ETHIOPIA

NATIONAL REPORT:
LEAD IN NEW ENAMEL DECORATIVE PAINTS IN ETHIOPIA

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NATIONAL REPORT
LEAD IN ENAMEL DECORATIVE PAINTS IN ETHIOPIA

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Pesticide Action Nexus Association
P.O.BOX 25765 Code 1000
Addis Ababa Ethiopia
Tel. +251-116-186774
Fax. +251-116-186769

Pesticide Action Nexus Association (**PAN-Ethiopia**) works on environment and development issues to contribute to the eradication of poverty in Ethiopia and beyond through raising awareness among the public in order to prevent the negative public health and environmental impacts of pesticides and other hazardous chemicals. Its main purpose is to support policies and strategies that enhance and promote the implementation of a safe and sustainable environment for all people and other living things, keeping them protected from harm posed by hazardous chemicals by building close collaboration among government and non-governmental organizations, civil society interest groups, urban and rural communities, nationally and internationally. PAN-Ethiopia coordinates the IPEN E-products working group.

IPEN
Website: ipen.org
Email: ipen@ipen.org
Twitter: @ToxicsFree

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PREFACE

Leaded paints for home use continue to be widely produced, sold, and used in developing countries despite the fact that most highly industrial countries banned leaded paints for household use more than 40 years ago. IPEN, the United Nations Environment Programme (UNEP), the World Health Organization (WHO), and others are cooperating to raise awareness that childhood lead exposure remains a serious problem, and have catalyzed national activity in a number of developing countries to eliminate lead paint and protect children.

In 2007 and 2008, NGOs in the IPEN network collected and analyzed solvent-based, enamel decorative paints on the market in 11 developing countries, and in countries with economies in transition. The results were startling. In every one of these countries, many of the paints had dangerously high lead content. In response, IPEN launched a worldwide lead paint elimination campaign. Since then, IPEN-affiliated NGOs and others have sampled and analyzed paints on the market in approximately 40 low- and middle-income countries.[1] Twelve of these studies were carried out with UNEP support.[2]

This report presents new data on the lead content of solvent-based, enamel decorative paints that are offered for sale in the Ethiopian market. This is the second time that PAN-Ethiopia has analyzed paints sold in Ethiopia for their lead content. A previous study, conducted in 2012/13, analyzed eight enamel paint samples from eight paint brands.

This report presents background information on why the present and former use of enamel decorative paints with high lead content is a source of serious concern, especially to children's health. It also proposes action steps by different stakeholders to protect children and others from lead paint and lead dust.

The report was prepared by PAN-Ethiopia with support and assistance from the African Lead Paint Elimination Project, which was established to eliminate lead in paint and raise widespread awareness among business entrepreneurs and consumers about the adverse human health impacts of lead-based paints, particularly on the health of children under six years old.

1 Information about the indicated countries and studies is provided in Annex A of this report.
2 Ibid.

EXECUTIVE SUMMARY

While lead exposure is also harmful to adults, lead exposure harms children at much lower doses, and the health effects are generally irreversible and can have a lifelong impact.[3] The younger the child, the more harmful lead can be, and children with nutritional deficiencies absorb ingested lead at an increased rate.[4] The human fetus is the most vulnerable, and a pregnant woman can transfer lead that has accumulated in her body to her developing child. Lead is also transferred through breast milk when lead is present in a nursing mother.

According to WHO, "Lead has no essential role in the human body, and lead poisoning accounts for about 0.6% of the global burden of disease."[5] Evidence of reduced intelligence caused by childhood exposure to lead has led the World Health Organization (WHO) 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.[6]

Most highly industrial countries adopted laws or regulations to control the lead content of decorative paints—the paints used on the interiors and exteriors of homes, schools, and other child-occupied facilities—beginning in the 1970s and 1980s. Many also imposed controls on the lead content of paints used on toys and for other applications likely to contribute 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. Exposure to lead also harms adults, especially those working in occupations associated with high lead exposure. Lead in paint can contribute to high occupational lead exposure in painters, auto body shop workers, construction workers involved in building renovations, and others.

