriginal Australians, on their annual migration to the Southern Alps / Snowy Mountains of South Eastern Australia (the White Mountains of Colleens' poetry book title) are nutritious and "suited people in a cold climate who needed fat and a burst of

energy…[as] 100 grams of Bogong moth abdomen contains 38.8 grams of fat and 1805 kilojoules of energy." See the World Health Organisation (WHO) edible insect story below, for links between insects as food and lead poisoning.]

Back cover note from the book: *With brilliant imagery Colleen Burke celebrates the awesome, fragile beauty of the Blue Mountains and the Snowy Mountains. Colleen's fine writing explores the contrast with the city, and the history and myth that resonate in the landscape. It is a magic book, rich in wisdom and humour. In the splendour and vulnerability of the mountains Colleen traces a landscape of the heart.* Alison Lyssa



White Mountain Poems

Ravens croak no more

"It would be a shame if the coming of the Europeans were

to prove as disastrous for moths as for Man . . ."

***The Moth Hunters*, Josephine Flood.**

The tribes gathered when the frost melted
on the lower ranges of the Snowy Mountains
and thousands of hungry ravens
croaking and hovering around the granite rocks
signalled the annual arrival of millions
of Bogong moths from the north.

Like a dark cloud the moths settled,
aestivating in fissures, cracks, and crevices.
After the bull roarer and appropriate rites
There was much noise and revelry.
During corroborees
chanting women beat drums
with yam sticks, or nulla nullas.
Others played reeds with their fingers.

Smoke signals heralded
the beginning of the moth hunt.
and groups of men climbed
up to the high granite tors in search of prey.

The moths, stupefied with smoke,
fell onto sheets of barks, nets or skins
and were then carefully cooked,
lightly roasted, so as not to scorch

bodies, or diminish their delicate flavour.

These summer gatherings of the Walgalu
and other tribes beneath the Bogong Mountains
were for sociability, for marriage,
initiation ceremonies
and to settle tribal disputes.
And the devouring of this luscious, fattening
nutritious food made bodies sleek, glossy, even fat.

And now the corroboree site
has been obliterated under the solid
weight of Blowering dam.
The Tumut river drowned.
There are no more corroborees here.
Moth numbers are dwindling
And ravens croak no more around high granite peaks.

A permit to kill *for Bridie*

A bright green
clearing glows through
the greyish bush.
Wattle blossoms
bend to the smell of
abundant water
tumbling down
from high mountains.

A kangaroo stands
alert – sensing
blood on the wind.
Last night
on a nearby property
hundreds of roos were
callously rounded up
for slaughter .
The owner/manager
had a permit to cull -
a licence to massacre.

Silence – shattered by the
sound of bullets screaming into
fragile flesh. Bloodstains

congeal in clear mountain air.
The roo bounds away.
Wattle blossoms shiver
in the quickshadow
of its passing

The Shooters

The pulse of the earth
slow at dusk.
The whispering bush still.
Clusters of kangaroos
listen warily as we move
over the old homestead
scuffing scent of dead roses.
Grass shadows bend to our weight.
The roos jump slowly downhill.
Pause. The rifle shot is loud.
In a lilt of green old rabbit bones glow.
A roo skull lies awkwardly.
As we walk over the hillside
roos move away quickly
gathering speed

Towards the mountains for Paddy

Cold air rising
silhouettes
of gum trees
scalloped on
sky glow

A hawk hovering . . .
Abundance of birds -
king parrots, finches
wrens, galahs,
crimson rosellas.
Dark cry of cockatoos
flying home.

Sonorous green air
subdued in sunset.
A roo poised on the
hillside listening . . .

Greedy for this wonder
we're reluctant to leave
to turn homewards
as though we'll never
walk this way again.

What should I test this with?

Suggestions made regarding choosing testing methods for 7 material classes of possibly lead containing objects.

By Zac Gethin-Damon with advice from Martin Bagnall, Sampling Technologies Pty Ltd and Lance Smith, Sydney Analytical Laboratories.

There are three different things you may be looking at when you are testing an object:

1. the presence of lead over or between certain thresholds
2. the actual amount of lead in the object.
3. the migrational properties of lead in object: i.e. the degree to which the lead in the object can migrate into the bloodstream or other systems: soil, rainwater tank etc.

While tests which determine **1** and **2** are useful as rapid methods to identify lead it is the results of **3** which are the most useful to you: it is this amount which equates to the lead contamination potential of an object. Although an object may be composed of high amounts of lead, if the lead cannot leach out into the environment then it is harmless. However if no lead is present it an object it will obviously have no leach potential therefore tests which show **1** and **2** should be seen as useful in the way they indicate the need to test for **3**.

We have identified 6 main tests which are available to you to test an object:

a) Lead Inspector Rapid Swab Test: Swab test which indicates the presence of lead by changing colour. The colour chart provided with the kit notes 5 possible colour changes, from beige: 1-3ppm lead to black: 50ppm lead.

b) 4 Hrs Leach Method: Comes with the Lead Inspector kit. Vinegar: a mild acid, is applied to the object and left for 4 hours to allow the lead to dissolve. The solution is tested after 4 hours against the same colour chart as in a).

c) Lead Check Swab Test Swab test which indicates the presence of >0.5% or 5000 parts per million (ppm) lead by changing to pink.

d) XRF RoHS Test (ppm): X-Ray Fluorescence is a rapid means of detecting the presence of lead and other heavy metals in paints, soils, metals, wood and other materials. XRF measures the total amount of the element (in parts per million or %) present by placing the test item onto the end of a hand held XRF instrument. Within 30 seconds, XRF will allow you determine if, a. Lead and other heavy elements are present. b. Determine if the concentration amount is high, medium or low level, and c. determine if you need to do further investigation with laboratory analysis.

e) Lab acid leach tests: As in b) but done under lab conditions and with stronger acids. The leaches were done with approximately a ratio of 20:1, i.e. f the object weighed 20gms, it was leached it in 400mL of acid. Initially 4% Acetic Acid, was added, the readings were then taken **(i)**, then Nitric

Acid was added to a level of 4% before taking the second reading **(ii)** A lot more lead will come out in the Nitric Acid as it is much stronger.

i. 4% Acetic Acid Leach (ppm Lead in solution):
ii. 4% Nitric Acid Leach (ppm Lead in solution)

Let us separate them according to their purpose:

1. Tests which identify the presence of lead between and/or over certain thresholds:

a) Lead Inspector Rapid Swab Test: Min reading: 1-3ppm, max reading:>50ppm.
b) Lead Check Swab Test: >.5% lead.

2. Tests which identify the actual amount of lead in the object:

c) XRF: In parts per million (ppm): an estimate.

3. Tests which identify the migrational properties of the lead in an object:

d) 4 Hrs Leach Method**:** As in a)**,** min reading: 1-3ppm, max reading: >50ppm.

e) Lab Acid leach tests.

The tests are often misleading.

The problem facing you as the person who wants to test an object for one of these things is that the validity of each of the tests will vary according to the material that the object you are testing is composed of.

What we did:

We have tested various items and arranged them according to the material they are primarily made from in order to determine which testing methods are appropriate for which materials.

How did we determine the appropriateness of each testing method?

To confirm the appropriateness of each testing method we look for agreement between testing methods across samples. Agreement means that the results do not contradict each other. For example if we take two items to be tested, lets say 1 and 2, and both testing methods **a)** and **b)** find 1 to be more leaded then 2, then these testing methods agree. Similarly where no lead is found by **a)** or **b)** the testing methods can be seen to agree. Where there is agreement between testing methods the validity of each test is suggested, oppositely where testing methods don't agree the validity of either one of the testing methods is challenged. The testing methods have been arranged in terms of validity from left to right, with the lab acid leach tests **e)** being the most valid. Hence if a testing method is contradicted by a testing method on its right then its validity is challenged.

Substances Tested:

1) **Paint**
2) **Metal**
3) **Ceramic**
4) **Teeth**
5) **Spice**
6) **Plastic**

Results:

<u>1) Paint</u>

	a)	b)	c)	d)	e) i.	e) ii.
Kitchen Ceiling Paint	-	-	Turned light pink immediately	5,000ppm	1170	2380
Kitchen Wall Paint	-	-	Turned light pink immediately	8,000ppm	220	460

c) The swab test indicated lead present in both cases.

d) The XRF test in the Kitchen Paint example suggests the Wall Paint is more leaded, yet the leach tests **e) i. and ii.** suggest that it is the Ceiling Paint which is the more leaded sample. As we are to take the leach tests as the more valid, this would suggest that the XRF result is not reflective of the true lead content of the paint. According to the company which did the XRF testing this could be for one of two reasons:

1. The paint sample may have had multiple layers of paint which varied according to lead content. As XRF tests all the layers of the paint and takes an average of the lead content the result does not always reflect the actual lead content of the item tested. If one layer of paint were leaded and one lead free for example, the lead-free layer would dilute the result and make it appear less leaded. 2. The other possibility is that a calibration error yielded an incorrect response. The example should be tested again with XRF.

Now the total lead in the sample must be more than 20 times the leached amount **(e)**, because the ratio is 20:1. If you take the paint samples as an example, the Nitric acid leach for the wall paint is 460ppm. The total lead must therefore be greater than 20x460 = 9200ppm.

Allowing for experimental error the figure of 8000 from the XRF is close enough.

For the Ceiling paint, the nitric acid leach is 2380ppm. The total therefore must be greater than 20x2380 = 47600ppm. The XRF result of 5000 is incorrect. It could be that the XRF result is out by a factor of 10, which may have been just a calculation error.

Conclusions: What should I use to test paint?

1. To test for the presence of lead: c) Lead Check Swab Test will indicate when paint contains over 0.5% lead.

2. To estimate the amount of lead: d) XRF testing, while not indicative of the actual amount of lead in this case did indicate high amounts of lead. XRF testing is useful to identify if an object has low, medium, or high amounts of lead but further lab testing is required to confirm the actual lead content or migrational properties of an object.

