The Global Lead Advice and Support Service (GLASS) provides information and referrals on lead poisoning and lead contamination prevention and management, with the goal of eliminating lead poisoning globally and protecting the environment from lead. GLASS is run by The LEAD Group Incorporated ABN 25 819 463 114

global lead advice & support service

Lead Poisoning in Indonesia

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[Note: This research was carried out in both English and Indonesian, so several references are in the Indonesian language only. Titles and main ideas were translated by Suherni.]

EXECUTIVE SUMMARY

Lead poisoning is one of the environmental problems around the world affecting human health. As a developing country, Indonesia has high potential to be exposed to lead, particularly for people living in rural areas, lacking education and information about lead poisoning. This report provides an overview about lead poisoning in Indonesia. Several studies relating to lead poisoning were reviewed. Most of these studies focused on blood-lead levels in urban areas and no study was based in a rural area. The main sources of lead poisoning in the reference studies were petrol (gasoline), and vegetables (from the soil or dust remaining on the vegetables when eaten). There was also beach and seawater contamination by lead, and toys. No studies on lead poisoning from paint, lead acid batteries, cosmetic and jewellery were found for Indonesia. This report makes several recommendations for the Indonesian government to improve environmental awareness in Indonesian society. It also identifies several gaps that need to be filled for future research on lead poisoning in Indonesia.

INTRODUCTION

This report is a literature review about lead poisoning in Indonesia. It forms part of my work for an internship with The LEAD Group Australia. I am interested in lead poisoning and lead contamination in Indonesia, especially in rural areas. However, there is very limited information available. The aim of this report is to identify what lead poisoning or lead contamination there is in Indonesia. It reviews studies on blood-lead levels. This report also looks at Indonesian regulations concerning lead in consumer products. Finally, the report provides two fact sheets to help people to avoid exposure to lead both at home and in the workplace in Indonesia.

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Introduction

Lead poisoning was recognized by ancient Egyptian and Greek physicians 5000 years ago. It is considered as one of the oldest diseases in human history (Graef 1997). In recent years, lead poisoning has been recognized as a serious environmental health problem throughout the world, particularly, for poor children in developing countries (Meyer et al 2003). Lead can cause serious illness for young people, especially to brain development. It can reduce the level of IQ, cause impaired growth and harm kidneys. Severe poisoning can induce coma, or cause death. (WHO HECA undated, post-2002).

The following are the *pathways* (means by which) lead poisoning can occur: ingestion (eating or accidentally swallowing), inhalation (breathing in), skin absorption, or via the placenta of a mother who herself is lead-poisoned.

Sources of lead poisoning can include emissions from vehicles using leaded petrol and from base metal mining, smelting or lead manufacturing or recycling industries, dust, soil, paint, toys, jewellery, drinking water, candies, ceramics, folk medicine and cosmetics (DHOCNY 2007). Lead enters the human body when people breathe, eat, swallow or drink any substance that contains lead. Water is contaminated when it flows through a pipe or brass fixture that contains lead (DHOCNY 2007). Lead-based paint usually has a sweet taste that appeals to children to swallow or put in their mouth. Moreover, lead from fuel can contaminate soil, and increase the blood lead level of children in urban areas (CHW & HCHN 2008), as a result of contact with the soil.

In Indonesia, children who live in urban areas with higher traffic density have a higher risk of lead poisoning.

"Our data indicate that Indonesian children living in urban areas are at increased risk for blood lead levels above the actual acceptable limit. Activities to reduce pollution (e.g., reduction of lead in gasoline) and continuous monitoring of lead exposure are strongly recommended." (Heinze et al 1998). In addition, the increasing number of industries in Indonesia has been associated with rising heavy metal pollution in several areas, such as in Jakarta and Dumai Riau. (Amin 2001, Anggarini 2007, Lestari and Edward 2004). Moreover, in recent news reported that lead was found in toys imported from China. Interestingly, the amount of lead in these toys is four times than the voluntary Indonesian standard (Qamariah, 2007). It is also presumed in some places, such as rural areas, lead contamination is higher, due to unknown or lack of information of lead's effect, particularly for people who work as labour in waste recycling and painting industries.