In 2014-15, PAN-Ethiopia purchased a total of 36 cans of solvent-based enamel decorative paints from the largest market place in Addis Ababa, in Ethiopia. The paints were from nine paint brands and all were produced by Ethiopian companies. All paints were analyzed by an accredited laboratory in USA for their total lead content, dry weight of paint.

3 Ibid, page 12
4 Ibid, page 48
5 World Health Organization, Childhood Lead Poisoning, 2010, page 11: http://www.who.int/ceh/publications/leadguidance.pdf
6 A. Prüss-Üstün and C. Corvalán, World Health Organization, Preventing Disease Through Healthy Environments: Towards an estimate of the environmental burden of disease, 2006, page 12: http://www.who.int/quantifying_ehimpacts/publications/preventingdisease.pdf

Three paint colors (yellow, orange and red colors) were included in the sampling since a previous study had shown that they were likely to contain high lead concentrations. For each brand, one white paint was included primarily to determine whether or not lead dryers had been used as white lead pigments have, to a large extent, been replaced with a lead-free alternatives.

FINDINGS

Lead Levels in Paint

- ***Most of the paints in this study would not meet regulatory standards set by most highly industrialized countries.*** In 28 of the 36 paints sampled (78% of paints) the lead content was greater than 90 ppm – the regulatory limit in the United States. The same number of paints had lead content greater than 600 ppm lead, the regulatory standard in some countries (e.g. Argentina, Chile and Uruguay).
- ***Paints with extremely high levels of lead are still easily available.*** Seventeen of the thirty-six paints had a lead concentration greater than 10,000 ppm. Brands selling paints with extremely high lead levels include; Mega, Kokeb, Mural, Dil, Kadisco, Abay Bright and Nile paints. The orange paint from the Abay brand had a lead content of 110,000 ppm which is 1,222 times greater than the regulatory standard of the United States.
- ***Some Ethiopian paint brands are producing low lead paints.*** Eight (22 percent) of the thirty six samples contained lead levels below 90 ppm, demonstrating that the technology and ingredients are available in Ethiopia to produce paints with low lead levels. These producers are: Rainbow Paints (white, orange and red colors), Kadisco Paints (white), Bright Paints (white, orange and red colors) and Nile Paints (white color).

Lead Levels by Brand

- ***Four paint brands produced paints with a lead content less than 90 ppm.*** Three out of four paints analyzed from Bright and Rainbow Paints contained less than 90 ppm lead. One of four paints analyzed from Nile and Kadisco Paints contained less than 90 ppm lead. However, each of these same four manufacturers also produced paints with lead levels above 90 ppm. All paints from all other producers contained more than 90 ppm lead.
- ***At least one product from all the brands/colors of paint, except the Rainbow brand, had lead content greater than 10,000 ppm lead.*** Seventeen of the thirty-six paints (47 percent) had lead content greater than 10,000 ppm lead. At least one or more products from all the brands included, except the Rainbow brand, had lead content greater than 10,000 ppm lead.

Lead Levels by Color

- ***White paints had the lowest lead content.*** White colored paints had, on average, the lowest lead content, and four of nine white paints (44 percent of white paints) contained lead levels below 90 ppm. Only one of the nine white paints analyzed had a lead content greater than 5,000 ppm lead.
- ***Yellow, orange and red colored paints had the highest lead content.*** A total of 24 brightly colored paints were analyzed for total lead content in Ethiopia. One or more colored decorative paint from each brand had a lead content greater than 10,000 ppm except from the Rainbow Paint brand. On average the yellow, orange and red colored decorative paints contained 47,900 ppm, 31,100 ppm, and 10,200 ppm lead respectively.

