IPEN Asia Lead Paint Elimination Project

Lead Paint Elimination Handbook

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The Asia Lead Paint Elimination Campaign is a project of IPEN. IPEN is an international organization promoting safe chemical policies and practices that protect human health and the environment.

This project is funded by the European Union

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The European Commission is the EU's executive body.

"The European Union is made up of 27 Member States who have decided to gradually link together their know-how, resources and destinies. Together, during a period of enlargement of 50 years, they have built a zone of stability, democracy and sustainable development while maintaining cultural diversity, tolerance and individual freedom. The European Union is committed to sharing its achievements and its values with countries and people beyond its borders."

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This draft information document, together with other materials produced and distributed to participants in the Project Inception Workshop, is intended to orient partner NGOs in the IPEN Asia Lead Paint Elimination Project to the lead paint issue. The document is a work in progress and it will be expanded and revised in the months ahead.

The IPEN Asia Lead Paint Elimination Project is primarily funded by the European Union SWITCH-Asia Program whose aim is to promote Sustainable Consumption and Production (SCP) in Asia. It was funded to promote sustainable production and consumption and to contribute to global efforts aimed at the elimination of the production and use of all decorative lead paints. Seven IPEN partner NGOs have each taken responsibility for project implementation in its country: Environment and Social Development Organization (ESDO), in Bangladesh; Toxics Link in India; Balifokus in Indonesia; Centre for Public Health and Environmental Development (CEPHED) in Nepal; Eco Waste Coalition in the Philippines; Centre for Environmental Justice (CEJ)n Sri Lanka; and Ecological Alert and Recovery Thailand (EARTH) in Thailand.

The IPEN Asia Lead Paint Elimination Project promotes sustainable production and consumption and contributes to global efforts aimed at the elimination of the production and use of all decorative lead paints.

The overall agreed project objective is to reduce children's exposure to toxic chemicals in partner countries and achieve better health conditions for marginalized groups. The specific project objective is to significantly reduce or eliminate lead decorative paints on the market in project countries. The project intends to achieve this specific objective by:

1. Creating increased consumer awareness about childhood lead-exposure hazards and significant demand for non-lead paints.

2. Stimulating the establishment and operation of Asian paint certification and labeling programs with certified and labeled non-lead paints available on the markets of at least 5 project countries.

3. Creating increased access for small and medium size paint manufacturers to the information and advice they need to cost-effectively reformulate their products.

4. Stimulating the enactment of effective national policy instruments to eliminate lead paint in project countries.

I. Introduction and Background

Lead is a metallic element whose chemical symbol is Pb from the Latin word *plumbum*. It is a heavy metal that is a bluish-grey in color when freshly cut. Pure lead is soft and malleable, but lead is also sometimes combined with other metals to form alloys. There are many chemical compounds that contain lead including lead oxides, lead salts and organic lead compounds. Metallic lead, lead alloys and lead compounds have been used for many purposes. Lead in all its forms is highly toxic, especially to young children.

Lead as an Environmental Pollutant

Lead was one of the first metals that people smelted and used. Archeologists have found lead objects and pigments dating from the early Bronze Age. Extensive evidence of ancient lead mining and smelting exists in both Asia and the Mediterranean region. [1] The Greek physician Hippocrates, who lived in the 4th century BCE, already accurately described the symptoms of lead poisoning. [2] During Greco-Roman times, syrups and alcoholic beverages were often cooked in vessels that contained lead. This resulted in widespread lead poisoning among the affluent and some suggest this was one of the causes of the downfall of the Roman Empire.[3] Investigations of human skeletal remains indicate that the lead body burden of people today is between five hundred and one thousand times greater than in pre-industrial times.[4] Once lead is introduced into the environment, it persists.

Lead in Automotive Fuels

One of the largest and most harmful historical uses of lead was the addition of tetraethyl lead to automotive fuels to improve engine performance. This practice was widespread until recently, but has now been largely eliminated. It ended in most highly industrial countries by the 1970's, but leaded petrol remained a predominant automotive fuel in most developing countries until 2002 and beyond. The Partnership for Clean Fuels and Vehicles (PCFV) was established by the United Nations Environmental Program (UNEP) in 2002 to eliminate leaded automotive fuel with participation from governments, industry groups, international organizations and civil society. This initiative was a success. By January 2012, leaded automotive fuels were eliminated in all but six countries. Leaded petrol remains the predominant automotive fuel in only three countries: Afghanistan, Myanmar and North Korea. It is still available as an automotive fuel in three additional countries: Algeria, Iraq and Yemen[5].

Lead Uses Today

Lead remains in widespread use today. In addition to lead pigments and other lead compounds used in paints and glazes, other major current uses of lead include lead storage batteries, lead pipes, lead ammunition, lead used as a stabilizer in vinyl (PVC) plastic, and others.

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[1] *Lead and Lead Poisoning from Antiquity to Modern Times*; MILTON A. LESSLER, OHIO J. SCI. 88 (3): 78-84, 1988, https://kb.osu.edu/dspace/bitstream/handle/1811/23252/V088N3-078.pdf?sequence=1

[2] *Lead and Lead Poisoning from Antiquity to Modern Times*; MILTON A. LESSLER, OHIO J. SCI. 88 (3): 78-84, 1988, https://kb.osu.edu/dspace/bitstream/handle/1811/23252/V088N3-078.pdf?sequence=1

[3] *Lead and Lead Poisoning from Antiquity to Modern Times* (cited above)

[4] *Childhood Lead Poisoning*; World Health Organization, 2010; http://www.who.int/ceh/publications/leadguidance.pdf

[5] UNEP Partnership for Clean Fuels and Vehicles; http://www.unep.org/transport/pcfv/PDF/Maps_Matrices/world/lead/MapWorldLead_January2012.pdf

Today, most of the lead in global commerce is obtained from recycling lead-acid batteries. Ninety-seven percent of lead batteries worldwide are reported to be recycled, mostly in low- income countries and mostly in informal, largely uncontrolled settings.[6] Global consumption of lead is increasing and is expected to exceed 10 million tons per year. The primary reason is that demand for lead batteries is growing rapidly for use in conventional vehicles, hybrid and electric vehicles, and also for backup power and in cell phone towers. Lead batteries presently account for approximately 80% of the lead that is used worldwide. Batteries are a major source of both occupational and environmental lead exposure, especially from poorly controlled battery recycling facilities.[7]