BACKGROUND

Lead is a heavy metal that occurs naturally in the form of metallic ore, and also in the fumes of volcanoes, and can be found throughout the environment (WHO HECA undated). Because of increasing human activity, such as mining and smelting, and the use of lead in petrol and a myriad of other manufactured products, the level of lead in the biosphere has risen in the past 300 years (NHMRC 2009). Lead can get into the environment and human body from various sources such as gasoline (petrol), recycling and dumping of car batteries, toys, paint, pipes, soil, some cosmetic and traditional medicine products and many other sources (WHO 2007). In most developing countries, the main sources of lead exposure comes from leaded gasoline. Consumer products and food can also contain lead. (Meyer et al 2003).

Lead poisoning can affect people at any age. However, young children, pregnant women and certain workers are most likely to be higher at risk than other groups (Kessel I & O'Connor 1997). Children are likely to be more sensitive to lead poisoning than adults because their central nervous systems are still developing (Albalak et al 2003). In addition, children spend time playing on the floor, or on the ground outdoors, exposed to soil and dust which may be contaminated with lead. Children also play with toys and often put them in their mouths. The toys may contain lead (Kessel I & O'Connor 1997). Women who are exposed to lead also have higher risk of causing lead poisoning in their children during pregnancy

and breastfeeding because lead ingested by the mother can cross the placenta and affect the unborn foetus or the baby (NHMRC 2009). Whereas a foetus's blood lead level can be equal to or even greater than the mother's (Tait et al 2002), the amount of lead in breast milk is only 1-5% of the lead in the mother's blood (Nigro and O'Brien 1998).

Certain workers, such as those working in mining, plumbing or painting industries, have a greater chance of being lead poisoned at work. (Kessel I & O'Connor 1997).

Lead is extremely toxic if absorbed into the body (Kessel I & O'Connor 1997). Since lead has been identified in Egyptian times, there are a number of reports indicating lead poisoning in people of ancient times. (Pueschel et al 1996). The US Centers for Disease Control and Prevention define lead poisoning as a blood lead level greater than 10 micrograms per deciliter (µg/dL) (Albalak et al 2003). Furthermore, lead poisoning among adults is associated with high blood pressure on a population basis; miscarriage, male infertility, kidney malfunction, loss of hand coordination, hearing problems, anemia, deafness, and nerve damage problems such as slowing of reaction time (Kessel I & O'Connor 1997).

The effects of lead exposure for child health are numerous, including reduction in IQ development, hyperactivity, learning difficulty, behaviour problems such as inattentiveness and aggressiveness, hearing loss and impaired growth (Meyer et al 2003). Levels of blood lead over 50 µg/dL can cause kidney damage and anemia. The concentration of lead 100 micrograms per deciliter in a child's blood may cause serious illness, coma, convulsion or death (Kessel I & O'Connor 1997).

[The World Health Organisation (WHO) has not set a guideline value for lead in blood but Fewtrell et al (2004) estimated for the WHO in 2004 "that 20% of all children have blood lead levels above10 µg/dL and that most of these children live in developing countries" (Clark et al 2009). Ed.]

FINDINGS OF BLOOD LEAD STUDIES IN INDONESIA

There have been several blood lead studies in Indonesia (Albalak et al 2003, Heinze et al 1998, Browne et al 1999, Adriyani and Mukono 2004, and Chahaya et al 2005). Most of these studies are focused on blood assessment in urban areas with higher traffic densities. The studies also concentrated on young children, particularly those in primary schools in Jakarta, Semarang and Surabaya, which are main cities in Indonesia. Also, one study, Chahaya et al 2005, focused on blood lead levels among workers in areas of high traffic. Unfortunately, no studies of lead blood level were found for rural areas. Also, no blood lead studies related to paint, lead acid batteries or waste were found. This might be due to limited research and information about the dangerous effects of lead poisoning in Indonesia, particularly in rural areas.

One study from Albalak et al (2003), done in Jakarta, found that a quarter of Jakarta school children had blood lead levels in the range 10-14.9 µg/dL, which exceeds the level of less than 10 µg/dL that the US Centers for Disease Control and Prevention regard as not lead-poisoned. [Recent research indicates that there are also dangers in having a blood-lead level below 10 µg/dL (Roberts et al 2009) Ed.]. Among those children, higher blood lead levels of more than 10 µg/dL were found in children who live near a highway or a major intersection. Meanwhile, children who live close to a street with lower traffic density were found to have lower blood lead levels. Albalak et al (2003) reported that the results for blood lead levels among children in Jakarta were moderately high and consistent compared to other countries that have phased out the lead in gasoline. It is expected that the blood lead level of children in Jakarta would decline since the removal of lead in gasoline.