Comparison with results from 2012/13 Analysis

- ***Lead levels haven't changed since the 2012/2013 analysis.*** Most (19) of the brand/colors analyzed in 2014/15 were also analyzed in 2012/13. Results for 17 of the 19 sampled paints were virtually the same in both studies.

Consumer Information

- ***None of the paint can labels carried information about the type and amount of ingredients including lead.*** All of the paint can labels did carry information on how to mix, how to paint, area coverage with one gallon of paint, the estimated time it takes to dry after applying on the surface, etc.

RECOMMENDATIONS

Lead paint is a serious human health hazard, especially when the paint is used in applications likely to expose children to lead. Decorative paints and paints for use on children's products can be easily produced without the use of lead pigments, lead driers, and lead anti-corrosive agents. Manufacturers can reformulate their decorative paints to avoid the use of leaded ingredients without any significant sacrifice to the quality of the paint, and with very little, if any, increase in their total cost of production. Paint manufacturers that currently produce lead decorative paints and lead paints for other applications likely to contribute to childhood lead exposure are encouraged to reformulate these paints to avoid the use of leaded ingredients.

Regulatory frameworks

- National efforts should be encouraged to promote the establishment of appropriate national regulatory frameworks to control the manufacture, import, export, sale and use of lead paints and products coated with lead

paints. In setting priorities and timeframes for implementation, special attention should be given to the elimination of lead decorative paints and lead paints for other applications most likely to contribute to childhood lead exposure.

Public Awareness

- Given the serious impact childhood lead poisoning has on both an individual and a nation's future, there is a need for public information campaigns in countries where results show the presence of lead paint on the market. These campaigns should inform the public about the hazards of lead exposure, especially in children; the presence of lead household paints for sale and use on the national market; lead paint as a significant source of childhood lead exposure; and the availability of technically superior and safer alternatives.

Voluntary Action and Labeling

- All paint manufacturers in countries that lack a well-enforced national lead paint control regime should be encouraged to act voluntarily to eliminate lead compounds in the formulation of their paints – particularly, their decorative paints and paints for other applications likely to contribute to lead exposure in children and others.

CHAPTER ONE

BACKGROUND ON LEAD IN PAINT

Lead is a toxic metal that is found in some paints.

Paints contain lead when the paint manufacturer intentionally adds one or more lead 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.

The lead compounds most commonly added to paints are pigments. Pigments are used to give the paint its color, make the paint opaque (so it covers well), and protect the paint and the underlying surface from degradation caused by exposure to sunlight. Lead-based pigments are sometimes used alone, and sometimes used in combination with other pigments.

Lead compounds also may be added to enamel (oil-based) paints for use as driers (sometimes called drying agents or catalysts). Enamel paints dry to a hard and smooth surface through a process that involves chemical reactions in which paint ingredients called binders polymerize and crosslink. The driers serve as catalysts that speed up the process and make paints dry faster and more evenly. When lead compounds are used as driers, they are generally not used alone, but are usually combined with other driers, including compounds of manganese, cobalt, and others.

Lead compounds are also sometimes added to paints used on metal surfaces to inhibit rust or corrosion. The most common of these is lead tetroxide, sometimes called red lead or minium.

Inorganic pigments, fillers, and possibly some other ingredients used in the manufacture of paints may be derived from natural, earth-based materials, and may be more or less contaminated with lead depending on geological characteristics at the location where they were mined. When lead-contaminated ingredients are used in the manufacture of paints, this will contribute to the lead content of the paint.

Finally, when a paint manufacturer uses lead-containing compounds in the manufacture of some of its paints (such as industrial paints), other paints pro-

duced in the same facility might become contaminated with lead when proper housekeeping and cleanup procedures are not followed.

Non-leaded pigments, driers, and anti-corrosive agents have been widely available for decades, and are used by manufacturers producing the highest quality paints. In most cases, by avoiding the use of lead pigments, lead driers, and other intentionally added lead compounds, a paint manufacturer will produce paints with lead content well below 90 ppm that can be sold in any country in the world.

