LEAD IN KENYAN HOUSEHOLD PAINT

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Executive Summary

In August, 2012, the Kenyan NGO, iLima, purchased thirty-one cans of oil-based (enamel) house paints from stores in and around Nairobi and sent samples of the paints to be tested for lead content by an accredited testing laboratory in the United States which complies with international accreditation requirements. This is, to our knowledge, the first time house paints for sale on the market in Kenya have been tested for their lead content.

Paints from eleven paint brands were tested. One or more paint sample from each of the brands tested contained high lead content – much higher than internationally recognized limits for lead in paint. This is cause for serious concern because when lead paint is used in homes or other areas frequented by children, it can result in lead exposure and serious health risks. The painted surface deteriorates with time or when disturbed, and lead from the paint then contaminates household dust and soils surrounding the home. Children ingest lead from dusts and soils during normal hand to mouth behavior. Exposure to even small amounts of lead can reduce the child's intelligence and school performance; and can also cause increased violent behavior. This is why the governments of virtually all highly industrial countries in North America, Europe and elsewhere prohibit the sale and use of leaded house paints in their countries.

The average lead concentration of the thirty-one samples of paint tested was found to be 14,900 parts per million (ppm). By comparison, the United States prohibits sale and use of house paints that contain more than 90 ppm lead: the average lead concentration of the tested paints purchased in Kenya was 165-times higher than the U.S. limit.

The highest lead concentration found in any of the Kenyan paints tested was 69,000 ppm. This is more than 750 times higher than the maximum lead content that would be allowed in house paints sold in the United States.

The paint sampling and testing activities were supervised by Dr. Scott Clark, Professor Emeritus, Environmental Health, University of Cincinnati, United States and IPEN Public Healh Advisor for Lead. The sampling was carried out by the Kenyan NGO iLima.

ILima is a registered not-for-profit non-governmental organization in Kenya specializing in promoting a toxics-free future and sustainable development approaches. 'iLima' is a word of South African origin meaning 'collective action'. The mission of the organization is to work for the realization of a healthy environment for all to live in, with special focus on the need to eliminate chemical pollution.

The sampling and testing effort was organized and supported by IPEN, an international NGO network of health and environmental organizations from all regions of the world In which iLima participates.

IPEN is a leading global organization working to establish and implement safe chemicals policies and practices to protect human health and the environment. Its 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.

Introduction

Paint manufacturers may add lead compounds to paint for one or more purposes. The most common is as pigments that are used to give color to the paint. Compounds commonly used as paint pigments include: lead chromates, lead oxides, lead molybdates, and lead sulfates. Lead compounds may also be added to paint to serve as drying agents and catalysts in oil-based paints. These make the paint dry faster and more evenly. Corrosion resistance agents are sometimes added to paints that are used on metal surfaces in order to inhibit rust and corrosion. The most common of these is lead tetroxide, sometimes called red lead.

Good, cost-effective substitutes for these added lead compounds have been in use and widely available since the 1980's and before. If a manufacturer chooses not to use added lead compounds for these purposes when formulating its paints, the lead content of the paint will be very low, almost always less than 90 parts per million. If a paint manufacturer is careful in selecting ingredients that do not contain lead as a contaminant, the lead content of the paint will often be as low as 10 parts per million of less.

In 2009, an International Conference on Chemicals Management – in which the Government of Kenya was a participant – agreed by consensus to identify lead in paint as an international priority issue of concern.[1] In response to this, in 2010, the United Nations Environmental Programme (UNEP) and the World Health Organization (WHO) jointly initiated a global partnership to eliminate the use of lead compounds in paints in order to protect public health and the environment. This partnership is called the Global Alliance to Eliminate Lead Paint (GAELP).

Because lead paints for household use are recognized to be a significant source of childhood lead exposure, they have been prioritized by GAELP and others for elimination (along with certain other paint categories likely to contribute to childhood lead exposure). GAELP's definition of lead paint includes any paint in which a lead compound is intentionally added to serve as a pigment, drying agent or some other purpose.