3. To test for the migrational properties: e) Acid leach testing.

2) Metal

a)

	a)	b) i.	c)	d)	e) i.	e) ii.
Metal Pen	Metal Surface - Unable to test	Light Brown: 5ppm	No Change - Stayed Yellow	Nil	<0.01	0.03
Metal rice bucket and rice dishes	Metal Surface - Unable to test	No Change	No Change - Stayed Yellow	Nil	<0.01	0.06
Green Chinese metallic silk scarf	Turned Yellow	No Change	No Change - Stayed Yellow	Nil	0.04	0.12
Enviroweights Bean 50 gms Biodegradable Fishing Sinker*	Turned Black ie more than 50 ppm Pb	Black: > 50 ppm	Turned grey, probably due to the product's colour	Nil	0.03	0.14
Metal Ball Sinker	Metal Surface - Unable to test	Dark Brown: 25 ppm	Turned pink	28,819ppm	160	7,000
Metal Clip	Metal Surface - Unable to test	Medium Brown: 10 ppm	Turned pink	5,000 ppm	2.0	2.9
Flower pearl and silver Necklace	Metal Surface - Unable to test	No Change	Turned grey, probably due to the product's colour	Nil	<0.01	<0.01
"Gold" Watch	Metal Surface - Unable to test	Beige: 1 - 3 ppm	No Change - Stayed Yellow	Nil	-	-
Sunflower made of Pewter - Metal	Metal Surface - Unable to test	-	Turned pink immediately	781,000ppm	-	-
Globe Charm made of "lead-free" pewter	Metal Surface - Unable to test	Beige: 1 - 3 ppm	Turned grey, probably due to the product's colour	Nil	<0.01	2.6
Pewter Koala lid of wooden potpourri dish	Metal Surface - Unable to test	No Change	Red - high lead	780,000ppm	-	-

b) The Lead Inspector rapid swab test cannot be used effectively on metal items. Those items that were tested and where a change in colour was observed:

c) the Chinese Scarf and the Enviroweights Bean were later shown to have minimal amounts of lead.

d) The 4 hour leach test is suggested to be similarly useless through the results, while indicating lead present in items shown by further testing to have lead, it also indicated the presence of higher amounts of lead in substances which later showed to have very minute amount, therefore disqualifying any results as valid.

b) The Lead Swab test in the metal example yielded effective results, in both cases where a pink colour change was observed, high levels of lead were found by testing methods d), e) and f)

d+e) The agreement between testing methods **d)** and **e)** suggests that XRF is useful to determine the amount of lead.

*****We tested enviroweights as they claim to be a lead safe product. The very low lead results confirm this claim; we can recommend envirowieghts as a non-lead alternative to generic fishing sinkers such as the Metal Ball Sinker tested.

Conclusions: What should I use to test metal?

1. To test for the presence of lead: c) Lead Check Swab Test
2. To estimate the amount of lead: d) XRF testing
3. To test for the migrational properties: e) Acid leach testing

3) Ceramic

	a)	b) i.	c)	d)	e) i.	e) ii.
Alex's wisdom tooth	No Change	Beige: 1 - 3 ppm	No Change - Stayed Yellow	Nil		1.2 mg/kg = 1.2 ppm
Alex's Right Molar lost 1/11/2012	No Change	No Change	No Change - Stayed Yellow	Nil		1.4 mg/kg = 1.4 ppm
Alex's Lower Left Molar lost 5/7/2011	Turned Yellow	Beige: 1 - 3 ppm	No Change - Stayed Yellow	Nil		1.8 mg/kg = 1.8 ppm
Alex's Right Molar lost 11/11/2009	No Change	Beige: 1 - 3 ppm	No Change - Stayed Yellow	Nil		1.2 mg/kg = 1.2 ppm

a) A comparison of the results would suggest that The Lead Inspector Rapid Swab Test only detected lead where there was at least more than 1.4 mg/kg (according to test**e) ii.**
b) The 4 hour leach test on the other hand showed no change in a test which was later shown by testing method **e) ii.** to be more leaded then 2 other examples were a colour change in the 4 hour leach test was observed: a false negative. This would suggest that the 4 hour leaching method is not a useful testing method for teeth.
c) The Lead Check swab test showed no lead in any of the four tested teeth. This is most likely due to the limitations of the range of detection in this testing method.

d) The XRF tests showed there was no lead in the teeth while the leaching test **e) ii.** Suggested that there was lead in the teeth. This could be either due to the limitations of the range of detection or specific to this material: teeth. Either way the suggestion made through these results is that XRF is not a useful method for identifying small amounts of lead in teeth.

Conclusions: What should I use to test teeth?

1. To test for the presence of lead: b) At least >1.4 mg/kg

3. To test for the migrational properties: e) Acid leach testing.

5) Spice:

TEST	a)	b) i.	c)	d)	e)	f)
Tumeric	Not able to be tested	No change	No change	Nil	<0.01	<0.01

a-c) Due to the yellow coloured nature of the turmeric tested, a colour change test was not practical.
d+e) The agreement between these three more exact tests would suggest that any of the three is appropriate for testing spices for lead. Clearly a more extensive test of spices would be required in order to draw conclusions.

6) Plastic

	a)	b) i.	c)	d)	e)	f)
Black Sticky Tape	No Change	No Change	No Change -	Nil	0.05	0.09
White PVC Tube	No Change	No Change	No Change -	Nil	<0.01	<0.01

The low amount of lead indicated in both the examples in the three more exact tests makes it unclear if swab tests are useful or not. What is suggested in these results is at least small amounts of lead identified in testing methods **e)** cannot be identified in plastic substances through swab **a+c)**, 4 hour leaching **(b)**, or XRF **(d)** testing methods. A more extensive test of plastics would be required in order to draw conclusions.

To sum it all up:

While tests **a)** through to **d)** can be useful to quickly identify the presence of lead in an object/estimate the amount of lead in an object, any confirmation of the actual danger that an object may have requires laboratory acid leach testing **e)**. What this document has tried to achieve is a demonstration of which tests are useful for identifying and/or estimating the presence of lead in different materials.

Lead Research/News

Articles collated and summarised by Lan Nguyen, University of Technology Sydney (UTS) Interns at The LEAD Group, May 2013 and Rama Veeraghanta MBA (Finance&Marketing), volunteer The LEAD Group Inc.

- **Beware of lead paint when renovating**

Darcy Wilson, Build.com.au, edited by Elizabeth O'Brien, The LEAD Group Inc, *Lead paint: is your home a threat? Many Australian houses built before the 80's contain extremely dangerous lead paint. Find out if your home's making you sick - Beware of lead paint when renovating* Build.com.au BUILD online newsletter, Mon 26/11/12

http://www.build.com.au/walls/wall-maintenance/beware-lead-paint-when-renovating

It's estimated that the vast majority of homes in Australia built before 1970 contain lead paint with up to 50% lead levels while it was reduced to up to 1% between 1970 and 1997. There are several methods to test the lead content of the paint, including a colour-change test kit, a DIY sample kit and a portable XRF machine. It is important that the process of removing lead paint and disposing of your contaminated waste is complicated and maybe dangerous so you need to manage it professionally.

- **Double murder trial delayed to investigate Black Leaf chemical site's effects on defendant**

Jason Riley, The Courier Journal, 31 May 2012,
http://louisville.edu/cepm/Double%20murder%20trial%20delayed%20to%20investigate%20Black%20Leaf%20chemical%20site%20Courier%20Journal%205-31-12.pdf

A double murder trial was postponed for further investigation about the possible effects of pesticides and heavy metals' poisoning on the defendant and its link to the case. Clarence Stiff, the defendant, had lived near the former Black Leaf industrial site during his childhood. According to the Kentucky Division of Waste Management, this site was reported with elevated levels of toxic pollutants, including the now-banned DDT, dieldrin, arsenic and lead. Also, nervous system damage, dizziness, lower IQ, liver and kidney problems and cancer are some health issues related to this type of poisoning discovered on and near the chemical site.

Editors note: The trial, postponed by a year, was due to start last month, May 2013.

- **New report says lead taints economy; loss to developing nations calculated at $992 bn/yr**

extracts are from Lead taints economy; loss to developing nations calculated at $992 billion, by Brian Bienkowski, Staff Writer, Environmental Health News, about a report published on 25 June 2013:

Editor's note: the fact that one of the co-authors of the report, Leonardo Trasande, was quoted as saying: "There are only a few countries using leaded gasoline, so the majority of the exposures are from lead-based paint, lead battery production and hazardous waste sites," would appear to indicate that the lead dust which settles in homes, on soil and in the sediments of waterways from the period of the use of leaded petrol, has not been regarded, by the authors, as a significant ongoing source of lead after the use of leaded petrol has been eliminated in a country.

Childhood lead exposure is costing developing countries $992 billion annually due to reductions in IQs and earning potential, according to a new study published today. The report by New York University researchers is the first to calculate the economic cost of children exposed to lead in Africa, Asia, Latin America and other developing regions. The researchers found that, despite major declines in exposure in the United States and Europe, lead is still harming brains and bottom lines in poorer regions around the world. The toxic metal is annually taking a 1.2 percent chunk out of the entire world's gross domestic product, according to the new report. The researchers found that Africa's economy is harmed the most, with annual economic losses estimated at $137.7 billion, or 4 percent of its gross domestic product. Lead paint, battery manufacture and hazardous waste sites are the major sources in developing nations.

(snip)

Lead exposure in the United States has rapidly declined since the 1970s, largely due to the phase-out of lead in gasoline. In the 1970s, about 88 percent of kids 5 years old or younger had excessive blood lead levels (greater than 10 micrograms per deciliter of blood), according to the U.S. Environmental Protection Agency.

In 2011, about 5.8 percent of U.S. kids had excessive blood lead levels. This dramatic decrease is in spite of the Centers for Disease Control and Prevention cutting its lead guideline in half, to 5 micrograms per deciliter of blood, last October in response to mounting scientific evidence that low levels can harm children's developing brains.

Similar trends have occurred in Europe.

But worldwide lead consumption has risen, from about 4.7 million tons in 1970 to 7.1 million tons in 2004, according to a 2010 United Nations report. The increase is largely driven by demand for lead batteries, according to the report.

(snip)

Previous studies also have looked at economic costs of lead exposure. Every dollar invested in lead paint control results in a $17 to $220 return, according to a 2009 study. Reduced lead exposure in the United States since 1976 has resulted in a $110 billion to $319 billion economic benefit due to higher IQs and worker productivity, according to a 2002 CDC study.

"We're basically pitting the health of our children versus economic health," "Until we can prove it's cost beneficial to protect kids we won't do it. It's really a strange thing for a species to do."