Lead Exposure Sources

Environmental lead pollution of air and soils can cause acute lead exposure in communities near mining areas, and near inadequately controlled lead smelting, refining and recycling facilities, including battery recycling facilities. Lead contamination is also often a legacy of historical contamination from former industrial sites. Parents working in lead-related industries can bring lead home on their clothing – and this can expose their children. One study found that children whose parents are engaged in lead-related occupations have a higher blood lead levels than their schoolmates of the same age.[8]

Lead can be present in toys, cosmetics and other products. It has been reported that in China, children who habitually chew on pencils often have high blood lead levels because the paint used in the manufacture of the pencils contained lead.[9] Lead exposure can occur from eating foods contaminated with lead, although circumstances vary greatly from country to country and region to region. In some countries, popcorn may be an important source of childhood lead exposure: some popcorn machines are made from a lead alloy that releases lead into the popcorn. [10] Food prepared in utensils that contain lead can be a significant source of lead exposure in many countries and regions. So is food stored or prepared in cans or utensils that have been soldered with lead solder. Eating from dinnerware made from pewter (a tin alloy that sometimes contains lead) or from glazed ceramics where lead pigments were used can also cause lead exposure.[11] In some Asian countries, traditional preserved eggs are made using lead oxide as a food additive.[12] Lead can enter the food chain through contaminated soils, and it has also been reported that lead is sometimes present in herbal and traditional medicines and folk remedies.[13]

Other major sources of exposure to lead include incineration of lead-containing waste, burning painted materials in fireplaces or cook stoves, processing electronic waste (e-waste), and drinking water from water systems that use lead pipes and or lead solder.

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[6] *Childhood Lead Poisoning*; World Health Organization, 2010; http://www.who.int/ceh/publications/leadguidance.pdf
[7] *Lead Battery Background*; Occupational Knowledge International, http://www.okinternational.org/lead-batteries/Background
[8] *Lead poisoning in Chinese children: risk factors and preventive measures*, Yao-Hua Dai and Zhao-Yang Fan, World Journal of Pediatrics, May 2007, http://www.wjpch.com/UploadFile/001.pdf
[9] same
[10] same
[11] *Childhood Lead Poisoning*; World Health Organization, 2010; http://www.who.int/ceh/publications/leadguidance.pdf
[12] *Lead poisoning in Chinese children*
[13] *Childhood Lead Poisoning*; World Health Organization, 2010; http://www.who.int/ceh/publications/leadguidance.pdf

Lead Paint

As noted above, lead paint is one of many serious sources of childhood lead exposure. Serious childhood lead poisoning often occurs in areas surrounding lead mines, lead smelters, poorly-controlled lead battery recycling facilities and other locations and these are serious issues that need to be addressed. Until recently, however, it was the use of lead additives in automotive fuels that caused significant lead exposure in more of the world's children than any other source. Following success in removing lead additives from the automotive fuels sold in almost all countries, lead paint replaces leaded fuels as the world's most common source of significant childhood lead exposure. And with the rising middle class and the very rapid growth of household paint sales in most developing countries, exposure from lead paints will continue to grow unless meaningful control measures are taken.

Following success in removing lead additives from the automotive fuels sold in almost all countries, lead paint replaces leaded fuels as the world's most common source of significant childhood lead exposure.

Lead paint and its toxicity received recent worldwide news media attention in 2007 when it was widely reported that many wooden toys exported from Asia to Western Europe, North America and other highly industrial countries were coated with lead paint and were therefore hazardous to children. Many brand holders and vendors recalled these toys and governments of many toy importing and exporting countries put controls in place to prevent reoccurrence. Much less attention was given at the time to lead paints manufactured for domestic consumption in Asia and in other regions of the developing world.

NGOs associated with the IPEN network, however, began to investigate whether decorative (household) and other paints for sale on their national markets contained lead. In 2007 and 2008, NGOs tested paints on the market in eleven developing countries and countries with economies in transition. The results were presented in a 2009 report: *Lead in New Decorative Paints*[14] which found that in all countries where testing was carried out, many of the oil-based (enamel) decorative paints on the market had hazardous lead content. Based on this study and on other more recent testing, it appears that leaded enamel decorative paints are widely available for sale on the market in almost all countries that do not have an effectively enforced national law or binding regulation that prohibits the manufacture, import, sale and use of these paints.

The continuing use of lead compounds in the formulation of decorative paints provides very little, if any, benefit to the paint manufacturer or consumer. Non-toxic or less toxic substitutes for lead pigments, lead dryers and other lead compounds that may be used in paints have been well-known for a half-century and longer. Differences in their cost, color, performance and availability are marginal at best. On the other hand, the harms to exposed children and to society as a whole that are associated with lead paint-related childhood lead exposure is very great, and has been well-studied and well-documented. There is therefore no valid justification for continuing the use of lead compounds in the formulation of decorative paints anywhere.

[14] http://www.ipen.org/ipenweb/documents/work%20documents/global_paintstudy.pdf

II. Health Effects of Lead Exposure

Exposure to lead causes significant and widespread injury to human health**.** Lead poisoning sometimes is also called lead intoxication, plumbism, or painter's colic. *Of all toxic environmental pollutants, harms from lead exposure are probably better understood and better documented than the effects of any other toxic environmental pollutant.*

Lead Exposure and its Effects Lead serves no useful biological function in humans[15] and exposure to lead can affect many different parts of the human body. A single high dose of lead can cause severe emergency symptoms. High lead exposure may cause vomiting, staggering walk, muscle weakness, seizures, or coma. Other symptoms of lead exposure can include: abdominal pain and cramping (usually the first sign of a high, toxic dose of lead poisoning), aggressive behavior, anemia, constipation, difficulty sleeping, headaches, irritability, loss of previous developmental skills (in young children), low appetite and energy and reduced sensations. [16] Lead exposure is a particularly insidious hazard since it has the potential for causing irreversible health effects before the exposure is clinically recognized. These effects include hypotension, central nervous system problems, anemia and diminished hearing acuity.[17]

The two most common routes of human lead exposure are respiratory (breathing lead fumes or lead dust into the lungs) and gastrointestinal (ingesting lead through the mouth into the stomach and intestines). The respiratory route is the most common route for occupational exposure; the gastrointestinal route is the predominant route of childhood exposure.