New lead decorative house paints are generally not an immediate source of lead exposure to children and home residents when they are still in the can or when they are being applied. However, surfaces that have been painted with lead paint will, over time, age, weather, and chip. As a result, the lead that was present in the paint accumulates in indoor dust and outdoor soils. Hazardous lead dust is also created in very large quantities when surfaces previously painted with lead paint are prepared for repainting by sanding and scraping. Children playing indoors or outdoors get dust and soil on their hands, and then ingest it through normal hand-to-mouth behavior. This is especially true for children in the six 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. In some cases, children may directly chew on painted objects or on paint chips.

Children and workers are especially at risk when surfaces that were painted in the past with lead paint are repainted or disturbed by construction or other activities. Workmen may sand, dry scrape, grind, or in other ways disturb the old painted surface and produce large quantities of dust with very high lead content.

[1] ICCM2 omnibus resolution II/4 on emerging policy issues,

Children have an innate curiosity to explore their world and engage in developmentally appropriate hand-to-mouth behavior. For example, 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.

Exposure to lead is much more harmful to children than adults, and the health effects are generally irreversible and can have a lifelong impact.[2] The younger the child, the more harmful lead can be. The human fetus is the most vulnerable and a pregnant woman can transfer lead that has accumulated in her body to that of her developing child.

Children are more biologically susceptible to lead than adults for several reasons including:

- 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 percent of ingested lead is absorbed by children, as compared with 10 percent in adults. (Pregnant women may also absorb more ingested lead than other adults).

Evidence of reduced intelligence caused by childhood exposure to lead has led the World Health Organization to list "lead caused mental retardation" as a recognized disease. WHO also lists it as one of the top ten diseases whose health burden among children is due to modifiable environmental factors[3].

In recent years, medical researchers have been documenting significant health impacts on children from lower and lower lead exposures.[4] In response, the U.S. Centers for Disease Control and Prevention (CDC) and other authorities have concluded that there is no known acceptable lead exposure level for children.

Most highly industrial countries enacted laws, regulations or mandatory standards to protect the health of their people in the 1970's and 1980's. These laws generally prohibit the manufacture, import, sale or use of lead paint for interiors or exteriors of homes, schools and commercial buildings. In recent years, these regulations have become increasingly stringent. The standard adopted by the United States imposes an upper limit of 90 ppm on total lead (dry weight) for house paints and many other paint categories. Other countries have adopted mandatory limits in the range of 90 to 600 ppm total lead (dry weight). NGOs associated with IPEN generally promote the 90 ppm standard as one that is fully achievable and maximally protective.

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[2] Childhood Lead Poisoning, World Health Organization, 2010

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

[4] Lead Poisoning, by Herbert Needleman, Annual Review of Medicine 2004,

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

NGOs and others based in approximately 25 developing countries and countries with economies in transition have in recent years tested paints on the markets in their countries. In almost all cases, the water-based (sometimes called latex, acrylic, or plastic paints) were found to not contain hazardous added lead compounds. On the other hand, in almost every country where testing was done and where there is no national law, regulation or enforced standard prohibiting lead in house paints, initial testing found hazardous lead content in most of the oil-based (enamel) house paints for sale on the market.

The Kenyan NGO iLima, with help and support from the international NGO network IPEN, purchased thirty-one cans of oil-based (enamel) house paints from stores in and around Nairobi and sent them to be tested for lead content at a certified laboratory in the United States.

The results from Kenya were generally similar to results from other developing countries which lack a national law or regulation controlling the lead content of paints. The average lead concentration of the thirty-one samples from Kenya was 14,900 ppm. NGOs and others have also sampled and tested paints in recent years in six other African countries. The corresponding results from these were: Cameroon, 23,100 ppm; Egypt, 26,200; Nigeria (two studies), 37,000 and 15,750 ppm; Senegal 5,870 ppm; South Africa, 19,860; and Tanzania 14,500 ppm.