Mt Isa Lead Research Media Backlash

New Research Article Slammed in Local Media for Linking Mt Isa Mine and Smelter Emissions with Lead Exposure

Summary of related research and media articles by Lan Nguyen, Masters of Business in Human Resources Management, University of Technology, Sydney, and Intern, The LEAD Group Inc

A survey in 2008 found 11 per cent of children in Mt Isa had elevated blood lead levels. For a long time mining company Glencore Xstrata and the state government have argued the high levels of lead contamination in the environment were largely a natural occurrence. However, a recent study published in *Environmental Pollution* provides strong links between the combined effects of historic and contemporary lead-emitting site operations in this mining and smelting Queensland town.

The scientific report, primarily completed by Professor Mark Taylor, looked at samples of soil, dust and air from inside and outside homes and public places in Mount Isa between 2005 and 2008. As summarised by Macquarie University Newsroom, this new and compelling study challenges Xstrata's claims about naturally occurring lead on the following grounds:

- Considering samples of property dust wipes, aerosol particulates and surface soils, there is little difference between lead levels within the city area and that of Mount Isa lead orebody. It is further noted that public spaces such as parks and property verges experience significantly higher lead levels compared to residential lots.
- Isotopic signatures in sub-surface soils and rocks from the urban area are completely distinguishable from the Mount Isa lead ore body's isotopic signatures. It can therefore be concluded that contamination has resulted from atmospheric deposition of contaminants.
- Moreover "the surface expression of the main ore body on the lease is no longer present because it has been mined-out and the existing surface is contaminated from ore and concentrate stockpiles and smelting activity": no substantial lead was found to be coming from natural surface exposures of minerals in the urban area.

These findings are considered as relevant to other mining areas in Australia and elsewhere all over the world where there is a serious risk of harm and cause of contamination due to lead mining and smelting operations. As the significant risk still remains within the urban atmosphere, Professor Taylor further stresses that there is a need for immediate action and better control.

In response to this study, while Mount Isa Mayor Tony McGrady said every resident in this mining area recognised and acknowledged the issue of both natural and "industrial mineralization" [a term with an unstated meaning*], the global mining giant Xstrata revealed that it was doing its own research into air quality and human health risk assessment and attempting to improve its environmental performance.

Commenting on the "negative" *Environmental Pollution* report, Councillor McGrady was quoted in the local newspaper as saying: "I take it as an offence personally as I have raised two children in this city and they're as smart as anybody else in this state so I don't see any adverse impacts of living with lead in the city as long as people take care with hygiene."

[*Editor's note: Wikipedia defines Mineralization (geology), as "the hydrothermal deposition of economically important metals in the formation of ore bodies or lodes… Mineralization may also refer to the product resulting from the process of mineralization. For example, mineralization (the process) may introduce metals (such as iron) into a rock. That rock may then be referred to as possessing iron mineralization." That doesn't sound like a process that could be anything but natural.

Wikipedia also defines **Industrial minerals** as "geological materials which are mined for their commercial value, which are not fuel (fuel minerals or mineral fuels) and are not sources of metals (metallic minerals). They are used in their natural state or after beneficiation either as raw materials or as additives in a wide range of applications… Typical examples of industrial rocks and minerals are limestone, clays, sand, gravel, diatomite, kaolin, bentonite, silica, barite, gypsum, and talc." But surely the Mayor and Xstrata who also use the term "industrial mineralization", are not referring to these industrial minerals.]

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Sandringham Lead Contamination Concerns

News articles collated by Swetha Lingala, Lead Group Volunteer, and Elias Chaloui, UTS Communications Intern at The LEAD Group Inc., Edited by Zac Gethin-Damon.

Optometrist David Cockburn and his late wife Barbara lived across the road from the Dunlop lead acid battery manufacturing factory in Sandringham in Melbourne from1951, as he said on the ABC TV News on Friday 14th June 2013 (Morgan 2013).

Here are some excerpts from that news report:

> **Presenter Danny Morgan:** "Over the years David Cockburn and his daughter Sally, a high-profile GP, became concerned about the effect on Barbara Cockburn, who died in 2005 at the age of 77.
>
> **David Cockburn**: "It's not possible to prove it, but certainly she [my wife] had an aggregation of problems and kidney failure that are attributable to lead poisoning."
>
> **Dr Sally Cockburn:** "Why was my mother's lead level, more than the current recommended level for the community?"
>
> **Presenter Danny Morgan:** "The Dunlop factory was decommissioned in the late 1980s."

HEALTH campaigner Dr Sally Cockburn said Merindah Park contamination is of very serious community concern (**Andrews 2013c)**

Australia's largest lead-acid battery factory ran in George St, Sandringham from 1949 to 1989. The (Environmental Protection Authority) EPA has reported the land is contaminated with lead, asbestos and other potential cancer-causing chemicals.

Dr Sally said Dunlop first identified the lead contamination as being as high as 129,000 parts per million in 1988 yet this fact was overlooked by the local council and its environmental auditors in the 1990s. It slipped through the cracks and pollution just sat there until the storm of late 2007 when a large pine tree fell over and revealed the contamination."

An EPA audit done in August last year, and issued on Monday, informed the council they had done a very poor job. The report states that the Green Belt area still contains asbestos, lead and potentially carcinogenic polyaromatic hydrocarbons, and that other parts of Merindah Park may also be contaminated. Five years ago the *Leader* lead levels in the soil were 20 times acceptable levels (Awadalla 2008), with the council subsequently spending more than $1 million to clean up and cover the area with mulch. They will now have to spend their $1.5 million cash stash put aside to fix up the unhealthy mess (Andrews 2013a).

The area had been environmentally audited and confirmed safe in the 1990's however residents raised concerns that the Green Belt may not had been subject to a similar audit. This aroused speculation on the possibility of elevated lead levels in the soil. Many assumed that the health risks were unlikely however because they required exposure to high amounts of lead over a long period of time. The council immediately mulched the Green Belt and urged nearby bore used to arrange a free test of their ground water supply.

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'Mad Dog' by Peter Corris

Review by Lan Nguyen, Masters of Business in Human Resources Management, University of Technology, Sydney, and Intern, The LEAD Group Inc

William 'Mad Dog' Moxley – one of the last people to be executed in NSW - was hanged at Long Bay Gaol in 1932 for the murders of Dorothy Ruth Denzel and Frank Barnby Wilkinson. The killing and resulting events attracted a great deal of attention of public and major Sydney newspapers. The two themes - fact and fiction - have been tightly interwoven in the book, making this an interesting read, with the Sydney Great Depression captured and the reconstruction of Moxley's life provided with great dialogue and story-telling.

Returned from World War I and registered as a habitual criminal, Moxley later was shot in the head and was heavily dependent on aspirin tablets to treat the resulting headaches. Moxley did not deny the murders, but claimed he could not recollect what had happened in the killing spree. This and an assessment by Professor Chris Winder, has resulted in an hypothesis about effects of this gunshot wound, with particles of lead in his head, on Moxley's behaviour. According to Professor Chris Winder, documents supplied by Peter Corris cannot show adequate signs of lead poisoning, but possibly both relatively large particles of 'high specific gravity and evidently metal' and 'finer pieces of little significance' might contribute lead to the body and produce toxicity (http://www.lead.org.au/Toxicity_of_lead_from_bullets.pdf).

Keep leaded six leggeds out of FAO edible insect strategy

By Shristi Lohani, Volunteer, The LEAD Group Inc. and Editor, Pristabhumi e-newsletter for ex-patriot Nepalese worldwide. The following article was originally published in Pristabhumi online magazine under the *Hungry* title shown below.

Introduction with a lead warning, for LEAD Action News, by Elizabeth O'Brien, BSc, Dip. Health Ed.

Introduction

> *Although the burden of lead poisoning has decreased across developed countries,* ***it remains the most prevalent environmental poison worldwide.***

So begins a 2003 research article investigating the sources of an outbreak of lead poisoning in Monterey County, California – the source turned out to be a snack food: chapulines (grasshoppers)

from Mexico. **Photo:** fried chapulines (grasshoppers) in Oaxaca with a chili and a clove of garlic. AlejandroLinaresGarcia, Wikipedia 2013.

The Wikipedia page on chapulines (plural for chapulin), lists two Health risks for people eating the grasshoppers:

1. Chapulines must be very well cooked prior to consumption, because, as with other grasshoppers, they may carry nematodes that can infest human hosts.

2. Lead contamination.

> A California health department warning in November 2003 stated: "Recent analysis of chapulines from Oaxaca, Mexico, showed that they may contain as much as 2,300 micrograms of lead per gram of product. The U.S. Food and Drug Administration (FDA) has recommended that children under age 6 should consume on average no more than 6.0 micrograms of lead each day from all food sources. A young child eating one of these highly contaminated chapulines could ingest nearly 60 times his or her tolerable daily intake for lead. While some of the chapulines analyzed contained no detectable lead, consumers have no practical way of determining if the product is contaminated with lead."

Photo at left: The New York City Health Department published a fact sheet in English, Spanish, Chinese, French, Arabic, Hindi, Urdu and Bengali, with this photo of chili chapulines, advising that people avoid some Mexican snacks, "especially those flavored with chili powder".

Photo at right (below): Lead-glazed "chirmolera" (clay pot) used for grinding spices in the Zimatlán District, in Oaxaca, Mexico. (Villalobos et al, 2009)

According to Villalobos M, et al, *Lead (II) detection and contamination routes in environmental sources, cookware and homeprepared foods from Zimatlán, Oaxaca, Mexico*, Sci Total Environ (2009), a clear source of the lead in chapulines prepared in this district in Mexico, was the lead glaze on the chirmolera, which leached lead into the spices, when ground with acidic lime juice. Chapulines are traditionally eaten spiced. Three different spices added to chapulines, that originally contained no detectable lead, reached lead levels from the hundreds to 1500 mg/kg because of this process. Villalobos et al also found that mine tailings in the district had been widely used for fill and it was difficult to distinguish the tailings from ordinary soil without testing for lead. They recommended local education programmes to:

(1) encourage a decrease in use of cookware that is most able to transfer lead into foods, even without heating. …Recent collaborations between a pottery-producing community organization that does not use lead in the glazing may result in replacement of lead-containing products with those that are lead-free …and as well, other cookware such as traditional stone-made "molcajetes", or non-glazed clay utensil cookware can become suitable substitutes;

(2) increase awareness of the lead risk from soil [contaminated with mine tailings].