Metallic lead and inorganic lead compounds are not easily absorbed through the skin. However, organic lead compounds can be readily absorbed through intact skin. Once it is in the body, lead is generally excreted slowly with a biological half-life of about 10 years. Since excretion is slow, accumulation in the body occurs easily.[18]

Lead in the body is distributed though the blood stream and reaches its highest concentrations in bone, teeth, liver, lungs, kidneys, brain and spleen. Lead in blood has an estimated half-life of 35 days, in soft tissue 40 days and in bone 20 to 30 years. Most absorbed lead ends up in bone and is not known to cause deleterious effect on the bone itself. The lead, however, does not necessarily remain in the bones, and it can be remobilized and cause continued toxicity after exposure ceases.[19] The lead that has accumulated in a mother's bones, when mobilized during pregnancy, can cross the placenta and reach the developing fetus.

While acute lead poisoning is very serious, repeated exposure to small quantities of lead is more common. The effects of lead poisoning build up slowly over time and the individual's health problems get worse as the level of lead in the blood gets higher. And even low levels of lead exposure not easily associated with any obvious symptoms can still harm a child's mental development. [20]

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[15] http://www.aafp.org/afp/1998/0215/p719.html
[16] U.S. National Library of Medicine, from the U.S. National Institutes of Health, http://www.nlm.nih.gov/medlineplus/ency/article/002473.htm)
[17] http://www.aafp.org/afp/1998/0215/p719.html (cited above)
[18] same
[19] same
[20] U.S. National Library of Medicine, from the U.S. National Institutes of Health cited above,

Lead Exposure in Children Lead is much more harmful to children than adults and the health effects are often irreversible and can have a lifelong impact. The younger the child, the more harmful lead can be. The human fetus is the most vulnerable.

Children are often at a higher risk for lead exposure than adults. Even before birth, the human fetus is exposed to lead throughout pregnancy. Children eat more food, drink more water and breathe more air per unit of body weight than do adults. Children have an innate curiosity to explore their world and engage in developmentally appropriate hand-to-mouth behavior: a typical one to six year old child ingests approximately 100 milligrams of house dust and soil each day. Wherever house dust and soils are contaminated with lead, children ingest lead along with the dust and soil. In those children who suffer from nutritional deficiencies, ingested lead is absorbed at an increased rate.[21]

Some children exhibit a condition called *pica*, that is, they intentionally eat clay, chalk or other nonfood materials. Pica can be caused by cultural tradition, acquired taste, or a neurological mechanism such as an iron deficiency, or chemical imbalance. According to one study in the United States, children with pica may eat as much as ten grams of nonfood materials per day. When children with pica eat lead contaminated soils or paint chips, they can suffer high lead exposure. In some cultures, pregnant women traditionally eat soil, ceramic fragments or other nonfood materials. When these are contaminated with lead, such women (and their developing fetuses) can be highly exposed.[22]

Lead is much more harmful to children than adults, and the health effects are often irreversible.

Children are more biologically susceptible to lead than adults: [23]

- A child's brain undergoes very rapid growth, development and differentiation and lead interferes with this process. Brain damage caused by chronic, low-level exposure to lead is irreversible and untreatable.

- Exposure to lead early in life can re-program genes, which can lead to altered gene expression and an associated increased risk of disease later in life.

- Gastrointestinal absorption of lead is enhanced in childhood. Up to 50% of ingested lead is absorbed by children, as compared with 10% in adults. (Pregnant women may also absorb more ingested lead than other adults).

The recognized clinical symptoms of lead exposure in children include abdominal pain and arthralgia (pain in the joints).Clumsiness and staggering may also be seen, followed by headache and behavioral change.[24]

[21] *Childhood Lead Poisoning*; World Health Organization, 2010
[22] same
[23] same
[24] Lead Poisoning, by Herbert Needleman, Annual Review of Medicine 2004, on the web at:

Until the 20th century, infectious diseases so devastated children that their prevention and cure was the overriding concern of almost all medical and public health workers. With rising prosperity in highly industrial countries, however, much of the population began to receive better nutrition, clean water, functioning sewage systems, and access to healthcare. As deaths and disabilities caused by infectious agents started to decline, health workers began to reconsider the dominant paradigm that automatically assumed infectious agents were the cause of all the diseases they observed. [25]

Starting in the 1920's, many articles linking childhood disease with lead poisoning began to appear in the medical and public health literature. These articles documented that convulsions, mental retardation and some other diseases of infancy and childhood that previously had been ascribed to infectious causes were actually symptoms of lead poisoning. A 1926 article, *Lead Poisoning in Children,* that appeared in the *American Journal of Diseases of Children* concluded that lead poisoning was a relatively frequent occurrence in children and was usually associated with the ingestion of lead paint.[26]

Subclinical Lead Exposure in Children

The clinical symptoms of lead exposure in children often do not appear until a high level of lead exposure has been reached: symptoms generally begin to appear when the child's blood lead level (BLL) reaches 60 micrograms per deciliter. Until the 1980's, most medical practitioners did not consider lead exposure in children to be a problem until and unless explicit clinical symptoms were observed. As early at the 1940's, however, some researchers had begun to conjecture that subclinical lead exposure in children was also a serious concern: that a proportion of school failure and behavioral disorder was caused by unrecognized lead toxicity. This conjecture was controversial at first, and was vigorously challenged by lead industry interests.