In 1997, before phase out of gasoline is used in Indonesia, a study from Heinze et al (1998) found that the percentage of children who had blood lead level more than 10 µg/dL was higher among children who lived in the central district rather than in the southern district. Compared to Albalak et al study (2003), the percentage blood lead level among children who lived in Jakarta in 1997 was much higher than blood lead of children studied in 2003. The same result was also found in Semarang in 1998 (another large city in Indonesia), with higher traffic density in the highway zone (Browne et al 1999). The blood lead levels among children in Jakarta were still higher than Semarang, even if the study in

Semarang was done before phase lead out gasoline in Indonesia. It might be that traffic densities in Jakarta are higher than Semarang. Moreover, lead contamination in Jakarta is also found in soil and tap water (Heinze et al 1998). Therefore, lead contamination in Jakarta is higher than Semarang.

Another study done by Adriyani and Mukono (2004) in Surabaya (the second largest city in Indonesia) found that the blood lead levels among children in were still within level of 10 µg/dL or less. This suggests that, since the phase out of in gasoline used in Indonesia, blood lead levels in children have declined. Moreover, a study by Chahaya et al 2005, conducted in Medan, found that blood lead levels among the pedicab workers vary depending on the distance of their homes and workplaces from high traffic densities.

Unfortunately, no other studies of blood lead level resulting from other sources such as toys, car batteries and paint were found. Further investigation is needed on blood lead levels in children who live close to waste recycling and/or children who work in waste recycling. It is presumed that children who work in waste recycling possibly have a higher potential to be contaminated by lead than children who live in areas of higher traffic density.

SUMMARY OF SOURCES AND PATHWAYS ALREADY IDENTIFIED

As well as lead poisoning from gasoline, there are a number of sources of lead poisoning identified in Indonesia. These sources are also associated with other heavy metals such as cadmium and mercury (Lestari and Edward (2004), Charlena (2004), Amin B (2001), Anggarini D (2007)). Most of these studies are focused on coastal areas such as Jakarta and Dumai Riau, which are contaminated with industrial effluent.

Figure 1: Map of Indonesia with yellow pins marking (from top left to bottom right) Medan; Dumai; Malacca Strait; Dumai, Riau; Ancol Beach in Jakarta Bay; Semarang; and Surabaya.

A study by Lestari and Edward (2004) undertaken in Dadap River, Clincing and Ancol Jakarta, found that the concentration of heavy metal in Clincing and Dadap Rivers especially around Jakarta bay was: lead - 0.0027 ppm, cadmium and mercury, 0.001. Meanwhile in Ancol Beach, the concentration of lead is 0.55 ppm, cadmium, 0.1 ppm and Mercury is 0.021 ppm. The concentrations of heavy metals in Dadap River

and Clincing are considered safe, causing no harm to the marine ecosystems. In Ancol Beach, the concentration of heavy metal is considered a greater risk due to the heavy metal concentrations are higher than the threshold value of heavy metal in sea water that stated by Indonesian Ministry for Life Environment (2004). The Indonesian Ministry for Life Environment (2004) stated that threshold values for heavy metals in sea water are 0.008 ppm for lead, cadmium is 0.001 ppm and mercury 0.001 ppm. It is interesting, because Ancol Beach is one of the tourist areas in Jakarta Bay. The tourists and local people might possibly be subjected to contaminated lead, particularly if they consume locally caught seafood.

Another study by Amin B (2001) in Dumai in Riau province, found that the sea water in Dumai beach was contaminated with lead and copper, but lead contamination was considered not dangerous for the marine ecosystem. Amin B et al (2005) did the same study in 2005 and found that the concentration of lead increased but it was still under the threshold. However, in 2007 a study by Angraini D (2007) in coastal Dumai found that the concentration of lead at the beach was higher than previous studies done by Amin B (2001 and 2005). The concentration of lead in seawater was 1.8 ppm and in sediment 64.2 ppm, which is higher than the threshold value. The concentrations of this heavy metal are considered dangerous for marine ecosystems, particularly mangrove forest, fishes and oysters. It is well known that most people in Indonesia, particularly in coastal areas, consume seafood such as fish, prawns and oysters because the prices are cheaper and the food is readily obtainable. Therefore, the possibilities of lead contamination in coastal areas such as Dumai are higher because Dumai beach is mostly used for fishing, and it would be a problem for local people who consume seafood from the beach.

