LEAD IN PLAYGROUND EQUIPMENT IN MALAYSIA

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PULAU PINANG

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This report presents new data on the total lead content of painted playground equipment found in public parks managed and maintained by local governments. The report also recommends action steps by different stakeholders to protect children from exposure to lead.

This report was undertaken as part of IPEN´s Global Lead Paint Elimination Campaign. It was conducted in Malaysia by the Consumers' Association of Penang (CAP) in partnership with IPEN and funded by the Swedish Government. Responsibility for the content lies entirely with IPEN and CAP, and the Swedish Government do not necessarily share the expressed views and interpretations.

Established in 1998, IPEN is an international NGO network of over 500 health and environmental organizations from 121 countries, mostly developing and transition countries of which CAP participates to establish and implement safe chemicals policies and practices that protect human health and the environment. IPEN's mission is a toxics-free future for all. IPEN helps build the capacity of its member organizations to implement on-the-ground activities, learn from each other's work, and work at the international level to set priorities and achieve new policies. Additional information materials about IPEN's Global Lead Paint Elimination Campaign can be accessed at **https://ipen.org/projects/eliminating-lead-paint**.

The Consumers' Association of Penang (CAP), based in Malaysia, was founded in 1970. Its primary aim is to ensure a sustainable model of development that meets the basic needs of the poor and is also socially just and sustainable. In the field of environmental protection, CAP is a fearless advocate of the people's right to a healthy and sustainable environment, challenging the unsustainable model of production and wasteful consumption patterns. Through the years, CAP's work has led to the exposing of unethical business behaviour, hazards in products, food and pharmaceuticals. CAP's advocacy has led to improvements in the laws to regulate these practices.

Consumers' Association of Penang (CAP)
10, Jalan Masjid Negeri, 11600 PENANG, Malaysia
www.consumer.org.my

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1. BACKGROUND

1.1 BRIEF OVERVIEW OF HEALTH AND ECONOMIC IMPACTS OF LEAD EXPOSURE

Children are exposed to lead from paint when surfaces painted with lead-containing paint begins to chip or deteriorate, since this causes lead to be released to dust and soil.[1] This is then ingested through normal hand-to-mouth behavior by children.[2] They might also pick up paint chips and put them directly into their mouths, which can be especially harmful since the lead content is typically much higher than what is found in dust and soils. When toys, play equipment, or other articles are painted with lead paint, children may directly ingest the lead-contaminated, dried paint when chewing on them.[3] Playground equipment can also be a direct source of exposure since children will get lead paint on their hands when playing.

Lead exposure is especially harmful to children, especially aged six and under. Once lead enters a child's body through ingestion, inhalation, or across the placenta, it has the potential to damage several biological systems and pathways. The primary target is the central nervous system and the brain, but lead can also affect the blood system, the kidneys, and the skeleton.[4] Lead is also categorized as an endocrine-disrupting chemical (EDC).[5]

According to the World Health Organization (WHO): "There is no level of exposure to lead that is known to be without harmful effects."[6]

When a young child is exposed to lead, the harm to her or his nervous system makes it more likely that the child will have difficulties in school and engage in impulsive and violent behavior.[7] Lead exposure in young children is also linked to increased rates of hyperactivity, inattentiveness, failure to graduate from high school, conduct disorder, juvenile delinquency, drug use, and incarceration.[2] Lead exposure impacts on children continue throughout life and have a long-term impact on a child's work performance, and—on average—are related to decreased economic success.

A recent study investigating the economic impact of childhood lead exposure on national economies in all low- and middle-income countries estimated a total cumulative cost burden of $977 billion international dol-

lars* per year.[8] The study considered the neurodevelopmental effects on lead-exposed children, as measured by reduced IQ points, and it correlated lead exposure-related reductions in children's IQ scores to reductions in lifetime economic productivity, as expressed in lifelong earning power.

1.2 THE USE OF LEAD IN PAINT

Paints contain high levels of lead when the paint manufacturer intentionally adds one or more leaded compounds to the paint for some purpose. A paint product may also contain some amount of lead when paint ingredients contaminated with lead are used, or when there is cross-contamination from other product lines in the same factory. Leaded paint ingredients are most commonly used in solvent-based paint due to their chemical properties, and solvent-based paints sold for home use have been found to contain high levels of lead in many countries.[9-11]

Reports from around the world highlight lead paint as a hazard in places frequented by children such as public parks, recreational areas, and playground facilities, as well as in children's articles such as toys and play equipment. Scientific studies conducted in Australia, Brazil, England, India, Israel, Japan and South Africa all detected high lead levels in playground equipment, and where analyzed, high levels of lead in the surrounding soil, dust and sand.[12-18] Equipment with high lead levels were commonly coated with yellow or red paint, indicating the use of lead pigments for both decorative and anti-corrosive purposes. Studies of dust collected from playground equipment in Australia, France and China attributed the lead content to lead paint on the structure.[12, 19-20] The geographical spread of these results suggests that use of lead paint on playground equipment is of global concern.