The Wikipedia page on insects and other creepy crawlies being eaten by people, gives the following definition:

Entomophagy (from Greek ἔντομον *éntomon*, "insect", and φᾰ́γεῖν *phagein*, "to eat") is the consumption of insects as food. Insects are eaten by many animals, but the term is generally used to refer to human consumption of insects; animals that eat insects are known as insectivores… Entomophagy is sometimes defined broadly to include the practice of eating arthropods that are not insects, such as arachnids (tarantulas mainly) and myriapods (centipedes mainly). And adds two more health warnings:

3. pesticide use can make insects unsuitable for human consumption. [NB lead arsenate is still used as a pesticide in countries where it has not been banned];

4. Adverse allergic reactions are also a possible hazard.

MAIN ARTICLE

Hungry...how about a caterpillar pizza??

Food is the basic necessity of human life. With the rapidly increasing population, human being has been demolishing numerous natural resources to fulfill his hunger. To discover alternatives for feeding the human beings, various scientific researches have pointed to a whole new spectrum of food prospects, one being the insects. Yes, you have heard it right, those slimy, scary, yucky looking species which are one of the easily available and protein rich resource of food.

According to FAO (Food and Agriculture Organization of the United Nations) in the news article "*Forest products critical to fight hunger - including insects*", insects can also be considered as a major option for food and feed. Insects are already being plated up in the conventional diet of at least two billion people worldwide. In accordance to FAO's research conducted in partnership with Wageningen University in the Netherlands, more than 1900 insect species are consumed by humans (Food and Agriculture Organization of the United Nations, 2013). FAO also stated that "with about 1 million known species, insects account for more than half of all living organisms classified so far on the planet."

Hence, Food and Agriculture Organization of United Nation(2013) describes that universally, the most consumed insects are:

Insects	Percentage
Beetles	31 percent
Caterpillars	18 percent
Bees, wasps and ants	14 percent
Grasshoppers, locusts and crickets	13 percent

In terms of dietary requirements most of the insects are rich in protein and good fats and high in calcium, iron and zinc. Economically as well, insect gathering and farming can provide employment and cash flow strengthening the country's economy. Not only for livestock feeding, insect use for meat can also be highly regarded cost efficient. As insects are cold-blooded, they don't utilize energy from feed for maintaining body temperature. FAO describes that, on average, insects utilizes just 2 kg of feed to produce 1 kilo of insect meat, whereas, cattle require 8 kg of feed to produce 1 kg of beef.

Moreover, insects produce a fraction of emissions for example: methane, ammonia, climate-warming greenhouse gases and manure, all of which contaminate the environment. Insects can also be utilized to break down waste, helping in the composting processes delivering nutrients back to the soil while also diminishing foul odors. Health wise as well scientists have discovered that insects are so biologically different from mammals that it is highly unlikely that insect diseases could be transmitted to humans.

Therefore, don't be surprised to have insects on the menu in future and who knows they might be one of the yummiest delicacies you ever tasted. *Photoshopped Insects on pizza: Shristi Lohani*

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Chapter 7 from the book Planning For A Healthy Baby

By Belinda Barnes & Suzanne Gail Bradley, Foresight Association UK, circa 1996

[PAGES 82-92]

Problems in the Twentieth Century: Toxic Metals

INFORMATION TO HELP YOU SAFEGUARD YOUR BABY BY AVOIDING TOXINS - AND WHY YOU NEED TO DO SO

All trace elements can be toxic if consumed in sufficient quantities. However, the term 'toxic metals' generally denotes 'those elements not recognised as having an essential function and known to have well documented deleterious effects'. [1] It is these on which we focus in this chapter.

Although man has been utilising many of them for hundreds of years, in this century their use has escalated as new processes, purposes and products have been developed. As a result, we now have more widespread pollution than ever before, with concomitant problems. Even though we know there are adverse effects of lead ingestion and inhalation, we are still reluctant to change to unleaded petrol. We are aware of the dangers of cadmium, highlighted in discussions on high soil levels, yet we overlook the major sources: cigarette smoking and refined flours. Dentists have been aware of the dangers of mercury for many years, but still use mercury-containing amalgams. We are now being told that aluminium may be a factor in Alzheimer's Disease - yet we know that patients in mental hospitals imbibe large amounts of tea which contains high levels of aluminium! It would seem prudent to assume that aluminium is toxic, until we know otherwise. At the least, this would not harm anyone, and at the best, it could save many from hospitalisation, if it is true. A major shift needs to take place from the assumption that a substance is safe until it is proven otherwise, to the position that it is dangerous until proven safe!

There is also a dearth of studies which look at more than one element, even though it is known that there is a continual interaction between many of them. Fortunately, the work of Bryce-Smith and Ward, among others, is remedying this, though such research is difficult and expensive. [2]

In this chapter, we examine the data on lead, cadmium, mercury, aluminium, copper and some other elements on which there has been less research. Since all chemicals interact in the body, we pay special attention to the studies which cover more than one metal, especially lead and cadmium, before explaining how the body can be detoxified.

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Lead

The single most researched chemical, lead has been known to be toxic to animals and humans for centuries. Despite this, its use has increased dramatically, especially in the last 40 years, so that it is now impossible to escape ingesting or inhaling it. It comes mainly from the atmosphere, polluted by

exhaust fumes from lead in petrol and from food, especially that grown in soils polluted by lead from petrol, and unlined cans. [3,4] A London GP warned against eating food grown in London. [5] Water which has coursed though old lead piping, or through lead-glazed earthenware mains, or through modern copper piping where the joins of the pipes have been formed with lead-containing alloys, is also a major source for many people. Cigarette smoking can increase lead uptake by 25 per cent, partly because of the way it interacts with other substances, and also from the lead arsenate used as an insecticide for tobacco. [6,7] Occupational exposure can be a hazard, as lead is used in a number of industries. [8,9] High rates of infertility, miscarriage, stillbirth, congenital abnormalities including macrocephaly, convulsions, early deaths and chromosomal alterations have been reported. [10,11] Children are at greater risk than adults, because they ingest more and have immature bodies. But lead can also cross the placenta, and so affect the fetus. The younger the child, the greater the risk, since lead affects the brain and the greatest brain development occurs before and in the first few year after birth. [12]

Animal research suggests that nutritional status may be a factor in lead absorption. Diets low in calcium, iron, zinc and manganese may actually enhance lead uptake. However, one study suggests that cow's milk may increase absorption, since, although high in calcium, it is low in other trace minerals such as iron. [13] The fact that lead can be removed from the body by nutrients further supports the idea that nutritional status is important. (See below.)

There is, as yet, no agreement on safety levels. Some researchers say that no level can be assumed to be safe, while the government sets limits for industry and the environment which are lowered from time to time as more is revealed about its toxicity. [14] There are no agreed ways to measure levels, which adds to the problem. Blood lead levels are not reliable, as the lead is passed from the blood to other tissues, especially bones, quite quickly. Hair analysis, though accepted as a reliable guide, is not widely available. (See Chapter 4.)

But, regardless of the arguments, there is no longer any doubt that levels which do not manifest symptoms of 'classical' poisoning may have subtle effects on the body. Chronic 'low' level lead exposure is implicated as a significant causative or contributory factor in a wide range of conditions, including cardiovascular disease, renal and metabolic disease, immune dysfunction, and a multiplicity of vague symptoms, such as lethargy, depression, muscle aches and pains, frequent infections, cancer, developmental abnormalities and learning, behavioural and central nervous system dysfunction. [15, 16] Lead interferes with the normal functioning of many trace elements, especially by inhibiting zinc dependent enzymes, making its effects widespread. [17] Other enzyme systems are also vulnerable. High childhood blood levels and smaller stature have been shown to be highly correlated. [18] [PAGE 84]

Lead and the next generation

Lead can affect both male and female reproductive abilities. Men exposed to high levels in their work have been found to be at risk of low sperm count, with more sperm likely to be misshapen and less mobile. [19, 20] In women, its capacity for inducing abortions has long been known – it was used around the turn of the century with, sometimes, blindness and brain damage in surviving babies. It was also this property that ensured that women were not being employed to work with lead. [21] One reason it may be abortifacient lies in its tendency to accumulate in the placenta. [22]

Research in the 70s has linked high lead levels with stillbirth. In 1977, a study of placental lead levels showed that there were greater amounts in the placentas of malformed stillbirths and neonatal deaths compared with normal births surviving longer than a week. [23] In the same year, two other researchers reported higher levels of lead (and cadmium – see below) in stillbirths, using rib and pre-ossified cartilage for the analyses. They concluded: ‘Although some levels were low, others

were so high as to raise suspicion that they were aetiologically connected to the death of the fetus.' [24] (This paper also cites useful references on animal research into the teratogenic effects of lead.) Multi-element studies involving lead are discussed below.

The relationship between lead exposure and *utero* and congenital abnormalities has already been mentioned. (See above.) Needleman and his colleagues have found it to be associated 'in a dose-related fashion with an increased risk for minor anomalies'. [25]

Prenatal exposure can result in lead intoxication in the newborn. In one report, an infant exposed in the eighth month *in utero* was delivered normally and found to have no detectable neurologic abnormality. However, testing at the age of 13 months showed she was functioning cognitively at the level of an 8-12-month child. [26] Another study measured the level of lead in umbilical cord blood at birth. Subsequent mental developmental testing at the ages 6 months and 12 months showed that the higher the level of lead the lower the test scores. At neither age were scores related to current blood lead levels. The researchers concluded: 'Prenatal exposure to lead levels relatively common among urban populations appear to be associated with less favourable development through the first year of life.' [27] A further study by the same researcher, which concerned 'Longitudinal analyses of prenatal and postnatal lead exposure and early cognitive development', concluded that: 'It appears that the fetus may be adversely affected at blood lead concentrations well below 25 µg/dl, the level currently defined by the Center for Disease Control as the highest acceptable level for young children'. [28] [PAGE 85]

Research by Drs McConnell and Berry of the University of Birmingham gives us a clue as to why this should happen. They found that in rats lead tends to derange the development of the brain in a special way. If you think of the brain as a computer, then at birth, although all the parts are there, they have not all been connected. This happens over childhood, with the greater number being 'wired up' in early infancy. The lead stopped much of the 'wiring' and may well have meant some wrong connections being made. Other studies have shown that other parts of the brain closely involved with learning processes are also susceptible to damage by lead. [29]

Animal research with monkeys has confirmed that learning abilities are affected. In one study, monkeys in their first year of life showed no physical signs of toxicity, but all the lead-treated ones showed performance deficits on reversal learning tasks. The effects are not the result of delayed maturation, as the researchers report that '… Data currently being collected in this laboratory indicate that the deficit can be observed at least three years beyond final lead dosing. It therefore appears likely that this deficit represents a relatively permanent characteristic of the chronically lead-poisoned monkey'. [30]

The most widely quoted study on the effects of lead on children is that done by Needleman and his colleagues. They showed that at levels below those which are considered to produce symptoms of toxicity, the performance of children in the classroom was adversely affected. A wide range of behaviours was examined, including distractibility, persistence, dependence, organisational ability, hyperactivity, impulsiveness, frustration, day dreaming, ability to follow, and overall functioning, and it was found the higher lead level, the poorer the performance in every measure. [31] Other studies have also indicated the negative effects of lead on learning abilities and classroom behaviour. [32-35]

Decreased hand-eye coordination and shortened reaction times, as well as physical effects, were seen in 45 adolescents and young adults with hair levels considered to be normal, with problems starting at levels as low as 10 ppm (parts per million). Most laboratories class up to 15 ppm as 'normal'. [36] (What this may mean for the acquisition of practical job skills and driving abilities has yet to be considered!)