In 1979, a well-designed study by pediatrician and psychiatrist Herbert Needleman resolved the issue. His study established that children with higher lead content in their teeth had, on average, lower IQs and higher incidents of bad classroom behavior. Follow-up studies on these same children 12 years later found that those who had the highest lead levels in their teeth as children continued to have school problems through their last year of high school. Other researchers reached similar conclusions and also found correlations between childhood lead exposure and higher rates of attention deficit, aggression, delinquency and crime.[27]

Industry-supported groups funded their own research in an attempt to discredit Needleman's findings and they orchestrated charges of scientific misconduct against him. As a result, Needleman's work was subject to multiple reviews by academic panels and government agencies. In the end, U.S EPA confirmed Needleman's results and called his work "a pioneering study." Because of the many reviews to which Needleman's research was subjected, his conclusions are now widely considered to be very robust, and they have been highly influential with government regulators.[28]

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http://www.rachel.org/files/document/Lead_Poisoning.pdf

[25] *Deceit and Denial: The Deadly Politics of Industrial Pollution*: Gerald Markowitz and David Rosner, University of California Press, 2003

[26] *Deceit and Denial: The Deadly Politics of Industrial Pollution*: Gerald Markowitz and David Rosner, University of California Press, 2003

[27] Lead Poisoning, by Herbert Needleman, Annual Review of Medicine 2004, on the web at: http://www.rachel.org/files/document/Lead_Poisoning.pdf

[28] Deceit and Denial, cited above

Needleman's findings and other studies convinced both the medical community and also authorities in many countries to recognize that children suffer significant neurological harm from relatively low-level exposure to lead even when they exhibit no clinically-observable symptoms. *Widespread subclinical childhood lead exposure, itself, came to be recognized as a very serious public health concern*. As a result, many jurisdictions therefore began revising downward the acceptable limit of blood lead in children. [29]

By the late 1990's, the World Health Organization and the international medical community generally agreed that a blood lead level in children of 10 micrograms per deciliter was the threshold for concern for medical and public health interventions. Some public health experts, however, suspected that even this threshold was inappropriately high.

Needleman's findings and other studies convinced both the medical community and also authorities in many countries to recognize that children suffer significant neurological harm from relatively low-level exposure to lead even when they exhibit no clinically-observable symptoms.

Based on the evidence of reduced intelligence caused by childhood exposure to lead, the World Health Organization included *lead-caused mental retardation* in its 2002 list of diseases. WHO classifies lead-caused mental retardation as among the world's most serious diseases caused in whole or in part by environmental factors. A 2006 WHO Report: Preventing *Disease through Healthy Environments: Towards an estimate of the environmental burden of disease* states that approximately one-quarter of the global disease burden, and more than one-third of the burden among children, is due to modifiable environmental factors, and it lists the twenty-four diseases that have the largest environmental contribution. These include diarrhea, lower respiratory infections, malaria, road traffic injuries, chronic obstructive pulmonary disease, and others. The report ranks these diseases according to what it terms 'disability adjusted life years' (DALYs) – a weighted measure of death, illness and disability. Of the top twenty-four diseases associated with environmental causation listed by WHO, *lead-caused mental retardation* is ranked number ten. [30]

No Safe Level of Lead Exposure in Children

In 2002, a study by Bruce Lanphear demonstrated the inadequacy of the 10 micrograms per deciliter BLL threshold that was then broadly considered the threshold of concern within the world medical community. Lanphear found that children's math and reading scores showed reductions that correlate to blood lead levels as low as 2.5 micrograms per deciliter. One conclusion health researchers have drawn from this study is that no threshold level for safe lead exposure has yet been demonstrated.[31]

[29] Lead Poisoning, by Herbert Needleman, Annual Review of Medicine 2004, on the web at: http://www.rachel.org/files/document/Lead_Poisoning.pdf

[30] (http://www.who.int/quantifying_ehimpacts/publications/preventingdisease.pdf

[31] Lead Poisoning, by Herbert Needleman, Annual Review of Medicine 2004, on the web at: http://www.rachel.org/files/document/Lead_Poisoning.pdf

In response to this and other studies, a Joint Expert Committee of the United Nations Food and Agricultural Organization (FAO) and the World Health Organization (WHO) in 2010 withdrew its previous reference standard for provisional tolerable weekly intake (PTWI) of lead. Significantly, the committee determined that it is not possible to establish a new PTWI that is health protective. Recent World Health Organization lead guidelines now indicate that there is no (zero) tolerable weekly intake for lead.[32] In 2010, the European Food Safety Authority Panel on Contaminants in the Food Chain reviewed the work of the Joint FAO/WHO Expert Committee and concluded that its previous provisional tolerable weekly intake of lead is no longer valid since "there is no evidence for a threshold for critical lead-induced effects."[33]

… no threshold level for safe lead exposure has yet been demonstrated.

In 2012, the US Center for Disease Control (CDC) concluded that its old reference value of 10 micrograms per deciliter BLL in children as the threshold of concern was no longer valid. CDC agreed in principle that it could not establish a new reference value (threshold of concern) based on compelling evidence that very low blood lead levels are associated with IQ deficits, attention-related behaviors, and poor academic achievement. Instead of identifying a new blood lead level beneath which deleterious effects would not be expected, CDC decided to give emphasis to primary prevention: preventing lead exposure rather than responding after the exposure has taken place. The current CDC policy is to set a BLL reference value at the 97.5th percentile of the BLL distribution among children 1–5 years old in the United States. This reference value is currently 5 micrograms per deciliter and will be reviewed and updated every four years. Clinicians are called upon to monitor the health status of all children with a confirmed blood lead level above the reference value.[34]

In the occupational health literature, the term "*lead overexposure*" is often used as a synonym for "*lead poisoning.*" Since children appear to have no safe level of lead exposure, any childhood exposure to lead is overexposure, and therefore, is lead poisoning.