Paints without added lead have been widely available for decades and are used by manufacturers producing the highest quality paints. When a paint manufacturer does not intentionally add lead compounds in the formulation of its paints and takes care to avoid the use of paint ingredients that are contaminated with lead, the lead content of the paint will be very low—less than 90 parts per million (ppm) lead by dry weight, and frequently down to 10 ppm or less.

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* An International dollar is a currency unit used by economists and international organizations to compare the values of different currencies. It adjusts the value of the U.S. dollar to reflect currency exchange rates, purchasing power parity (PPP), and average commodity prices within each country. According to the World Bank, *"An international dollar has the same purchasing power over GDP as the U.S. dollar has in the United States."* The international dollar values in this report were calculated from a World Bank table that lists GDP per capita by country based on purchasing power parity and expressed in international dollars.

Most highly industrial countries adopted laws or regulations to control the lead content of decorative paints beginning in the 1970s and 1980s. Many also imposed controls on the lead content of paints used on toys and for other applications such as in playground equipment which highly likely contributes to lead exposure in children. These regulatory actions were taken based on scientific and medical findings that lead paint is a major source of lead exposure in children, and that lead exposure in children causes serious harm, especially to children aged six years and under.

The current limit for decorative paints in e.g., the U.S., the Philippines, and India is a total maximum lead content of 90 ppm, and adherence to this ensures that a manufacturer can sell its paint anywhere in the world. This limit is also recommended for all paints, including paints for industrial applications, in the *Model Law and Guidance for Regulating Lead Paint*,[21] which was developed by the Global Alliance to Eliminate Lead Paint (GAELP) and published by the UN Environment Programme.

In the USA, outdoor playground products designed or intended primarily for use by children 12 years or under are required to comply with the total lead limit of 90 ppm for paint or any similar surface coatings as per the Consumer Product Safety Improvement Act.[22]

In the Philippines, a related memorandum circular on the scope of prohibition on the use of lead paint in toys and playground equipment was issued in 2016, setting the maximum limit on lead in paint at 90 ppm. "Children's products," according to the said circular, include, among other things, "indoor/outdoor playground equipment such as slides, swings, seesaws, play pens, and playhouses."[23]

1.3 REGULATORY FRAMEWORK IN MALAYSIA

In Malaysia, there is currently no regulation in place that bans the use of lead in paint. There is a mandatory safety standard in toys intended for children below 14 years old—MS ISO 8124-3, Safety of Toys Part 3: Migration of Certain Elements—which stipulates that the maximum acceptable migration of lead in paint should not be more than 90 ppm. However, the scope of the toy standard does not cover playground equipment and is also unsuitable for this purpose since it does not take the exposure routes in playgrounds into account.

2. RESULTS

In August 2019, 10 playgrounds in Penang and Kedah states in Malaysia were visited. In each playground, painted play equipment (e.g., climbing bars and frames, posts, railings, ramps, rockers, see-saws, slides, swings, etc.) were examined and physical details, e.g., colour of painted surface, substrate type (metallic, wooden, plastic, fiberglass, etc.), and the condition of painted surface (new, old, visible chipping off or flaking) were observed and documented.

Samples of chipping paint were taken from 17 pieces of playground equipment and analysed using a handheld XRF OLYMPUS Delta Series, Delta Standard – standard performance SDD (Silicon Drift Detector), Model: DS-6500-C (DELTA Standard - Ta/Au tube).

This study shows that:

- Paint chips from 13 out of 17 pieces of playground equipment contained total lead concentrations above 90 parts per million (ppm), dry weight. In addition, 11 analysed playground equipment contained dangerously high lead levels above 10,000 ppm.
- Paint chips from seven pieces of yellow-painted equipment, three pieces of red-painted equipment, and one piece of orange-painted equipment contained dangerously high lead levels above 10,000 ppm.
- The highest lead concentration detected was 620,000 ppm in a yellow multi-layered playground equipment at a public playground in Georgetown, Penang, Malaysia.

3. CONCLUSIONS AND RECOMMENDATIONS

The high lead levels found in painted playground facilities constitute a risk of lead exposure for children who spend time playing in these environments. The study results highlight the importance of urgent actions to prohibit the production, sale and use of lead paint for all purposes.

To address the problem of lead in paint, CAP and IPEN propose the following recommendations:

For the Malaysian government to identify an agency that will take the lead in drafting a regulation that will ban the manufacture, import, export, distribution, sale and use of lead paints, i.e., paints that contain total lead concentrations exceeding 90 ppm, the limit recommended in the Model Law and Guidance for Regulating Lead Paint, developed by the Global Alliance to Eliminate Lead Paint (GAELP) and published by the UN Environment Programme.