A number of other studies have also suggested a link between hyperactivity and raised lead levels. [37-38] One looked at 13 children with no apparent cause for their hyperactivity and found that their behaviour improved when the lead was removed with lead-chelating medication. [39] A Danish study linked high levels with minimal cerebral disfunction (MCD) – learning disabilities are often linked with hyperactivity or MCD. [40]

[PAGE 86]

Cadmium

Cadmium is now a common pollutant which is highly dangerous to man as it accumulates in the kidneys and liver slowly, unless nutritional measures are taken to remove it or reduce absorption. It particularly builds up in people deficient of Vitamins C, D, B6, zinc, manganese, copper, selenium and/or calcium. [41] The main sources are cigarette smoking and processed foods, since in the refining of flour, the zinc in the germ and bran is removed leaving a high cadmium to zinc ratio. It is found in water, especially where impure zinc has been used in galvanising of the mains and pipes, through which soft water flows. [42] It is also widely used in manufacturing industries, including those concerned with paint, batteries, television sets and fertilisers. [43] It also comes from shellfish from polluted waters and galvanised containers [44] and coal burning. [45]

It is known to be embryotoxic in animals. Cleft palate and/or lip, other facial malformations and limb defects have been reported in a number of species. [46] Testicular and ovarian necrosis, and renal disorders are also found. [47] It has been found to impair reproduction in mice. [48] Cadmium accumulates in the placenta, causing placental necrosis if large amounts are given. [49] It also crosses the placenta. [50] Pregnant animals have developed toxaemia, an observation which has led one expert to wonder if 'one might suspect that toxaemia in humans may be due to excess cadmium and/or a lack of the nutrients that counteract the effect of cadmium'. [51]

In humans it has been associated with proteinuria [52] (protein in the urine) as well as low birth weight and small head circumference. (See below.)

The importance of zinc in counteracting the effects of cadmium has been demonstrated in animal research on the effects of cadmium on the testes. Pretreatment with zinc can abolish some of the adverse effects, though it does not reverse others. [53] When cadmium is injected subcutaneously into female rats it produces marked changes in the ovaries, the adverse effects increasing over time, although the ovaries do return to normal eventually. [54]

Mercury

Mercury has long been recognised as a poison. The 'Mad Hatter' of *Alice in Wonderland* was often a reality, as mercury was widely used in the millinery trade. The damage it can cause to he fetus was highlighted in the Japanese tragedy of Minamata, in which 23 children were born with cerebral palsy-like symptoms, varying from mild spasticity to severe mental retardation, blindness, chronic seizures and death. [55, 56] Their mothers, free from symptoms themselves, had been exposed to Mercury while pregnant. Mercury is readily passed through the placenta and fetal blood often contains concentrations 20 per cent greater than the maternal blood. Fetal brain tissue brain tissue may be four times higher than the mother's brain tissue. [57] Adults and older children were also affected, with a total of 46 dying. [PAGE 87]

There are three basic forms, elemental, non-organic and organic. The elemental and non-organic forms tend to be slowly absorbed and readily excreted, unlike the organic forms, which are easily absorbed and slow to be eliminated. Thus, the main dangers lie in the latter, especially methyl mercury, although there are conditions linked to elemental mercury. These include psychological disturbances, oral cavity disorders, gastro-intestinal, cardiovascular, neurologic, respiratory,

Immunological and endocrine effects. In severe cases there are hallucinations and manic-depression. Organic Mercury exposure is linked to psychological symptoms which develop into paralysis, vision, speech and hearing problems, loss of memory, uncoordination, renal damage and general central nervous system dysfunctions. Eventually coma and death can occur. [58]

Metallic Mercury vapour has been reported to affect men exposed to it in a serious way for prospective parents. In one study of nine men exposed after an accident, all complained of a loss of libido, lasting in some cases up to eight years. One reported temporary impotence for 18 months. [59]

Animal work by Dr Joan Spyker suggests that the adverse effects may be long-term. Mice exposed *in utero* did not appear outwardly different from controls until they were about 18 months old (middle-aged). The experimental mice then contracted severe infections, implying an immune system impaired prenatally. They lost all pretence of normalcy, ageing quickly and prematurely. Only extensive investigation, magnifying the brain tissues 48,000 times, showed slight damage to the individual cells – yet this slight damage was responsible for their problems. Dr Spyker points out that the victims of Minamata are deteriorating just as the animal model predicted. [60]

The main sources of mercury are pesticides and fungicides (see chapter 11), fish, industrial processes and dental fillings. The larger the fish, the greater the concentration, with tuna fish being the most likely source in the UK. [61] Freshwater fish can also be contaminated if the river has been polluted with factory effluent, or water run off fields that have been subjected to mercury-containing agrochemicals. It is found in slimicides, used in paper manufacture to stop the growth of slime moulds. [62] If your hair level is high, it would be wise to have your water checked.

The major current controversy around the dangers of mercury concerns mercury-containing amalgams in dentistry. [63, 64] Dentists have been aware of mercury poisoning for many years –indeed, 147 years ago the American Society of Dental Surgeons was opposed to such amalgams. (They were overruled by their members, many of whom must later have suffered from toxic effects!) [65] Sweden has now banned mercury in dental work on pregnant women as a prelude to a total ban.

[PAGE 88]

It appears that some large marine mammals ingest high levels of selenium, which detoxifies mercury, especially if taken with Vitamin E. [66]

Aluminium

Aluminium is easily absorbed, accumulating in the arteries. It is now linked with Alzheimers Disease, though scientists are quick to point out that there is no conclusive proof. However, it is known that aluminium can destroy many vitamins as it readily binds with other substances. It weakens the lining of the gut. It inhibits fluoride and phosphorus metabolism, resulting in mineral loss from the body over a long period. Excessive amounts can lead to constipation, colic, excessive perspiration, loss of appetite, nausea, skin problems and fatigue. Adverse affects associated with the body's attempts to cleanse itself, in which aluminium salts are found in small quantities in the blood, include paralysis and areas of numbness, with fatty degeneration of the kidney and liver, as well as symptoms of gastrointestinal inflammation. [67] Thus it can seriously compromise nutritional status. It has been linked with kidney problems in babies, with the researchers concluding that formula feed should be aluminium-free for neonates and infants with reduced kidney function. [68] (Why not for all, we ask?) It has been associated with behavioural problems and autism. [69] Mice fed large doses had no symptoms, but the next three generations of offspring had growth defects. [70]

The major sources include antacids, antiperspirants and food additives, especially an anti-caking agent found in milk substitutes. [71, 72] In some places, aluminium flocculants are added to the

water, so you should have your water tested to at the tap if your hair level is high. Aluminium saucepans and other cooking utensils impart some metal if they are in contact with the food. Leafy vegetables, rhubarb, apple and other acid fruits are especially problematic. Pressure cookers are worse than ordinary pans. Kettles and aluminium teapots are potent sources, particularly if the tea is allowed to stand for a long time. Work at University College, Cardiff, suggests that our major food source of aluminium is tea, since the tea plant thrives on alum soils, so it is fed with alum. (Think of all that tea drunk in psychiatric hospitals!) Foil-wrapped foods, such as meats, fish, poultry and pies made in foil saucers are other sources. Foil-wrapped fats and acid foods are the worst.

Copper

The contraceptive pill and copper coil can both cause copper levels in the body to rise. (See Chapter 9.) Excess levels may be embryotoxic or teratogenic. [73] They are certainly known to produce behavioural symptoms, such as uncontrollable rages, [74] and are linked with toxaemia. [75] Copper levels rise naturally during pregnancy, so if a woman conceives with a raised level, she is at risk of overloading her body. This could lead to postpartum depression. [76] Raised levels are associated with low levels of zinc and manganese, both of which are known to cause birth defects. (See Chapter 5.)

[PAGE 89]

Other sources of copper may be the drinking water in areas where water is soft and acid, or where it has been heated through an Ascot heater. Always fill the kettle from the cold tap. If you have been using a filter for two weeks and seen the white contents of the filter change to bluish green, you have a significant amount of copper in your water. You should continue to filter, changing the cartridge regularly.

Copper kettles, pans and jewellery are also sources. There may be external contamination of hair from Henna dyes and rinses, and in swimming-pool water where the water has been treated with a copper-containing algicide. For an accurate reading, you should cease the contamination for six weeks before having another hair mineral analysis.

Other metals

Animal tests have brought arsenic, lithium and selenium under suspicion as embryotoxic or teratogenic. [77] Arsenic has also been found to act as a transplacental carcinogen. [78] A study among workers in Sweden has implicated arsenic in decreased birth weight and an increased rate of spontaneous abortion, but the design of the study was poor so the results are subject to debate. Depending on when it is administered it is said it can cause neural tube defects, agenesis and renal problems. [79]

Multi-element studies

As far back as 1969, it was reported that 'Cadmium teratogenicity is dramatically augmented by lead when they are administered concurrently'. [80] Lead and cadmium often occur together. Their concentrations in hair and blood show strong positive correlations and their overt symptoms of toxicity are not unalike. These similarities have lead some researchers to the view that 'It is possible that some of the deleterious effects attributed to lead in correlational studies may instead be due to cadmium'. [81] They conducted a study on hair cadmium and lead levels in relation to cognitive functioning in children, in which the results showed that hair cadmium and lead were significantly correlated with intelligence tests and school achievement, but not with motor impairment scores. Statistical analysis suggested that 'cadmium has a stronger effect on verbal IQ than does lead and that lead has a stronger effect on performance IQ than does cadmium'. [82]

A few years before this, Professor Bryce-Smith and his colleagues, aware of the inadequacies of single element studies, had reviewed the levels of four elements: lead, cadmium, zinc and calcium in stillbirths' bones and cartilage. They found that cadmium concentrates in the stillbirths were ten times greater than the levels normally found in human bone. Lead levels were also raised. Low calcium and zinc were sometimes associated with these marked elevations. [83] (See also lead above for reference to this study.) [PAGE 90]

Given the results of these, and many other studies, showing that lead and cadmium can have adverse effects on the fetus and older children, could they also cause problems for the neonate? Research has shown that they do!