It is presumed that the heavy metal contamination of sea water in Jakarta and Dumai in Riau province originate from industrial effluent, because the beaches in these areas are located close to the industries (Lestari and Edward 2004, Amin 2001, Anggarini 2007. Local people who live in these areas have a higher risk of lead contamination, particularly for seafood consumption. However, in some coastal areas of Indonesia, fish are still safe to consume, although they may be contaminated with lead. One study from Ikram et al (2008) in Malacca Strait found that the concentration of lead in Kerisi fish is safe to consume, because the lead concentration is below the threshold (lead 0.002 ppm, cadmium and mercury are 0.001 ppm).

Another source of lead contamination that has been identified in Indonesia is related to vegetables (Charlena 2004). A study from Charlena (2004) found that phosphate fertilizer which is mostly used by Indonesian farmers contains lead in the range of 5- 156 ppm. The study predicts that lead concentrations in soil increase when the fertilizer is used continuously. In addition, pesticides and herbicides have contributed to increasing the amount of lead in the soil. Most Indonesian farmers use pesticides and herbicides to protect crops and maximize yields. Charlena (2004) found that pesticides and herbicides that are used on vegetables such as carrots, potatoes, red onions, red chillis and cabbages in West Java and Central Java are considered dangerous. Rosen CJ (2002) noted that lead is likely to accumulate on vegetable leaves and on the roots. Rosen CJ (2002) also stated that the threshold of lead on the soil should be less than 300 ppm. The crops that grow in the soil containing lead at more than 300 ppm are considered dangerous to consume (Rosen CJ 2002). In Bogor, West Java, where traffic densities are higher than elsewhere in the area, it was found that vegetables and tea plantation were contaminated with lead from gasoline (Abahjack 2010). The concentration of lead on the plants was possibly higher because of chemical fertilizer. AbahJack (2010) noted that the concentration of lead on vegetables and in tea plantations in Bogor is more than the WHO threshold standard for vegetables (WHO threshold: 2 ppm for wet weight and 2.82 ppm for dried weight) (AbahJack 2010).

Lead contamination in toys in Indonesia has been determined as dangerous. Most toys contaminated with lead are imported from China (Qamariah 2007). In recent news, it was reported that in Jakarta a number of children in primary school were poisoned when playing with toys from China (Sinar Indonesia 2010). A study conducted by the Indonesian Association of Educative and Traditional Toys found that about 80% of toys in Indonesia contain lead four times above (Sinar Indonesia 2010) the voluntary

Indonesian National Standard (SNI) for toys (BSN 2009). The Chinese standard for lead in paint and consumer products is 90 ppm (Barboza 2007) [clearly not always enforced. Ed.]. Indonesia has no regulation limiting lead in consumer products.

OTHER SOURCES WHICH MAY NOT HAVE BEEN IDENTIFIED YET IN INDONESIA

Based on my personal experience and knowledge about lead contamination in Indonesia, I presume that a lot of lead sources have not been identified or studied, especially lead contamination in waste and batteries. In Indonesia, waste management is not managed properly. Mostly, people burn waste because there is no waste collection, particularly of household waste. It could be dangerous for health because wastes are not separated and may contain hazardous material, not only lead.

The plastics industry in Indonesia is considerably huge, manufacturing such things as plastic bags, household homewares, shoes, toys, etc. The recycled materials used in this industry also are not regulated. In a Swedish study (SSNC 2009) of heavy metals in plastic shoes, Indonesian shoes revealed the highest level of cadmium, nearly five times higher than any other shoe tested. The level was 117 mg/kg, which is above the level of 100 mg/kg allowed in the European Union's (EU) Flower eco-labelling criteria for shoes. Two of the four Indonesian shoes tested also contained more than the EU Flower criterion for lead in shoes, of 100 mg/kg. The results were 915 and 389 mg/kg in two different brands of flip-flops (called “thongs” in Australia) made in Indonesia (SSNC 2009). Some national industry associations (eg in Sweden and Australia) have voluntarily banned the use of lead and cadmium as stabilisers in plastics, but they are clearly still used in Indonesia (SSNC 2009, Vinyl Council of Australia 2008).