These paint testing results suggest that in Kenya, and also in the other African countries where paint testing was done, children and others are being needlessly exposed to lead from the lead paints that coat the surfaces of homes and other buildings. This will continue and increase unless action is taken to prevent future production, import, sale and use of lead paints, especially for those applications most likely to contribute to childhood lead exposure.

Materials and Methods

Thirty-one cans of new enamel paints were purchased in retail stores in Kenya. These paints were from eleven different brands. In most cases, the selection was one white, one red and one yellow. However, in one case, a blue paint was selected. The availability of these paints in such retail establishments suggested that they were intended to be used within home environments. Excluded were automotive and industrial paints and paints designed to be used solely on metal.

Each paint sample was thoroughly stirred in the can and applied by a separate unused single-use brush to duplicate, individual, numbered, unused, wood blocks by staff of the NGO iLima following instructions provided to them by Professor Scott Clark. Each stirring utensil and paintbrush was used only once, and care was taken to avoid cross contamination. After drying, the blocks were placed in individual plastic bags and shipped for analysis of lead content to the Wisconsin State Laboratory of Hygiene in the United States.

The Wisconsin State Laboratory of Hygiene is accredited by the American Industrial Hygiene Association (AIHA) under the U.S. EPA Environmental Lead Laboratory Accreditation Program. The accreditation program operated by AIHA meets all international program requirements of ISO/IEC 17025 and subsequently ISO/IEC 17011. AIHA is a full member of the International Laboratory Accreditation Cooperation (ILAC).

The laboratory scraped paint off the wood pieces they received. The paint was then weighed into a hot block digestion tube and the paint chips digested by EHD METALS METHOD 750.1 rev.2 based on EPA method SW846 3050B. Due to limited sample, only 0.05 grams were weighed, and the final volume was 25 mL. Nitric acid was added to the paint sample and was refluxed at 95 degrees Celsius on a hot block. After the sample was allowed to cool, hydrogen peroxide was added in multiple aliquots. After the

peroxide additions, the sample was refluxed again. The sample was cooled, hydrochloric acid was added, and a final reflux was performed. Once the sample cooled, it was brought to the final volume.

Lead in the digestates was analyzed by in-house method EHD METALS METHOD 400.2 rev.3 based on EPA 200.7 and SW846 6010B. It was analyzed by an Inductively Coupled Argon Plasma Optical Emission Spectrometer (ICP-OES). The sample results are expressed as parts per million, based on the weight of the sample digested.

Results and Discussion

A total of thirty-one paint samples were tested. All were oil-based (enamel) household paints. A total of eleven paint brands are represented in the samples that were collected. All the paints were manufactured in Kenya. In most cases, three samples of each brand were purchased: usually, one white, one red and one yellow. For each of the paint brands tested, one or more of the samples had very high lead concentration

As has been found in samples in other countries, the lead concentration of the paints tended to vary by color. The yellow paint samples generally had the highest lead concentrations, averaging 38,900 parts per million lead. The red paint samples averaged 8,480 parts per million lead; and the white paint samples averaged 2,150 parts per million lead.

The following table summarizes the lead content of the paints tested by color:

Table 1

Lead Concentration (parts per million) by Color of Enamel Household Paints Purchased in Kenya

Color[1]	Number of Samples	Average ppm	Maximum ppm
Red	10	8,480	44,000
White	11	2,150	5,000
Yellow	9	38,900	69,000

[1] One blue sample contained 3,900 ppm lead.

Of the 31 paint samples tested, nine contained more than 10,000 parts per million lead. Two of these were from United brand paints; one each was from the following brands: Apex, Basco, Contractor, Ideal, Shamco, Solai and Unity.

Three samples were tested for each of ten of the eleven brands selected (all but Beaver).

- For six of these ten brands, all three of the paint samples tested contained more than 600 parts per million lead. These were: Contractor, Ideal, Shamco, Solai, United, and Unity brands. Each had a sample with lead content of 22,000 ppm lead or more.