For the local authorities and private entities in charge of managing playgrounds and childcare facilities to promote the procurement and use of lead-safe paints for painting and maintenance of playground equipment, facilities, structures, and toys offered to children. They must also ensure that proper lead paint abatement procedures are observed when repainting lead painted playground equipment to avoid the dispersal of lead dust.

For the local and health authorities to make sure that playgrounds in the country are free of hazardous substances such as lead. Periodic maintenance inspection of parks and playground environments must be carried out and the use of lead paint in playground equipment, facilities, and other painted structures must be prohibited.

For paint companies that still produce lead paints to expeditiously stop the use of leaded paint ingredients in paint formulations. Paint companies that have shifted to non-lead paint production should get their products certified through independent, third party verification procedures to increase the customer's ability to choose paints with no added lead.

For parents and teachers to raise children and students' awareness on the dangers of children sucking on or biting painted surfaces and on the importance of handwashing after playing in parks and playground environments.

For public health groups, consumer organizations and other concerned entities to support the elimination of lead paint, and conduct activities to inform the public and protect children from lead exposure through lead paint, lead in dust and soil, and other sources of lead.

For all stakeholders to come together and unite in promoting a strong policy that will eliminate lead paint in Malaysia.

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APPENDIX

MATERIALS AND METHODS

In August 2019, 10 playgrounds in the states of Penang and Kedah in Malaysia were visited. In each playground, painted play equipment (e.g., climbing bars and frames, posts, railings, ramps, rockers, see-saws, slides, swings, etc.) were examined and physical details, e.g., colour of painted surface, substrate type (metallic, wooden, plastic, fiberglass, etc.), and the condition of painted surface (new, old, visible chipping off or flaking) were observed and documented.

Seventeen samples of chipped off paint were taken and analysed using a handheld XRF OLYMPUS Delta Series, Delta Standard – standard performance SDD (Silicon Drift Detector), Model: DS-6500-C (DELTA Standard - Ta/Au tube).

The limit of detection for lead using this method is 7 ppm. To ensure accurate analyses, calibrations were performed when the XRF analyser was started.

Photos during the conduct of the activity are shown in Figure 1.

Figure 1. Photo of staff of CAP measuring lead content in paint chips obtained from playground facilities using portable XRF analyzer.

TABLE 1. LEAD CONCENTRATIONS (PPM) MEASURED IN PLAYGROUND ENVIRONMENTS IN MALAYSIA.

Playground Name and Location	Playground Facilities	Part (includes type of material)	Color	Lead Content (ppm)	Other Remarks
Fort Cornwallis, Penang	Playground equipment	Metallic handle	Red	37,400	Chipping paint
			Yellow (a)	620,000	Multi-layered, chipping paint
			Yellow (b)	73,000	Chipping paint
Taman Pekaka, Penang	Playground equipment	Metallic handle	Red	ND*	Chipping paint
			Yellow	ND	
Taman Sir Hussein, Penang	Playground equipment	Metallic handle	Orange	31,200	Chipping paint
			Yellow	44,800	
Cheeseman Road, Penang	Playground equipment	Metallic handle	Red	58,800	Chipping paint
Jalan Boundary, Penang	Playground equipment	Metallic handle	Yellow	ND	Chipping paint
Taman Lumba Kuda, Penang	Playground equipment	Metallic handle	Yellow	80,000	Multi-layered, chipping paint
Persiaran Vantage, Penang	Playground equipment	Metallic handle	Red	26,800	Chipping paint
			Yellow	26,000	
Bandar Baru, Kedah	Playground equipment	Metallic handle	Red	ND	Chipping paint
			Yellow	112	
Medan Maktab, Penang	Playground equipment	Metallic handle	Yellow	49,600	Chipping paint
Fettes Park, Penang	Playground equipment	Metallic handle	Yellow	33,400	Chipping paint
			Green	8,870	

** ND: not detected*

Figure 2. Photos of Analyzed Playground Facilities.

TABLE 2. DISTRIBUTION OF LEAD CONCENTRATION BY COLOR OF PAINTED SURFACES.

Color	No. of Painted Surfaces Sampled	No. of Samples Above 90 ppm	No. of Samples Above 10,000 ppm	Minimum Lead Content (ppm)	Maximum Lead Content (ppm)
Yellow	10	8	7	ND*	620,000
Red	5	3	3	ND	58,800
Orange	1	1	1	31,200	31,200
Green	1	1	0	8,870	8,870
Multi-layered Coatings	2	2	2	80,000	620,000

** ND: not detected*

www.ipen.org

ipen@ipen.org

@ToxicsFree