In Indonesia, there is a lack of information about the toxics contained in consumer products, the dangers of burning municipal waste and specifically the dangerous impact of lead on health. By comparison in the United States, frequent recalls of consumer products which contain lead and other hazardous materials notify the public to be wary of toxics, especially in products imported from China. For instance, over 340 different products have been recalled for excessive lead levels in the US including Toys, Jewelry and Accessories, Furniture, Crafts, Office Supplies, Foodware and Clothing (CDC 2010). The plastic products recalled for too much lead, included vinyl diaper bags and baby change mats, baby bibs, (Kukac 2008), sunglasses, jewellery, children’s books, plastic-coated magnets and other toys (CDC 2010). Most kids in the countryside in Indonesia love to play with waste. They also collect it to sell for recycling. As a child I used to play with burning plastic, which possibly contained lead.

Figure 2: Kohl eye cosmetic may contain lead

Furthermore, e-waste in Indonesia is unregulated. Kids are usually used to separate parts of the e-waste to sell.

Other possibilities for lead contamination in Indonesia are cosmetics, jewellery and paint. Kohl is an eye cosmetic, similar to mascara, mostly used by women in Middle East. It is a precious gift for Indonesians during the pilgrimage season. A study by Ashban et al (2004) found that most of the kohl from Saudi Arabia is contaminated with lead. In addition, some jewellery from China was found to contain toxic chemicals such as lead and cadmium (Nugraha F 2010). This jewellery has a potential to cause lead poisoning in Indonesia because the product is cheap and easy to find in the market.

Lead sources in paint have not been identified because of lack of information; therefore most people in Indonesia are not aware that paint may possibly be harmful to their health.

INDONESIAN REGULATIONS CONCERNING LEAD IN CONSUMER PRODUCTS

So far there are no regulations controlling lead in paint and other consumer products in Indonesia. Following rising concern about lead contamination of toys from China, many organizations in Indonesia demanded the government make regulations for consumer products, particularly toys (Sinar Indonesia 2010). Safety standards for consumer products is essential in Indonesia, particularly since the free trade agreement with China under the Association of South East Asian Nations (ASEAN) was signed (Sugiarta 2010). According to Danang (Chief of Toys Association in Indonesia) safety standards for toys in Indonesia have been compiled as a draft by the Industries Ministry, but it is still not finished. It is hoped that in 2011 Indonesia will have regulations controlling lead and other hazardous material in consumer products (Sinar Indonesia 2010).

In 1997/1998, Indonesia banned leaded gasoline and replaced it with unleaded gasoline (Hamonangan 2004). Since the removal lead from gasoline in Jakarta, it has been found that the concentration of lead in the air is decreasing every year. However, some areas such as Palembang, Ambon and Sorong still used leaded gasoline, and the amount of lead in the air in these areas is higher than in other parts in Indonesia (KPBB 2008). The report was examined data from 2006. It showed that in some country areas such as Palembang, Ambon and Sorong, gasoline industries were still manipulating ordinary people who lack knowledge about the harmful effects of leaded gasoline. The government needs to look into the question of fuel supply in country areas. Corruption and bribery between 2002-2006 was causing leaded petrol to still be sold, well beyond its phase-out date. (US SEC 2010, Rayda 2010)

[Petrol sold in Indonesia is not labelled as either unleaded or leaded. Ed.]

COMMENT ON OTHER LIKELY SOURCES AND PATHWAYS

Based on study finding in Dumai Riau and Malacca Strait (Lestari and Edward 2004 and Ikram et al 2008), the concentration of lead in seawater varies depending on the distance from industrial areas. However, in general it is likely that marine biota in coastal Sumatra island is safe, particularly in Malacca strait. But in some areas such as in Dumai, which is close to industries, there is need for more evaluation and monitoring from government, especially of seafood, because most people in Indonesia, particularly in Sumatra are likely to consume fish and other seafood products. Further investigation is needed on Jakarta Bay, especially at Ancol and other beaches that are close to the bay. Being a tourist area, the marine ecosystems and the environment surrounding the beaches must be free from lead contamination, because otherwise it may cause a decline in tourism as well as of natural resources.