- For Apex brand paint, one sample contained more than 90 parts per million lead but less than 600 parts per million lead; two other samples contained more than 600 parts per million lead; one of these samples contained 65,000 ppm lead.

- For Basco brand paint, one sample contained less than 90 parts per million lead, another sample contained more than 90 ppm lead but less than 600 ppm lead; the third sample contained 43,000 ppm lead.

- For Crown brand paint, two samples contained less than 90 parts per million lead; and the third sample contained 4,600 parts per million lead.

- For DuraCoat brand paint, one sample contained less than 90 parts per million lead, two samples contained more than 600 parts per million lead with the maximum containing 5,500 ppm.

Both Basco and DuraCoat paints are produced by the same company. The Basco paints tested cost about one-half as much at the DuraCoat paints tested and contained an average of six times more lead.

The lead concentration of the paints from Kenya by brand is summarized in Table 2.

Table 2

Distribution of Lead Concentration (ppm) by Brand of New Enamel Architectural Paints Purchased in Kenya

Brand	Number of Samples	Average ppm	Number greater than 90 ppm	Number greater than 600 ppm	Number greater than 10,000 ppm	Maximum ppm
APEX	3	22,300	3	2	1	65,000
Basco	3	14,500	2	1	1	43,000
Beaver	1	2,200	1	1	0	2,200
Contractor	3	10,300	3	3	1	22,000
Crown	3	1,556	1	1	0	4,600
DuraCoat	3	2,400	2	2	0	5,500
Ideal	3	20,900	3	3	1	58,000
Shamco	3	9,530	3	3	1	22,000
Solai	3	15,570	3	3	1	39,000
United	3	38,900	3	3	2	69,000

Unity	3	17,600	3	3	1	48,000
OVERALL	31	14,900	27	25	9	69,000

Table 3 presents the data for all the enamel paints purchased and tested in Kenya. All the paints were purchased in one liter cans; the paint price listed is the purchase price of one liter in Kenyan Shillings. The manufacture dates and batch numbers in the table are from the paint can label. None of the labels, in any way, indicated that the paints contain lead.

Table 3

Results of all Paint Samples Tested

Sample Number	Brand Name	PPM Lead Content	Color	Manu-facture Date	Batch Number	Date of Purchase	Price KS
KEN01	Crown	61	Strong Red	August 2012	12AUGWK32-00576	16 Aug 2012	650
KEN02	Crown	4,600	Strong yellow	November 2011	11NOVwK45-00072	16 Aug 2012	650
KEN03	Crown	Less than 15	Brilliant white	August 2012	12JULwK30-01793	16 Aug 2012	650
KEN04	Duracoat	5,500	Strong Red	Not clear	1117821	16 Aug 2012	600
KEN05	Duracoat	1,700	Strong yellow	July 2012	272243	22 Aug 2012	650
KEN06	Duracoat	Less than 5	Brilliant white	April 2012	269002	22 Aug 2012	650
KEN07	Basco	360	Strong Red	March 2012	265203	16 Aug 2012	300
KEN08	Basco	43,000	Strong yellow	Not clear	200768	16 Aug 2012	300
KEN09	Basco	Less than 15	Brilliant white	June 2012	271720	16 Aug 2012	300
KEN10	Solai	4,700	Strong Red	Not clear	Not provided	16 Aug 2012	350
KEN11	Solai	39,000	Strong yellow	Not clear	Not provided	16 Aug 2012	350
KEN12	Solai	3,000	Brilliant white	Not clear	Not provided	16 Aug 2012	350
KEN13	Contractor	22,000	Strong Red	November 2011	57429	22 Aug 2012	500
KEN14	Contractor	3,900	Dutch Blue	May 2012	62263	22 Aug 2012	500
KEN15	Contractor	5,000	White	January 2012	33087	16 Aug 2012	500