Economic Impact of Lead Exposure As indicated above, lead exposure in children is associated with a lifelong, irreversible decrease in their intelligence (as measured by IQ score). Studies on animals have found an association between lead exposure during development and aggressive behavior.[35] Human health studies have found associations between blood lead concentrations in children and arrests for offenses involving violence later in their lives.[36] Other neurological effects of childhood lead exposure

[32] *Preventing Disease through Healthy Environments; Exposure to Lead: A Major Public Health Concern*; WHO 2010, http://www.who.int/ipcs/features/lead..pdf

[33] Scientific Opinion on Lead in Food, EFSA Panel on Contaminants in the Food Chain (CONTAM); EFSA Journal 2010, http://www.efsa.europa.eu/fr/scdocs/doc/1570.pdf

[34] CDC Response to Advisory Committee on Childhood Lead Poisoning Prevention Recommendations in "Low Level Lead Exposure Harms Children: A Renewed Call of Primary Prevention" June 2012 http://www.cdc.gov/nceh/lead/ACCLPP/CDC_Response_Lead_Exposure_Recs.pdf

[35] *Exposure to lead during development alters aggressive behavior in golden hamsters;* http://www.ncbi.nlm.nih.gov/pubmed/10440488

[36] *Association of Prenatal and Childhood Blood Lead Concentrations with Criminal Arrests in Early Adulthood*; http://www.plosmedicine.org/article/info:doi/10.1371/journal.pmed.0050101

may include: problems maintaining attention in school or home; hyperactivity; problems with learning and remembering new information; rigid, inflexible problem-solving abilities; problems controlling aggressive or impulsive behavior; problems paying attention; poor work completion; and others.[37] Many of the subclinical health impacts from lead exposure are difficult to quantify and therefore more attention has often been given to the effect of lead exposure on IQ effects and school performance.

On the basis of multiple studies in several countries, it is estimated that about a quarter to half of an IQ point is lost for each microgram per deciliter increase in a preschool child's blood lead level (for children with blood lead levels in the range of 10 to 20 micrograms per deciliter). For children with blood lead levels lower than 10 micrograms per deciliter, the dose/response relationship is stronger: an increase in a child's blood lead level from less than 1 microgram per deciliter to 10 micrograms per deciliter is associated with a six point decrease in IQ.[38] Lead-related IQ loss in children is an indicator of irreversible neurological damage, and is associated with lifelong behavioral and mental deficits that remain even after the child becomes an adult.

When national childhood lead exposure is sufficiently widespread to cause a decrease in the average IQ of children, and subsequently in adults, this can have a nationwide effect on the country as a whole. At the low end of the intelligence spectrum, the total number of a country's citizens exhibiting symptoms of mental retardation is substantially increased; at the high end, the number with truly superior intelligence is substantially decreased. One result can be a large increase in the number of children who do poorly in school and who may not contribute fully to society when they become adults. Another result can be a reduction in a country's future intellectual, business and political leadership potential and a widening gap in socioeconomic attainment between countries with high and low levels of lead exposure in their children.[39]

Blood lead levels in children vary widely from country to country and region to region. The highest blood lead levels are generally seen in low income countries. In 2004, 16% of all children worldwide were estimated to have blood lead levels above 10 microgram per deciliter. *Ninety percent of these children live in low-income regions.*[40]

A 2002 study by Philip Landrigan and others investigated the socio-economic impacts of lead exposure in U. S. children. (The U.S. is a country with low childhood lead exposure compared to most developing countries and countries with economies in transition.) The study estimated the cumulative reduction in childhood intelligence associated with 1997 levels of lead exposure in children, and it correlated this to a child's lifetime earning potential. The study concluded that the decreased adult earning potential that results from this childhood lead exposure costs the U.S. economy $43.4 billion per year.[41] This finding has been used to justify government programs to reduce lead exposure in U.S. children such as lead abatement in homes that had been painted with lead paints 35 years ago and longer.

Circumstances in different countries, of course, vary widely. This study, nonetheless, provided an indication of the magnitude of the economic impact of widespread childhood lead exposure in one highly industrial country associated with childhood lead exposure. Nor does this study even attempt to

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[37] *Neuropsychological Effects of Lead Poisoning on Child Development;* Mt. Washington Pediatric Hospital; http://www.mwph.org/services/effects_lead_poisoning.htm

[38] Childhood Lead Poisoning; World Health Organization, 2010

[39] same

[40] samr

[41] See: Philip Landrigan and others, Environmental Pollutants and Disease in American Children: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1240919/pdf/ehp0110-000721.pdf

capture the full costs to society of childhood lead exposure since it does take into account several other costs to society associated with effects of lead exposure such as increases in violence and criminal behavior or added costs to the national education system.

Blood lead levels in children vary widely from country to country and region to region. The highest blood lead levels are generally seen in low income countries.

While it would be difficult to accurately quantify national socio-economic impact of widespread childhood lead exposure on any particular developing country or country with economy in transition, it is reasonable to assume that– in relative terms – national socio-economic costs associated with childhood lead exposure in the developing world is generally greater than the costs documented in the U.S. In part, this is because average childhood lead exposure in the U.S. – where systematic efforts have been made for years to address this problem – is much lower than childhood lead exposure in most developing countries and countries with economies in transition. Additionally, issues associated with increasing national labor productivity and improving national education systems are among the most important challenges facing most developing countries. Lead-caused diminished intelligence and mental retardation together with other lead-caused neurological effects such as increased violent behavior and others are major barriers toward meeting and overcoming this challenge.

III. Lead in Paint

Lead paint is a major source of childhood lead exposure: in many countries, more children are exposed to lead from paints than from any other source. Lead paint is also one of the most easily preventable of all sources of childhood lead exposure.

What is Lead Paint?

The term *paint* is used to also include: varnishes, lacquers, stains, enamels, glazes, primers and coatings. Paint is typically a formulated mixture of resins, pigments, fillers, solvents, and other additives. The term *lead paint* is defined as paint to which one or more lead compounds have been added. [42]

Lead compounds may be added to paint for a number of purposes including:

- **Pigments** Certain lead compounds have long been used as pigments to give paints their color. These include lead chromates, lead oxides, lead molybdates and lead sulphates.

- **Drying Agents** Certain lead compounds are sometimes added to oil-based (enamel) paints to make the paint dry faster and more evenly. These may include lead naphthenate, lead acetate, and lead octoate.

[42] See GAELP *Operational Framework*; March 2011; http://www.unep.org/hazardoussubstances/Portals/9/Lead_Cadmium/docs/GAELP/Final_operational_framework_GAELP.pdf

- **Corrosion Resistance** Lead oxides and other lead compounds are sometimes added to paints that are used on metal surfaces to inhibit rust or corrosion and to increase durability. One of the most common of these is lead tetroxide which is also called *red lead* or *minium*.