Lead contamination of vegetables and in tea plantations

The government must be aware that lead contamination of vegetables and tea will be a problem for Indonesia in the future. The best place for market gardening and tea plantations in Indonesia may be far from urban areas where lower traffic densities are [though this adds to transport costs and increases greenhouse gas pollution, Ed.]. In any case, there needs to be a farming policy, monitoring and regulation by the government.

Lead poisoning in toys

The Indonesian government must become more serious about preventing lead poisoning of Indonesian children. Third parties outside Indonesia, who have more power, must pressure the government to create regulations for consumer products. The government should be aware that many consumer products, especially from China are dangerous, therefore regulations are essential to protect the Indonesian people.

RECOMMENDATIONS FOR FURTHER RESEARCH ON LEAD POISONING IN INDONESIA

Based on studies in the earlier part of this report, there is a need for more evaluation or investigation or research on lead poisoning in Indonesia.

1. Exposure to leaded paint needs to be investigated as a source of lead poisoning

[Clark et al (2009) tested 11 samples of household paint purchased by an Indonesian member organisation of the International POPs Elimination Network, from retail shops in Indonesia accessible to the public in 2009. Following purchase, the paint tins were shipped to Cincinatti, opened, stirred and brushed out on to unused wooden blocks. Each stirring utensil and paint brush was used only once. Paint scrapings from a measured area of the wood were carefully removed with a clean blade, and sent to a lab for lead analysis. The paints were made by four different paint companies, two of which were found to have at least one sample with lead greater than 1%. The average of the 11 samples was 1.5% lead (Clark et al 2009). Household paint sold in Australia since 1970 was limited to a lead content of less than 1% (DEWHA 2009). Seventy three percent of the samples tested exceeded the 1978 US Standard which limited lead in paint to 0.06% (Clark et al 2009). Ed's note]. Regulation, further testing of the blood lead of children, in which parents are surveyed about children's exposure to paint or paint renovation dust is necessary. This would help establish to what extent paint, which is not required in Indonesia to be lead-free or low-lead, has an effect on children's exposure to lead.

2. Lead-based paint, batteries, e-waste, jewellery and cosmetics

Everyone with a house or furniture or other painted goods should be made aware of the danger of lead poisoning. [With houses and painted goods the danger from leaded paint comes when the paint is removed, e.g. by sanding, for the purpose of repainting, or if the paint is peeling off due to weather, etc. The danger is if the paint flakes or dust are ingested, usually by contact with them, then not washing one's hands before eating. The dust may also be inhaled. Ed.]

Cathode ray tubes (in TVs and computer monitors) are one type of e-waste material that contain lead and may be dangerous for human health. It is well known that in Indonesia electronic waste is not managed properly. Most people, including children, have access to using dumped electronic equipment or selling it for recycling. Due to lack of information and education about the environmental hazards, the people are not aware that lead acid batteries and e-waste may cause serious illness. It is commonplace in Indonesia for people to separate some part of batteries to sell for recycling or to burn as a way of getting rid of garbage.

[Only lead acid batteries contain lead. These are the rectangular ones, not the small, mostly cylindrical batteries as used in household items like torches. One household battery is rectangular. However, most batteries contain toxic heavy metals, even if not necessarily lead. Ed.]

As a result of growing concern about lead in jewellery and cosmetics, the Indonesian government or other interested parties need to carry out more research about lead poisoning related to jewellery and cosmetics. It is essential to determine if people have been poisoned with lead from those products. The results of that study could be used to make recommendations to the government to develop a policy about consumer products imported by Indonesia.

3. Lead poisoning in rural area and children who work on waste recycling

As mentioned previously, I have not found any research about lead poisoning in rural areas. Therefore, it is suggested that there needs to be a study of lead poisoning in the countryside, especially among children working in waste collection. In addition, there also needs to be blood-lead level testing of children who work or live close to waste collection. It would be useful to identify any serious problems of lead poisoning among the children and their communities. By identifying the serious condition of people contaminated with lead, the government and communities can develop solutions to improve their health and reduce their blood lead levels. Also it would help prevent lead contamination in the future. (See: O'Brien and Roberts 2008)

FACTSHEET

Prevention of Exposure to Lead at Work in Indonesia

Which occupations have more risk of high lead exposure?