KEN16	Ideal	1,500	Strong Red	September 2011	0805911	16 Aug 2012	300
KEN17	Ideal	58,000	Strong yellow	Not clear	Not indicated	16 Aug 2012	300
KEN18	Ideal	3,200	Brilliant white	December 2011	01/027/1.2	16 Aug 2012	300
KEN19	United	44,000	Strong Red	December 2009	1200628	22 Aug 2012	350
KEN20	United	69,000	Strong yellow	December 2011	1200727	22 Aug 2012	350
KEN21	United	3,700	Brilliant white	December 2010	1200801	22 Aug 2012	350
KEN22	Shamco	3,200	Strong Red	May 2012	1205004	16 Aug 2012	350
KEN23	Shamco	22,000	Strong yellow	July 2012	1207080	16 Aug 2012	350
KEN24	Shamco	3,400	Brilliant white	April 2012	1208008	16 Aug 2012	350
KEN25	Apex	1,600	Strong Red	Novemer 2011	1801011	22 Aug 2012	500
KEN26	Apex	65,000	Strong yellow	September 2011	761911	22 Aug 2012	500
KEN27	Apex	190	Brilliant white	Novemer 2011	4011111	16 Aug 2012	350
KEN28	Unity	1,900	Strong Red	December 2010	None given	22 Aug 2012	350
KEN29	Unity	48,000	Strong yellow	December2010	None given	22 Aug 2012	350
KEN30	Unity	2,900	Brilliant white	December2010	None given	22 Aug 2012	350
KEN31	Beaver	2,200	Brilliant white	No date	No Batch	16 Aug 2012	400

Conclusions and Recommendations

Of the 31 samples of enamel house paints purchased in Kenya and tested, 27 had lead content greater than 90 parts per million lead and would not be permitted for sale or use in the United States. Twenty-five of these had lead content greater than 600 parts per million lead and would not be permitted for sale or use in most highly industrial countries. Nine had lead content greater than 10,000 parts per million lead.

Because lead household paints are commonly available for use in Kenya, children and others are being needlessly exposed to lead from the lead paints that coat the surfaces of homes and other buildings. This will continue and increase unless action is taken to prevent future production, import, sale and use of lead paints, especially for those applications most likely to contribute to childhood lead exposure.

The sale and use of household paints is growing rapidly in most developing countries including Kenya with the growth of the middle class. This suggests that urgent national action is needed to eliminate the production, import, sale and use of lead household paints in Kenya as well as paints for other applications likely to contribute to childhood lead exposure. In addition, since many homes and schools already are coated with lead paints, initiatives are also need to protect children and others from these legacy paints.

Recommendations

1. The Government of Kenya should establish a national regulatory framework to control the manufacture, import, sale and use of lead paints with priority to those paints most likely to contribute to childhood lead exposure.
2. A policy dialogue involving all relevant national stakeholders is needed to design and secure agreements on the elements of an effective national lead paint control instrument.
3. Paint manufacturers in Kenya should no longer use lead pigments, lead drying agents and other lead compounds in the formulation of the paints they produce and sell with priority to those paints most likely to contribute to childhood lead exposure.
4. Paint vendors should demand that their suppliers eliminate the use of lead compounds in their paint formulations with priority to those paints most likely to contribute to childhood lead exposure, and should refuse to continue selling the paints of suppliers who refuse to comply.
5. Efforts are needed to increase public awareness about the hazards of lead exposure, especially to children, and awareness also that lead paint is a widespread and significant source of childhood lead exposure.
6. Consumers, parents and other stakeholders should demand that lead paints are no longer sold and used in Kenya with priority to those paints most likely to contribute to childhood lead exposure.
7. Paint cans should be required to state whether the paint's formulation includes lead compounds or other toxic substances and should contain a warning of lead dust hazards that are created when preparing for re-painting surfaces containing leaded paints.

8. Efforts are needed to increase awareness of the hazards of lead dust produced when surfaces that have already been coated with lead paints are re-painted, and also of the techniques that can be used to greatly reduce these hazards.