- **Unintentional** Reportedly, trace quantities of lead are sometimes present in fillers and other earth-based ingredients that are used in paint formulation. In such cases, the lead compound is not an intentional part of the paint formulation: it is not added for some functional purpose.

Pigments and drying agents that do not contain lead are available and can be substituted for those that contain lead. Corrosion resistant paints that do not contain added lead compounds are also widely available.

Paints whose formulation does not include the use of any intentionally added lead compound may, when tested, be found to contain "unintentional" lead as a trace contaminant. In these cases, however, the lead content of such paints should be very low, usually less than 45 parts per million lead. When paint is tested and found to contain more than 90 parts per million lead (measured as the total lead content of the dry paint film), this suggests that one or more lead compound was intentionally used in the paint's formulation. And if claims are made that some particular paint product with more than 90 ppm lead contains no intentionally added lead compound, it would be reasonable to suggest that the manufacturer would be advised to find a new supply of earth-based materials with less or no lead content.

Lead Decorative Paints

Decorative paints (also sometimes called architectural paints or home paints) are paints that are produced to be used on the inside or outside surfaces of homes, schools, commercial buildings and similar applications. These paints are the main focus of the IPEN/EU Asia Lead Paint Elimination Project. Sales and use of decorative paints are growing very rapidly in most Asian countries.

Lead decorative paints are a significant source of childhood lead exposure. The new paint, itself, is not generally an important source of childhood exposure. However, when surfaces that have been painted with lead paint age, weather, chip, and/or are exposed to sun, the paint deteriorates. Lead that is present in the paint accumulates in indoor dust and outdoor soils. Children playing indoors or outdoors get dust and soil on their hands, and then ingest it through typical hand-to-mouth behavior. This is especially true for children in the 6 years and under age group, the group most easily harmed by exposure to lead. Paint chips can be especially harmful because their lead content can be much higher than what is typically found in dust and soils.

Children (and workers) are especially at risk when surfaces that were painted in the past with lead paint are repainted or are disturbed by construction or other activities. Workmen may sand, scrape, grind, or in other ways disturb the old painted surface and produce large quantities of dust with very high lead content. Painters, carpenters and construction personnel should not sand, scrape or grind old painted surfaces that may contain lead paint; and should take care to contain any dust or debris they may create.

Exposure from lead paint remains a problem for many years after the lead paint is applied to a surface; old homes, schools and other locations that were painted with lead paint as long as 30-50 years ago, or more, continue to be sources of lead exposure in children. And once a surface is painted with lead

paint, the costs associated with lead abatement can be very high. This makes it all the more urgent to stop producing, selling and using new lead paints, especially in countries where the sale and use of decorative paints is rapidly growing.

Based on the limited data available, the water-based decorative paints (sometimes called plastic paints or latex paints) that are currently sold in developing countries, with a few exceptions, do not generally appear to contain added lead compounds. On the other hand, oil-based (enamel) decorative paints frequently contain high concentrations of lead. For example, in a sample of 232 enamel decorative paints that were purchased in 2008 in eleven regionally diverse developing countries and countries with economies in transition: 65% had lead concentrations greater than 600 ppm lead; the average lead concentration was 23,707 ppm lead; and the highest lead concentration was more than 500,000 ppm lead.[43]

Lead decorative paints are a significant source of childhood lead exposure…Exposure from lead paint remains a problem for many years after the lead paint is applied to a surface; old homes, schools and other locations that were painted with lead paint as long as 30-50 years ago, or more, continue to be sources of lead exposure in children.

For most paint brands and types tested, the white paints tended to contain n the lowest quantities of lead; the bright yellows, reds and greens often had the highest lead content. This suggests that white lead pigments are not commonly used and that most of the lead in these paints came from lead pigments used to create the bright colors. In some cases, the white paint and the bright colored paints of a particular brand and type both contained substantial amounts of lead, but the lead content of the brightly colored paints was much higher. In such cases, it appears that the paint formulation includes not only lead pigments but also other added lead compounds used as drying agents or for some other purpose.

Countries where decorative paints on the market have been sampled and tested since 2007 include: Armenia, Bangladesh, Belarus, Brazil, Cameroon, China, Egypt, Ecuador, India, Indonesia, Kazakhstan, Lebanon, Malaysia, Mexico, Nepal, Nigeria, Paraguay, Peru, Philippines, Russia, Senegal, Seychelles, Singapore.

Why the Project Will Focus on Lead Decorative Paints

While there are many important sources of childhood lead exposure, all of which should be addressed, this project will address only one of these sources: lead paint. And in particular, the project will focus its main attention on the lead decorative paints.

Leaded decorative paints are not the only lead paints likely to contribute to childhood lead exposure. Significant lead exposure can occur when lead paints are used as coatings in the manufacture of toys, pencils, cribs and playpens, furniture and other household items, especially ones children may chew on. (Old toys, cribs, playpens, furniture and other household items, however, are often repainted with

[43] The full data set can be found in: *Lead in New Decorative Paints*, IPEN 2009, http://www.ipen.org/ipenweb/documents/work%20documents/global_paintstudy.pdf

decorative paints). Specialized rust and corrosion-resistant paints for use on metal surfaces are sometimes used on school playground equipment and similar applications.

The project, however, will focus primarily on lead decorative paints and to a limited extent on rust and corrosion-resistant paints sold in the consumer marketplace. The project will give less attention to paints produced for industrial use as coatings on manufactured articles. Industrial purchasers should know whether or not the paints they use contain lead, and it is therefore reasonable to hold them directly responsible for leaded coatings used in the manufacture of toys and the other articles they produce. On the other hand, most of the consumers who purchase decorative paints have little or no control over the content of the paints they buy, and in most cases, know nothing about the lead content of the paint.

Decorative paints (and some corrosion-resistant paints) are branded products sold to individual and institutional consumers. The paint's manufacturer, brand holder and vendor can and should be held directly responsible for the lead content of the paints they produce and sell. And in most cases, they are highly motivated to uphold and defend their brands' reputations.

Even though the project will focus its activities mainly on the paints that are sold on the consumer market, however, when project partners engage in dialogues relating to national legislation or regulations to eliminate of control lead paints, they are encouraged to give attention not only to decorative paints, but also to other paint categories.