Shooters and especially shooting instructors (eg in the Police and Armed Forces) are at particular risk of high lead exposure because they typically use lead bullets. Risks are higher for shooters who practice in indoor shooting ranges (if these exist in Indonesia) (Rainier Ballistics Corporation 1992). People who have been shot but survived and have retained lead shot or bullet fragments in their bodies should have regular blood lead tests for the rest of their life, to determine whether lead is leaching from the lodged lead fragments into the bloodstream (LLSBS 2010). Cleaning and maintenance workers at shooting practice ranges are also at risk from the lead dust which (is emitted every time a gun is fired and) collects on soil, floors and other surfaces (MWSHP 2002).

There are many workers who are at serious risk of high lead exposure, particularly those workers in industries where activities as following are done:

1. Lead acid batteries manufacture and breaking [the plastic casing of a battery has to be broken in order to remove the lead plates for re-use of recycling]
2. Lead smelting, alloying, casting and refining
3. Ceramic glaze mixing
4. Removal and burning of lead old paint
5. Spray painting of vehicles
6. Renovating infrastructure or buildings where lead-based paint was used
7. Lead fishing weight production
8. Manufacturing lead compounds and lead glass
9. Recovering lead from scrap or waste
10. Steel bridge maintenance
11. Brass, copper and lead foundries
12. Radiator manufacturing and repair
13. Car or boat maintenance
14. Working with assay laboratories
15. Furniture refinishing

People who work in electronic, plumbing and printing industries may also be at risk of exposure to lead, but the percentage is lower than people who work on the above activities (Source: HSE UK 2009, WorkSafe BC 2006 and Oregon DHS 2007).

How to prevent lead exposure in the work place

The first principle of preventing lead exposure at work is to institute the HIERARCHY OF CONTROLS (NSW WorkCover (2008) which are:

1. substitute the lead hazard with another of lower risk
2. isolate the lead hazard from the person put at risk
3. minimise the lead risk by engineering means
4. minimise the lead risk by administrative means
5. provide personal protective equipment (PPE)

In more detail:

1. Replacing lead material with non-lead material is one of the most effective ways to prevent lead exposure in the workplace. However, the replacement material needs to be safe and not contain hazardous material.
2. Isolating the lead hazard, e.g. having a fume cupboard, where the worker can carry out the task without coming into direct contact with the fumes.
3. Engineering control to eliminate lead exposure includes improving exhaust ventilation of the work area, and modified work processes to eliminate lead exposure.
4. Administrative means of reducing lead exposure: Increase awareness of workers about lead hazards in the workplace. This includes education and training in safe work procedures, maintenance of equipment, provision of separate food consumption areas, provision of good facilities for showers and hand-washing, and advice on safety hygiene, such as not biting one's nails or chewing gum while during processing, washing hands before eating or drinking, removing work clothes and taking a shower before going home.
5. Equipment must be used in workplace to minimize lead exposure. This equipment may include safety clothes and respirators that are washed regularly and remain in good condition.

Lead exposure in the workplace can prevent by minimizing the amount of lead with which the workers come in contact. All employers in lead industries must provide an exposure control plan to minimize the exposure of their employees to lead (WorkSafe BC 2006). Furthermore, signs must be posted in work areas containing hazardous material in order to warn the workers of potential hazards. In addition, the workers should always wear safety equipment and make sure the equipment is safe and in good condition. Exposure to dust and fume system collection also should be limited in the workplace (DHS 2010). It is also essential for employers to provide training and information to work safety with lead in all conditions whether it emergency or not (HSE UK 2009). Also, employers are required to monitor air quality in order to determine the level of lead exposure in workplace. If air quality in the workplace contains lead above 30 microgram per cubic meter (ug/m3), employers must provide medical examination, including a blood-lead test every six months (permissible workplace exposure is below 50 ug/m3). If the employee has a high blood-lead level, the employer must transfer the employee to work in an area where they are not exposed to lead, and guarantee the employee the same benefits as their regular job (DHS 2010).