Spurred on by the results of the four element study, a much larger project was done by Professor Bryce-Smith and his colleagues. This major study has taken a number of years to complete, revealing much of interest throughout. In an interim report in 1981, Professor Bryce-Smith said that for all the elements being studied (at that time, 36), the levels of fetal and maternal blood were about the same. Only in lead levels was there a difference, with the fetal level about 95 per cent of the maternal. He went on to explain the significance of this: "This means that the placenta passes all elements, both nutrients and toxins, to the fetus from the maternal circulation with little or no selectivity or filtering defect. We can see no evidence for a significant barrier to protect the fetus from inorganic toxins such as mercury, arsenic and antimony; and there is only a slight, but significant ($p=0.01$) barrier in the case of lead for normal births only.' [84] Having begun by analysing nine tissues, including maternal and fetal (umbilical) cord whole blood and serum, amniotic fluid, placenta, and scalp hair from the mother and neonate, later on they decided that the placental element levels showed the clearest correlations with indices of fetal development for supposedly 'normal' births. Thus it was with this tissue that they continued the investigation.

In the first written report on the final 37 elements studied, the researchers observed highly significant negative relationships between placental cadmium and lead levels, and birth weight, head circumference and placental weight. The smaller the birth weight, head circumference and placental weight was, the higher the levels of cadmium and lead. There was a statistically significant positive correlation between placental cadmium and lead levels where birth weights were less than 3,000 g. For higher birth weights, the correlation, though still positive, was not significant. Placental zinc showed significant positive relationships with birth weights up to 3,000 g and head circumference of less than 34 cm, i.e. the lower the zinc level, the lower the birth weight and the smaller the head circumference.

With respect to other elements, there was 'a weak positive correlation between placental iron and head circumference, and stronger but negative correlations for chlorine, vanadium, and lanthanum'. However, placental levels of iron did not correlate with birth weight, nor were the iron levels or birth weights significantly raised in those mothers receiving iron supplements. Indeed, the results in iron and zinc led the researchers to suggest that more emphasis should be paid to zinc supplements than to iron.

The final point made in the paper states that 'In cases of cadmium, lead and zinc, biological, neurobehavioural, and biosocial studies in which the levels of all three elements are measured may prove more informative than those involving single elements'. [85] [PAGE 91]

Much the same conclusion was reached by the researchers who conducted further investigations into lead, cadmium and cognitive functioning. Looking at the protective effects of zinc and calcium against toxic metals, they found that higher zinc levels seemed to protect against the effects of cadmium, while calcium did the same against lead. They concluded: 'The results suggest that the effects of heavy metal pollutants on cognitive function cannot adequately be assessed

without concurrently evaluating the status of essential nutrients with which these toxins are known to interact metabolically.' [86]

Detoxifying the body

The preferred method for detoxification must, undoubtably, be nutritional, since it does not have the same potential for adverse side effects as drugs. (There is a drug called EDTA which can be used in acute poisoning, though it is not to be recommended.) It binds the elements to it so they are removed from the body along with the EDTA. However, it removes essential minerals as well, so the doctor needs to check to see if you are not short of calcium, magnesium and other nutrients. Alternatively, penicillamine may be given. The following is a guide to the nutrients and foods that are helpful in removing toxic metals.

Vitamin C and zinc supplements were used successfully in reducing blood lead levels of psychiatric outpatients in one study. The treatment was also found to lower blood copper levels. Subjects included some hyperactive children. [87] Vitamin C has also been shown to lower cadmium levels in birds. [88]

Calcium helps prevent absorption, as well as removing lead from the tissues. Vitamin D is necessary for calcium metabolism and to help displace lead from the bones. Vitamin B1, taken with a B-complex, provides protection against lead damage. Lecithin can also help in protection, while Vitamin A helps to activate the enzymes needed for detoxification. Trace elements, in addition to zinc, which are protective include chromium and manganese. Garlimac tablets are often used but they need to be combined with manganese to preserve the levels of manganese. In the diet, peas, lentils and beans act as detoxifiers. Algin, found in seaweeds, attracts lead to it in the gut and carries it out of the body. Yoghurt, garlic, onions, bananas and fruits such as apples and pears which contain pectin (especially the pips) help to reduce absorption, as well as detoxifying. [89] Vitamin [?] may also reduce lead poisoning. [90] Manganese and selenium are also useful in detoxification.

It has also been found that sunlight can help remove toxic metals in animal studies. [91] [PAGE 92]

CHECKLIST FOR REDUCING TOXIC METAL LEVELS IN THE BODY.

1. Eat nutritious food and supplement in your diet wisely. Include many of the foods mentioned in the section on detoxification above.
2. Wash foods carefully – a vinegar solution of 1 tablespoon to a pint of water will remove much surface lead, but be careful not to soak, as the essential nutrients will be lost to the water.
3. Avoid unlined tinned foods especially, though you are best avoiding all tins. If the label on the tin does not specify it is lined, you will have to check on opening.
4. Buy organic foods.
5. If you buy food which contains additives, read the labels and check the additives in the Foresight booklet *Find Out*.
6. Avoid aluminium kitchenware, foil and foods containing aluminium additives.
7. Have your water tested for toxic metals. Use a filter, being sure that you follow the manufacturers instructions.
8. Avoid, where possible, heavily polluted air, e.g. do not stand around unnecessarily in heavy traffic. Close car windows in tunnels. Fit net curtains to windows facing a busy road and wash frequently.
9. Check labels of toiletries and cosmetics. Be especially wary of deodorants and antiperspirants, unless they specify the ingredients.
10. Refuse mercury-containing dental fillings.
11. Check what chemicals you may be exposed to in the course of your work. Ask about safety precautions and obey the rules.

Info Pack - NSW Used Lead Acid Battery (ULAB) Waste

State Government Guidelines

Collated by Elizabeth O'Brien, BSc (Sydney), Grad Dip Health Education

The key reference that you need to be aware of when organising transport of leaded waste in NSW is: "Waste Classification Guidelines: Part 1: Classifying Waste" by Department of Environment and Climate Change (DECC) NSW

http://www.environment.nsw.gov.au/resources/waste/09281classifywaste.pdf and the key sections of the Guidelines relating to used lead acid batteries (ULABs) are as follows:

Step 3: Is the waste pre-classified?

If the waste is neither special nor liquid waste, establish whether the waste has already been classified by the EPA. Some commonly generated wastes have been pre-classified as hazardous waste, general solid waste (putrescible) or general solid waste (non-putrescible). Wastes that have been classified by the EPA cannot be reclassified by any other party.

The following wastes have already been classified by the EPA.

[Reference: page 11 of 30]

Hazardous waste

The following wastes have been pre-classified by the EPA as 'hazardous waste':

[among others]

- lead-acid or nickel-cadmium batteries (being waste generated or separately collected by activities carried out for business, commercial or community services purposes)

According to *"Waste Tracking Fact Sheet: Protecting the environment and your business - Waste that must be tracked"* by Department of Environment and Climate Change (DECC) NSW, at http://www.environment.nsw.gov.au/resources/owt/trackwaste07522.pdf :

Wastes included in Table 1 must be tracked when transported within NSW or interstate.

Table 1 includes:

Waste code B100 - Acidic solutions or acids in solid form; and

Waste code D220 - Lead; lead compounds.

At http://www.environment.nsw.gov.au/owt/index.htm you will find the following guidance:

Steps in waste tracking:

- Determine whether the waste to be transported requires tracking (see the Waste that must be tracked fact sheet and the current list of exemptions).
- Obtain prior approval to transport the waste in the form of a consignment authorisation (CA) issued by a person authorised to do so.
- Create a transport certificate (TC) which must accompany the waste while it is being transported.
- Complete the TC when the waste has arrived and been processed by the receiving facility.
- Report any non-compliances to the Environment Protection Authority (EPA).

The EPA has developed an online waste tracking system to enable CAs and TCs to be created and updated online. A single printed copy of the TC must accompany the waste during transport but it can be created online and printed when needed. The online tracking system is secure and a user ID and password are needed to access it. There is no charge for using the system.

In the *"Waste tracking for waste transporters fact sheet"* at

http://www.environment.nsw.gov.au/resources/owt/transporters07523.pdf it says:

"Waste transporters are responsible for ensuring that high-risk waste is transported only after all the necessary documents and checks have been completed....

A consignment authorisation is issued to a waste consignor (either a waste producer or their authorised agent) by DECC or by an approved receiving facility. It allows the transport of specified waste from a consignor to a receiving facility. It can cover multiple loads and remain valid for up to one year. A separate transport certificate must accompany each load of waste transported....

A waste transport certificate is a document containing required information about a load of waste and must accompany that load of waste during transport. It includes information about the waste, the consignor, transporter and receiving facility. Users of the DECC's online waste tracking system can create a transport certificate using the system."

ULABs to be recycled by either RMT (Renewed Metal Technologies Pty Ltd, an Enirgi Metal Group company) in Wagga Wagga or Australian Refined Alloys Pty Ltd (ARA, owned by Enirgi Group) in Alexandria in Sydney are collected by Orbitas collection company – phone 1300783978 or see www.orbitas.com.au

The third lead recycler (and collector) in NSW is Hydromet Corporation Pty Limited at Unanderra (in Wollongong) – phone 42711822 or see www.hydromet.com.au

Plans for International Lead Poisoning Prevention Week of Action 20-26 October 2013 and proposal for Lead Poisoning Prevention Month 2013

Emails by Jack Weinberg, Senior Policy Advisor USA/Global, International POP's Elimination Network (IPEN); Kathleen Burns, Ph.D., Director, Sciencecorps; Tamara Rubin, Executive Director, Lead Safe America Foundation; Beth Butler, A Community Voice - Louisiana, and Board of Directors, Lead Safe America Foundation; and Reghan O. Walsh, Health Education Specialist, Wisconsin Childhood Lead Poisoning Prevention Program; edited by Elizabeth O'Brien, President, The LEAD Group Inc.