IV. Lead Paint and the Sound Management of Chemicals

At the 1992 Rio World Environmental Summit, and at subsequent World Summits in 2002 and 2012, governments pledged to work toward achievement of the Sound Management of Chemicals. In 2002, the World Summit on Sustainable Development in Johannesburg set a goal that was reiterated at the 2012 Rio+20 Summit : *the achievement of the sound management of chemicals throughout their life cycle so that, by 2020, chemicals are produced and used in ways that minimize significant adverse impacts on human health and the environment*.

In the view of IPEN, no country where lead decorative paints continue to be manufactured, imported, sold and/or used can make a valid claim that it has made real progress toward the goal of sound chemicals management.

Strategic Approach to International Chemicals Management

In 2006, Environment Ministers, Health Ministers and other government delegates from more than 100 countries met in Dubai along with representatives of United Nations specialized agencies, NGOs, industry trade associations and others for the first International Conference on Chemicals Management (ICCM1). The Conference adopted the Strategic Approach to International Chemicals Management (SAICM): a policy framework and program of action whose goal is to achieve sound chemicals management in all countries by 2020.[44]

[44] See http://www.saicm.org/index.php?menuid=2&pageid=256

At the time that SAICM was being prepared and adopted, it appears that most participating government and NGO experts were unaware that lead paints remain widely available in the developing world: the word "paint" does not appear even one time in the 120 plus pages of SAICM founding documents. Soon afterwards, NGOs in the IPEN network began testing decorative paints on the market in their home countries and found in every country were testing was done that most of the brands of oil-based decorative paints they tested had hazardous lead content. IPEN then decided that the elimination of lead paint is a critical SAICM issue and a necessary part of the implementation of sound chemicals management in any country.

There is a clear match between the goals, objectives and policies contained in the SAICM guiding documents and the objective of global lead paint elimination. Two of SAICM's founding principles, as expressed in the high-level declaration adopted by Environment Ministers and others at SAICM's founding meeting, are:

> *The sound management of chemicals is essential if we are to achieve sustainable development, including the eradication of poverty and disease, the improvement of human health and the environment and the elevation and maintenance of the standard of living in countries at all levels of development;* and …
>
> *We are determined to protect children and the unborn child from chemical exposures that impair their future lives.*[45]

The continuing widespread sale and use of lead paint harms human health, undermines the eradication of poverty and disease, and is a barrier to the elevation and maintenance of standards of living.

These principles can be directly related to lead paint. The continuing widespread sale and use of lead paint harms human health, undermines the eradication of poverty and disease, and is a barrier to the elevation and maintenance of standards of living. Lead paint elimination is necessary to protect children and the unborn child from chemical exposures that impair their future lives.

One of the agreed key pillars of the SAICM Policy and Strategy document adopted at the conference is the SAICM Risk Reduction Objective:

> *To ensure, by 2020 that chemicals or chemical uses that pose an unreasonable and otherwise unmanageable risk to human health and the environment based on a science-based risk*

[45] *Dubai Declaration on International Chemicals Management*; http://www.saicm.org/documents/saicm%20texts/SAICM_publication_ENG.pdf

assessment and taking into account the costs and benefits as well as the availability of safer substitutes and their efficacy, are no longer produced or used for such uses. [46]

The lead compounds used in decorative paints do pose an unreasonable and otherwise unmanageable risk to human health and the environment: they impose very high costs on society, provide very little if any benefits, and should no longer be produced and used. Safer substitutes for the lead pigments, lead drying agents and other lead compounds used in the manufacture of paints have long been used, are widely available, have well-demonstrated efficacy, and have at most marginal impact on the wholesale price of the paint product.

At the national level, the challenges to achieving lead paint elimination are modest. In almost any country, if government officials and stakeholders work together, national lead paint elimination should be relatively easy to achieve for the following reasons:

- The significant harms associated with childhood lead exposure – including low-dose subclinical exposure – are now well-documented and not likely to become a subject of serious national controversy;

- The barriers that national paint manufacturers and importers will need to surmount to eliminate the use of lead pigments, lead dryers and other lead compounds in their paint formulations are minimal, not costly, and not technically difficult;

- The drafting of an appropriate national legal instrument to prohibit the manufacture, import, sale and use of lead decorative paints is not a difficult exercise; and

- Modalities can be found for compliance monitoring and enforcement of a well-crafted national lead paint control instrument that are neither costly nor technically challenging to implement.

This suggests that any country where lead paints are widely available for sale and use, and where effective preventive actions are not taken has still made very little progress toward achieving sound chemicals management.

Global Alliance to Eliminate Lead Paint

In 2009, a second meeting of the International Conference on Chemicals Management (ICCM2) was held in Nairobi. IPEN and others presented evidence to the Conference that lead paints continue to be widely manufactured, sold and used in many developing countries and countries with economies in transition. Delegates from government ministries and stakeholder organizations from all regions participating in ICCM2 responded by adopting a resolution that identified *Lead in Paints* as an emerging SAICM policy issue and that invited the United Nations Environment Programme and the World Health Organization to establish a global partnership to promote phasing out the use of lead in paints and to serve as its secretariat.[47]

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[46] *SAICM Overarching Policy Strategy*; http://www.saicm.org/documents/saicm%20texts/SAICM_publication_ENG.pdf

[47] ICCM2 omnibus resolution II/4 on emerging policy issues; http://www.saicm.org/documents/iccm/ICCM2/emerging%20issues/ICCM2%20Outcomes/Emerging%20issues/Omnibus%20resolution%20II_4.doc

UNEP and WHO jointly initiated this partnership under the name: *Global Alliance to Eliminate Lead Paint* (GAELP). GAELP's broad objective is to phase out the manufacture and sale of paints containing lead and eventually to eliminate the risks from such paint.[48] GAELP defines the term "paint" to also include: varnishes, lacquers, stains, enamels, glazes, primers or coatings. GAELP defines the term "lead paint" as paint to which one or more lead compounds has been added.[49]

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GAELP's overall goal is to prevent children's exposure to lead via paints containing lead and to minimize occupational exposures to lead in paint. GAELP's broad objective is to phase out the manufacture and sale of paints containing lead and, eventually, to eliminate the risks from such paint.[50]