FACTSHEET

How to Protect Your Family from Lead in Indonesia

FOR INDONESIAN PEOPLE EXPOSED TO LEAD AT HOME

In order to protect their family from lead exposure, people who work with lead must ensure that they not take lead dust home on their clothes. This can be done in several ways, including using separate clothes and shoes while at work, showering and removing work clothes before returning home, putting work clothes in a plastic bag, washing them separately from other clothes, cleaning the washing machines afterwards to remove the lead from the machine.

For people who have hobbies that involve working with lead: keep the work away from children and pregnant women (DHS 2010).

Protecting children from exposure to lead

There are several steps parents can take to protect children from lead exposure.

1. Find information from the local health department about lead in drinking water. If the lead concentration in drinking water is higher than 0.010 milligrams per litre (0.010mg/L), find a water source that is safe to consume.
2. Use cold tap water for cooking or infant formula and let the tap water run approximately one minute before consuming. [This is because the heating system for water will probably contain leaded brass or bronze fittings. Ed.]
3. Wash children's hands often to rinse off any lead dust or dirt, especially before meals.
4. Use dishes that are free from lead. Some dishes may contain lead, especially chipped or cracked dishes.
5. Wipe the floor or any surfaces with wet material twice a week to eliminate dust (which may contain lead).
6. Avoid food from cans that contain lead, use glass or lead-free plastic storage to store food from cans. Cans that contain lead have a raised seam.
7. Wash children's toys frequently, and throw away toys that have flaking paint.
8. Avoid planting vegetables in soil that possibly contains lead - such as in wasteland.
9. If removing peeling paint, or carrying out painting, always wear safety clothes and gloves. Keep children away from peeling paint and the renovation site, and mop any dust from the peeling paint with wet material.
10. Protect very young children who are not yet crawling by putting down a clean, washable sheet on the floor as a play area.
11. Contact local health department to find any professional workers who can help to remove lead based paint.

(Source: Yayasan Tambuhuk Sinta 2010 and DHOCNY 2007).

Good food and nutrition is another way to protect against lead being absorbed by the body. Food containing iron and calcium is protective. Iron can be found in most meat, green vegetable, eggs, tuna and whole grain. Calcium can be found in dairy products such as milk and yogurt. It is also found in ice cream, cheese and milkshakes. Children should also eat sufficient food, because children with an empty stomach may absorb more lead into the body (DHOCNY 2007).

CONCLUSIONS AND RECOMMENDATIONS

In conclusion, lead poisoning is an environmental problem that can be found in many part of the world. Since lead used in many consumer products, it is important that there be public awareness of the harmful effects of lead. As a developing country, Indonesia may be at risk of high lead exposure due to limited information and awareness of lead poisoning.

This report has identified several studies about lead poisoning in several areas in Indonesia. Due to limited information and research time, this report has only identified lead poisoning in urban areas. Therefore it is suggested that a study on lead poisoning in rural areas is needed. Collaboration with Balifokus is also recommended because the Swedish Society for Nature Conservation (SSNC) plastic shoe study (SSNC 2009) notes: "In collaboration with the SSNC, Balifokus has launched the Indonesia Toxics Free Network to support and teach other environmental organisations in their work on chemicals issues."

In order to increase community awareness of lead poisoning in Indonesia, there are several recommendations suggested in this report. These recommendations include:

1. Improve the education or training about lead poisoning, especially for people who live in rural areas where there is a lack of information and awareness about lead poisoning and other environmental diseases. By providing information about the sources of lead and its effects on health, people may be able to take steps to avoid contact with lead that may harmful and also be able to prevent lead contaminating the environment.
2. Improve waste management for the whole country. Waste may be a source for many hazardous materials, and is one of the environmental problem in Indonesia. The government should not focus just on waste management in urban areas only. Better waste management would help society eliminate burning waste and hazardous material. In addition, it would improve environmental health and eliminate other environmental diseases in the society.
3. Improve environmental policy. The current environmental policy needs to be improved by addressing the potential source of environmental hazards. For example, as mentioned previously, agricultural land should be separate from urban areas and traffic densities in order to eliminate lead contamination of vegetables or paddy rice. In order to manage farming areas, the government needs to urge businesses to not build close to farming areas.
4. Demand that the government regulate lead content of consumer products. This is important, especially since Indonesia has entered into free trade agreements.

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