THE LEAD GROUP INCORPORATED

The Lead Education and Abatement Design Group
Working to eliminate lead poisoning globally and to protect the environment from lead in all its uses: past, current and new uses
ABN 25 819 463 114

As The LEAD Group noted in the world's first celebration of Lead Poisoning Awareness Day (or Week or similar) on October 20, **1997**, that day was chosen because it marked the centenary of the world's first publication in a medical journal (in Australia) of an article about childhood lead poisoning. The article was *Lead-Poisoning Among Queensland Children* by Jefferis A. Turner, Australasian Medical Gazette, 20 October 1897.

On the 21 December **2000,** The LEAD Group declared that our health promotion charity would mark the Inaugural "International Lead Poisoning Awareness Day" on 20 October **2001** and "International Lead Poisoning Awareness Week" Saturday 20 October 2001 to Friday 26 October **2001.** The LEAD

Group has promoted these International awareness efforts every year since and in 2010, proposed to the World Health Organisation (WHO) the setting up of an International Lead Poisoning Prevention Week. This has finally come about and the Inaugural International Lead Poisoning Prevention Week of Action kicks off on 20 October 2013!

The following emails are examples of the excitement this proposed annual event has caused in the lead world, and the final email even suggests the declaration of International Lead Poisoning Prevention Month in October.

During the 13th annual US National Lead Poisoning Prevention Week on 24 October 2012, the Robert Wood Johnson Foundation announced that "recently the Coalition to End Childhood Lead Poisoning, the U.S. Environmental Protection Agency (EPA), the U.S. Department of Housing and Urban Development (HUD) and the Ad Council rolled out a new partnership with the goal of eliminating childhood lead poisoning in the United States." See http://www.rwjf.org/en/blogs/new-public-health/2012/10/what_will_it_taketo.html

Now all we need is for every country to create similar partnerships to eliminate lead poisoning in every age group, and to coordinate these efforts across national borders, to build on the work that has already been done in countries where for instance, leaded food cans, leaded petrol and leaded paint have already been eliminated... thus spreading the benefits of good policy to the rest of the planet.

While putting together this issue of *LEAD Action News*, the DRAFT Declaration for Lead Poisoning Prevention Month in October, which follows this article, was prepared by Lead Safe America Foundation. Now we just need someone to research the data and globalise it!

From: Jack Weinberg

Sent: Wednesday, March 13, 2013 7:44 AM
To: ipennetwork@npogroups.org
Subject: [ipenlistserve] International lead poisoning prevention week of action 20-26 October 2013

Dear IPEN Colleagues:

The World Health Organization has posted on its web site an announcement of International lead poisoning prevention week of action 20-26 October 2013.

World Health Organization

(http://www.who.int/ipcs/assessment/public_health/pb_campaign/en/index.html [see the flyer for International Lead Poisoning Prevention Week 2013 following this article. The English flyer is also available in French and Spanish.])

The theme will be: Eliminate lead paint.

IPEN will be encouraging NGOs in countries where lead paints are still widely sold and used to undertake some kind of action that week. Your thoughts on how to jointly coordinate and organize these activities are most welcome.

Jack Weinberg
IPEN Senior Policy Advisor

International lead poisoning prevention week of action 20-26 October 2013
Theme: Eliminate lead paint
Slogan: Lead free kids for a healthy future
The issue

Lead poisoning is entirely preventable, yet lead exposure is estimated to account for 0.6% of the global burden of disease, with the highest burden in developing regions. Childhood lead exposure is estimated to contribute to about 600,000 new cases of children with intellectual disabilities every year.

Even though there is wide recognition of this problem and many countries have taken action, exposure to lead, particularly in childhood, remains of key concern to health care providers and public health officials worldwide.

Paints containing high levels of lead are still widely available and used in many countries for decorative purposes, although good substitutes without lead are available. This is an opportunity to mobilize political and social commitment for further progress.

The objectives

During the campaign week, the Global Alliance to Eliminate Lead Paint (GAELP) aims to:

Raise awareness about lead poisoning;

Highlight countries and partners' efforts to prevent childhood lead poisoning; and

Urge further action to eliminate lead paint.

From: Kathy Burns
Sent: Wednesday, March 13, 2013 8:06 AM
To: 'IPEN Listserve'

Subject: RE: [ipenlistserve] International lead poisoning prevention week

I think it would be helpful to establish a clearinghouse of information that has been used effectively in countries where lead paint was phased out, and that may be useful to countries where the struggle continues. We've all developed scientific, political, and public outreach materials, and while some good organisations do provide resources, there isn't a single point of access. That could be provided fairly easily, and include links to some of the organisations.

I've found that a combination of visuals (e.g., easily printable posters) with language that is geared towards specific target groups (mom, teachers, etc) is helpful when combined with technical info sheets for MDs, policy people, etc. I'm sure others have an array of useful materials that they've relied on. There has been extensive work done on this, so a wide variety of resources exist. Insuring that they can be easily located, tailored to local requirements and translated appropriately, could support efforts in a range of countries.

From: Tamara Rubin
Sent: Saturday, June 15, 2013 12:05 PM
To: The LEAD Group

Subject: Come Meet Oprah With Me?

Hi friends! I truly love checking in with this petition and reading all of your amazing comments and stories. Thank you.

We just hit 450 signatures today! Wow! If each of you had one friend sign this weekend (just show them the petition on your smartphone? and walk them through signing? It's easy ... and immediate gratification!) we'd have 900 signatures very quickly - and if each of you had two friends sign we'd be at 1,350 signatures by MONDAY, please play this "game" with me and we'll all win.

I'm upping the stakes of my commitment here too. If we actually get connected with Oprah (if she responds and agrees to see the film) I am going to invite each and everyone one of the people who signs the petition to come see the film with us (hopefully you can all make it!) Of course I cannot guarantee this is going to happen - and I don't know where and when it will happen, but if she does agree to watch this film with me I can't imagine a more amazing group of people to share that moment with.

Thank you for playing! :-)

Today Heidi (my editor) and I edited all day and submitted the film to the Mill Valley Film Festival. The current cut is one hour and 40 minutes long. This week we also heard from 7 different state agencies and the EPA - all interested in hosting a "Special Engagement Preview Screening" of the film in October for Lead Poisoning Prevention Month... so I've been very busy following up with everyone - working on arranging these screenings! We're also working on a couple of focus-group screenings of the rough-cut & as of right now will be showing the rough-cut (with a focus-group discussion afterwards) in Louisville, Kentucky on June 23rd. Please join us if you can and email me if you would like more information!

Thanks again!

From: M. Butler
Sent: Tuesday, June 11, 2013 12:34 PM
To: leadnet@mail-list.com

Subject: [Leadnet] October 2013 Lead Poisoning Prevention Month/ Film Screenings

Great news!

For those who haven't yet heard, the film *Mislead*, won it's* first award*last month, (even though it is still a rough-cut!)—Honorable Mention, at the International Film Festival for Environment, Health and Culture, held in Jakarta, Indonesia.

One of our main goals has been to create a vehicle that would allow us to educate, agitate for change and aid people concerning lead. Therefore, it is triple exciting that the Lead Safe America Foundation has just started booking "Special Engagement Preview" screenings of the completed film, "*MisLEAD: America's Secret Epidemic*" for Lead Poisoning Prevention Month in October, 2013.

We're excited to announce that first on board to schedule a screening is the State of New Hampshire, Department of Health and Human Services. New Hampshire has tentatively booked October 23rd, and is making plans to hold two public screenings that day. For available screening dates please look at the list below.

Each presentation of the film in October will be followed by a panel discussion about the issue and the film, with the panel to include the film's Director, parent advocate Tamara Rubin and a selection of other parents of lead-poisoned children, as well as experts in the field of lead-poisoning prevention. Runtime of the completed film is anticipated to be approximately 96 minutes long, and events are expected to last a total of 2½ to 3-hours, depending on the length of the panel discussion.

Groups interested in hosting may include health departments, parent groups, advocacy groups, training centers, RRP-certified firms, schools, hospitals, maternity clinics, PTAs, universities, anyone, really. The events may be structured as outreach and education events - or as fundraisers for the organizing agency. Screenings may be held in theaters, churches, libraries, board rooms, conference rooms, class rooms - any space with an appropriate video and sound system.

Anyone interested in learning more about coordinating a screening of "*MisLEAD*" for Lead Poisoning Prevention Month, can contact the Lead Safe America Foundation by emailing leadsafe@mac.com (please type "October 2013 screening" in the subject line).

Kate Kirkwood is working with the State of New Hampshire to organize the screenings on October 23rd, and has found multiple agencies to help cover the costs. [Kate has offered to make herself available with guidance and ideas based on her experience with the screenings she is coordinating, if you would like to contact her directly.]

Many thanks to everyone who has helped make this film., and special thanks to those who work and struggle with lead issues.

Beth Butler
Board President
Lead Safe America Foundation
http://www.LeadSafeAmerica.org

A Community Voice – Louisiana
http://www.acommunityvoice.org/

October Screening Schedule as of June 10, 2013

October 1 - *Available*
October 2 - *Available*
October 3-13 - Tentatively Booked - California Locations

October 14-22 - *Available*
October 23 - Tentatively Booked - New Hampshire
October 24-29 - *Available*

From: Walsh, Reghan O - DHS
Sent: Wednesday, June 12, 2013 1:27 AM
To: leadnet@mail-list.com

Subject: RE: [Leadnet] October 2013 Lead Poisoning Prevention Month/ Film Screenings

How exciting!! And a great idea to recognize Lead Poisoning Prevention Week. Can we get it changed to a month? Maybe we can get our states to name October as Lead Poisoning Prevention Month via Governor proclamations? It could help with the publicity. Thinking out loud...

Reghan O. Walsh
Health Education Specialist
Wisconsin Childhood Lead Poisoning Prevention Program
Madison, WI 53701-2659

Check out our Lead-Safe Wisconsin website OR call 1 800 LEAD FYI to learn how to protect children from lead poisoning.