GAELP's specific objectives are:[51]

> (a) To raise the awareness of government authorities and regulators, the private sector, manufacturers, consumers, workers, trade unions and health-care providers about the toxicity of lead in paints and the availability of technically superior and safer alternatives;
>
> (b) To catalyze the design and implementation of appropriate prevention-based programs to reduce and eliminate risks from the use of lead in paints and products coated with lead paints;
>
> (c) To help identify paint manufacturers and formulators that continue to produce and market paints containing lead so as to foster actions to phase out lead from their products;
>
> (d) To promote the establishment of appropriate national regulatory frameworks to stop the manufacture, import, export, sale and use of lead paints and products coated with lead paints;
>
> (e) As appropriate, to promote international third-party certification of new paint products to help consumers to recognize paint and coatings without added lead;
>
> (f) To share guidance and promote assistance to identify and reduce potential lead exposure in and around housing, childcare facilities and schools in which paint containing lead and paint dust is present and in industrial facilities producing or using paint containing lead to reduce workers' lead exposure.

[48] See GAELP Objectives; http://www.unep.org/hazardoussubstances/LeadCadmium/PrioritiesforAction/GAELP/GAELPObjectives/tabid/6331/Default.aspx

[49] See GAELP *Operational Framework*; March 2011; http://www.unep.org/hazardoussubstances/Portals/9/Lead_Cadmium/docs/GAELP/Final_operational_framework_GAELP.pdf

[50] *Global Alliance to Eliminate Lead Paint: Objectives;* http://www.unep.org/hazardoussubstances/LeadCadmium/PrioritiesforAction/GAELP/GAELPObjectives/tabid/6331/Default.aspx

[51] same

The World Health Organization and the United Nations Environment Program devote resources, staff time, and their influence to GAELP and the achievement of its objectives. Several academics in the fields of medicine and public health, and NGO representatives associated with IPEN, Occupational Knowledge International and others are active GAELP participants and contributors. The leading paint industry international trade association, International Paint and Printers Ink Council (IPPIC) is also active. Representatives of the United States and Nigerian Government participate on the GAELP Interim Advisory Committee.

Since GAELP's formation, the issue of lead paint elimination has continued to garner statements of support from governmental regional grouping participating in SAICM processes. Resolutions in support of GAELP's lead paint elimination objectives were adopted at the *Fourth African regional meeting on SAICM* in Nairobi on April 2011; and the *Third Latin American and Caribbean regional meeting on SAICM* in Panama City on June 2011.[52] At a global SAICM meeting in Belgrade, November 2011, a representative of the Group of Asian and Pacific countries stated that this regional group also "accorded high priority to work on lead in paint, urging the world community to phase out the use of lead forthwith.[53] However, despite these statements of support, only a handful of developing world governments have yet adopted meaningful measures to actually prohibit or strictly control lead paint manufacture, import, sale and use.

At the national level, the challenges to achieving lead paint elimination are modest. In almost any country, if government officials and stakeholders work together, national lead paint elimination should be relatively easy to achieve.

National Alliances to Eliminate Lead Paint

The Global Alliance has so far been rather slow in finalizing and implementing plans and strategies to advance the objective of global lead paint elimination. One important agreed initiative, however, is to sponsor an *International Lead Poisoning Prevention Day of Action* in late 2013 with lead paint elimination as its theme. This can be a good opportunity for project partner NGOs to mobilize organizations and individuals in their countries in support of lead paint elimination objectives. (More information on this will be forthcoming.)

The Global Alliance has also established a procedure by which organizations and individuals can formally register with UNEP and WHO as *Contributors* to GAELP. By registering as a GAELP Contributor, the organization or individual formally indicates support for GAELP's goals and objectives; agrees to contribute to activities that advance these goals and objectives; and agrees also to collaborate and share information with other GAELP Contributors. The GAELP Contributors Form and information on how to

[52] http://www.saicm.org/images/saicm_documents/OEWG/Meeting%20documents/OEWG%201%20INF%2011%20Compilation%20of%20reg%20mtgs.pdf

[53] Report of the work of the Open-ended Working Group of the International Conference on Chemicals Management, http://www.saicm.org/images/saicm_documents/OEWG/Meeting%20documents/OEWG1%2019_OEWG1%20Report%20E.pdf

register as a GAELP Contributor can be found on the GAELP web site.[54] One category of GAELP Contributor is a *National Contributor:* that is, an organization or individual committed to advancing GAELP objectives within their own country.

One of the project activities that partner NGOs are to implement in their countries is to organize National Alliances to Eliminate Lead Paint: national coalitions of organizations and individuals who support the project's national lead paint elimination objectives and are willing to contribute toward their achievement. The GAELP-initiated *International Lead Poisoning Prevention Day of Action* can be a good focal activity in project efforts to organize these national alliances. Additionally, one technique for organizing national alliances is to encourage those organizations and individuals who appear to be potential participants in a national alliance to register with UNEP and WHO as *GAELP Contributors*. The National Alliance can then be organized as an alliance of the GAELP Contributors in your country.

V. Concluding Remarks

This information document is a work in progress and as noted above, will be revised and expanded into an NGO Guide to Lead Paint Elimination for use both by project partners and others who wish to pursue lead paint elimination efforts in their countries.

Besides the information presented above, the booklet will also include other information much of which is being presented at the workshop including information on:

- Surveying, sampling and testing paints on a country's national market;
- Lead paint elimination communications activities and messaging;
- Organizing National Alliances to Eliminate Lead Paint;
- Third party paint certification and labeling;
- Outreach to small and medium-size paint manufacturers; and
- National legislation and/or regulation

Your feedback on this information document would be very much appreciated. It would be helpful to know if you find it useful; if you think some of the information it contains should be revised or expanded; and what other kinds of information might be useful in a revised and expanded version.

Good luck on your national lead paint elimination efforts.

[54] Global Alliance to Eliminate Lead Paint: Information on Becoming a Contributor: http://www.unep.org/hazardoussubstances/Portals/9/Lead_Cadmium/docs/GAELP/GAELP_Becoming_a_contributor.pdf