International Lead Poisoning Prevention Awareness Week Flyers

By The Global Alliance to Eliminate Lead Paint (GAELP) and The Lead Safe America Foundation (GAELP English Version)

International Lead Poisoning Prevention Awareness

Eliminating Lead in Paints

Join the Global Alliance to Eliminate Lead Paint

in activities during October 20-26, 2013

Activities may include

- Increasing awareness using customized print materials
- Engaging the general public through social media
- Media outreach utilizing sample news articles and press releases
- International and regional coordination and assistance
- Technical webinars and learning sessions
- - National conferences and meetings to engage key decision-makers

Who should participate?

Governments, intergovernmental organizations and representatives of civil society and the private sector that are willing to support the goals of the Global Alliance to Eliminate Lead Paint.

Participating Partners

International Pediatrics Association

United Nations Environment Programme

US Centers for Disease Control and Prevention

US Environmental Protection Agency

World Health Organization

Interested in organizing activities in your country?

Contact : USEPA - wadlington.christina@epa.gov

GAELP Secretariat - noleadinpaint@who.int

LeadFreeKids

for a healthy future

For general information on the Global Alliance to Eliminate Lead Paint:

unep.org/hazardoussubstances/ Click: Global Alliance to Eliminate Lead Paint
who.int/ipcs/assessment/public_health/gaelp/en/index.html

(French Version)

Sensibilisation internationale à la prévention de l'intoxication par le plomb

Eliminer le plomb des peintures

Rejoignez l'Alliance mondiale pour l'élimination des peintures au plomb autour d'activités du 20 au 26 octobre 2013

Plusieurs activités possibles

- Sensibilisation du public par la distribution de documents imprimés adaptés
- Mobilisation du grand public via les réseaux sociaux
- Utilisation d'articles et de communiqués de presse types pour favoriser la participation des médias
- Coordination et assistance internationales et régionales
- Séminaires en ligne et séances de formation techniques
- Conférences et réunions au niveau national pour sensibiliser les principaux décideurs

Qui peut participer ?

Les gouvernements, organisations intergouvernementales et représentants de la société civile et du secteur privé désireux de soutenir les objectifs de l'Alliance mondiale pour l'élimination des peintures au plomb..

Partenaires participant à l'initiative

Association internationale de pédiatrie
Programme des Nations Unies pour l'environnement
Centres de lutte contre la maladie (États-Unis)
Agence pour la protection de l'environnement (États-Unis)
Organisation mondiale de la Santé

Si vous souhaitez organiser des activités dans votre pays

Contact : USEPA - wadlington.christina@epa.gov
Secrétariat de l'Alliance globale pour l'élimination des peintures au plomb - noleadinpaint@who.int

Un avenir sans plomb

Des pour des enfants en bonne santé

Des informations générales sur l'Alliance globale pour l'élimination des peintures au plomb sont disponibles aux suivantesadresses (en anglais) :
unep.org/hazardoussubstances/ puis cliquer sur « Global Alliance to Eliminate Lead Paint »
who.int/ipcs/assessment/public_health/gaelp/en/index.html (documents disponibles en fra nçais

(Spanish Version)

Campaña Internacional de Prevención del Envenenamiento con Plomo

Eliminar el Uso del Plomo en la Pintura

Participa en las actividades de la **Alianza Mundial para Eliminar el Uso** del Plomo en la Pintura del 20 al 26 octubre de 2013

Esas actividades pueden incluir:

- **Actividades de concienciación utilizando material impreso específico**
- **Fomento de la participación del público general a través las redes sociales**
- **Actividades de difusión y extensión utilizando una selección de artículos y comunicados de prensa**
- **Coordinación y asistencia a nivel internacional y regional**
- **Seminarios técnicos a través de la web y sesiones de información**
- **Conferencias nacionales y reuniones para promover la implicación de los decisores clave**

¿Quiénes deberían participar?

Los gobiernos, las organizaciones intergubernamentales y los representantes de la sociedad civil y el sector privado que desean contribuir a los objetivos de la Alianza Mundial para Eliminar el Uso del Plomo en la Pintura.

Socios participantes

Asociación Internacional de Pediatría

Programa de las Naciones Unidas para el Medio Ambiente

Centros para el Control y la Prevención de Enfermedades (Estados Unidos)

Agencia para la Protección del Medio Ambiente (Estados Unidos)

Organización Mundial de la Salud

¿Está interesado en organizar actividades en su país?

Póngase en contacto con :

USEPA USEPA (Agencia para la Protección del Medio Ambiente) - wadlington.christina@epa.gov

Secretaría de la GAELP (Alianza Mundial para Eliminar el Uso del Plomo en la Pintura) - noleadinpaint@who.int

Prevenir la exposición de los niños al plomo para un futuro saludable

Para obtener información general sobre la Alianza Mundial para Eliminar el Uso del Plomo en la Pintura, sírvase consultar:

unep.org/hazardoussubstances/ haga clic en: Global Alliance to Eliminate Lead Paint
who.int/ipcs/assessment/public_health/gaelp/en/index.html

Lead Safe America Foundation
P.O. Box 820044 • Portland, Oregon 97282
www.LeadSafeAmerica.org

Declaration

DRAFT

Whereas childhood lead poisoning is still a major concern in America today in 2013...

Whereas lead paint was banned for residential use in 1978 and was widely used until 1980...

Whereas the United States Census from 2012 shows that 80,000,000 homes were built in America before 1980...

Whereas lead-poisoning causes permanent brain damage, learning disabilities, behavioral disorders and long-term health complications that negatively impact the educational potential of our nation's children...

Whereas a study published in May 2011 conducted by Dr. Leonardo Trasande at the Mt. Sinai School of Medicine (an update of the earlier economic impact report by Dr. Philip Landrigan) showed that the total cost of environmental illnesses in the United States is conservatively seventy-six *billion* dollars (*$76,000,000,000*) annually and that childhood *lead poisoning accounts for more than 2/3 of that total* (more than 50.9 billion dollars annually—*$50,900,000,000*)...

Whereas the May 2011 reported numbers are conservative and look only at direct healthcare costs of treating current elevated lead levels and lost earning potential of children impacted...

Whereas economic impacts of early childhood lead-poisoning not included in the study include special education costs, home remediation costs, lost parental income, long-term interventions & therapies, emergency relocation costs, impact on the criminal justice system and more...

Whereas lead-poisoning is the therefore the most pervasive—yet most *preventable* environmental illness in America today....

On this, the 20th day of June 2013, The Lead Safe America Foundation declares that this year and henceforth, the entire month of October is "Lead-Poisoning Prevention Month", as lead-poisoning is one of the most significant environmental impacts on our children today and also the most preventable. Prevention is only possible with parent awareness, and the level of parent-awareness necessary to truly prevent lead-poisoning can be enhanced by an entire month of activities and public awareness efforts.

Lead Safe America
"Preserve Your Child's Potential"...

The vision that 100% of lead used per annum will by 2025 be in lead acid batteries

Emails by Elizabeth O'Brien, President at The LEAD Group Inc & Peter Hurley, Managing Director at Cylenchar Limited

On 07/15/12 7:55 PM, Elizabeth O'Brien wrote:

Dear Peter,

I've initiated a new Lead-Safe World Project and I'm looking for sponsors among the lead industry, lead-substitute industry and other lead-related industries.

My vision is that by approximately 2025, all the lead in the world will be being made into batteries to store renewable energy like solar and wind energy, because by that time, there'll be precious little fossil fuels left for manufacturing anything.

I came up with the year 2025 by plotting the percentage of lead used in batteries in 1970, 1990 and approximately 2007, and continuing the straight line trend to 100% of all lead use. It hits the year 2025.

Is it reasonable to hold the vision that 100% of Pb used per annum will one day be used to make lead acid batteries?

Cheers

Elizabeth O'Brien, Australia

From: Peter Hurley via LinkedIn

Sent: Monday, July 16, 2012 7:14 PM

To: Elizabeth O'Brien

Subject: RE: Is it reasonable to hold the vision that 100% of Pb used per annum will one day be used to make lead acid batteries?

Hi Elizabeth

as lead-tin solders are finally squeezed out of consumer goods, more lead will go into batteries than into other products. Lead batteries for power-back-up and storage demand will grow as smaller micro generation schemes increase across the developed and developing world. But car consumption will always be number 1. And eventually electric cars/hybrids will replace the combustion engine, and they will use even more lead.

The anticipated continued growth in demand assumes that a 'disruptive technology' such as the sodium-sulfur battery does not become commercial. If it ever does, world consumption of lead would plummet 50% in 10-20 years, assuming that the major car manufacturers don't resist it.

Best regards

Peter

From: Elizabeth O'Brien via LinkedIn

Sent: Thursday, June 20, 2013 11:46 AM

To: Peter Hurley

Subject: RE: Is it reasonable to hold the vision that 100% of Pb used per annum will one day be used to make lead acid batteries?

Dear Peter,

I wasn't predicting that lead consumption overall would remain at current levels - and I agree with your argument that total lead used will fall if another battery technology becomes popular. My prediction however, is in compliance with every trend you've commented on. My prediction is that 100% of the lead used will be used to make lead acid batteries by 2025. The only way it will not be 100% is if there is some other lead product which is irreplaceable with less toxic alternatives: the only lead uses that I can think of, which may not be fully replaced with less toxic alternatives would be x-ray shielding and ammunition. I'd be interested in your thoughts on those uses and any others which you think are likely to haunt us for decades to come.

Cheers

Elizabeth

From: Elizabeth O'Brien via LinkedIn
Sent: Friday, June 21, 2013 1:05 AM
To: Elizabeth O'Brien

Subject: RE: Is it reasonable to hold the vision that 100% of Pb used per annum will one day be used to make lead acid batteries?

Hi Elizabeth

Tungsten is slowly replacing lead X-ray shielding in medical diagnostics. Pure lead is only being retained in the nuclear industry as its stable long term, whereas tungsten composites are not.

Viz ammunition. The Germans are openly talking of a complete lead ban and the US Army is deploying tin-bismuth alloy in theatre and solid copper in training.

Viz batteries. Slim plates based on lead-tin alloy are replacing lead-antimony, reducing the overall weight of lead and cost in a battery whilst significantly improving its working life. Lead acid batteries will continue to me the major battery type at least until the middle of the current century. Perhaps by then lithium ion - manganese capacitor technology will replace it.

Best regards

Peter

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