Most highly industrial countries adopted laws or regulations to control the lead content of decorative paints—the paints used on the interiors and exteriors of homes, schools, and other child-occupied facilities—beginning in the 1970s and 1980s. Many also imposed controls on the lead content of paints used on toys and for other applications likely to contribute 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.

Lead Paint Terminology

As used in this booklet:

- "Paint" includes varnishes, lacquers, stains, enamels, glazes, primers, or coatings used for any purpose. Paint is typically a mixture of resins, pigments, fillers, solvents, and other additives.
- "Lead paint" is paint to which one or more lead compounds have been added.
- "Lead pigments" are lead compounds used to give a paint product its color.
- "Lead anti-corrosive agents" are lead compounds used to protect a metal surface from rusting or other forms of corrosion.
- "Lead driers" are lead compounds used to make paint dry more quickly and evenly.
- "Decorative paint" refers to paints that are produced for use on inside or outside walls, and surfaces of homes, schools, commercial buildings, and similar structures. Decorative paints are frequently used on doors, gates, and windows, and to repaint household furniture such as cribs, playpens, tables, and chairs.
- "Solvent-based, enamel decorative paint" or "enamel decorative paint" refers to oil-based paints.
- "PPM" means parts per million total lead content by weight in a dried paint sample.

CHAPTER TWO

LEAD EXPOSURE AND ITS HEALTH EFFECTS

Children are not generally exposed to lead from paint while the paint is still in the can or when the paint is being newly applied to a previously unpainted or uncoated surface. Rather, lead exposure generally occurs after the lead paint has already dried on a painted wall or object.

Over time, paint on a surface will chip, wear, and deteriorate. This happens more quickly when the surface is exposed to sunlight or is subject to friction and impact (such as with windows and doors). Any lead present in the deteriorating paint is released to dust and soil in and around the home, school, or other location where the paint was used. When a surface previously painted with lead paint is sanded or scraped in preparation for repainting, very large amounts of lead-contaminated dusts are produced and spread.

Children playing indoors or outdoors get house dust or soil on their hands, and then ingest it through normal hand-to-mouth behavior. If the house dust or the soil is contaminated with lead, the children ingest lead. Hand-to-mouth behavior is especially prevalent in children aged six years and under, the age group most easily harmed by exposure to lead. A typical one- to six-year-old child ingests between 100 and 400 milligrams of house dust and soil each day.[7]

In some cases, children pick up paint chips and put them directly into their mouths. This can be especially harmful because the lead content of chips can be much higher than what is typically found in dust and soils. When toys, household furniture, or other articles are painted with lead paint, children may chew on them and directly ingest the lead-contaminated, dried paint. Nonetheless, the most common way that children ingest lead is through lead-contaminated dust and soil that gets onto their hands.

While lead exposure is also harmful to adults, lead exposure harms children at much lower doses, and the health effects are generally irreversible and can have a lifelong impact.[8] The younger the child, the more harmful lead can be, and children with nutritional deficiencies absorb ingested lead at an increased rate.[9]

7 "The amount of soil and house dust that a typical 1–6-year-old child ingests is said to be 100 mg/24 h, but a more conservative estimate of 200 mg/24 h with an upper percentile of 400 mg/24 h has also been suggested." World Health Organization, Childhood Lead Poisoning, page 18. http://www.who.int/ceh/publications/leadguidance.pdf (2010)

8 Ibid, page 12

9 Ibid, page 48

The human fetus is the most vulnerable, and a pregnant woman can transfer lead that has accumulated in her body to her developing child. Lead is also transferred through breast milk when lead is present in a nursing mother.

Once lead enters a child's body through ingestion, inhalation, or across the placenta, it has the potential to damage a number of 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.

It is generally agreed that one key element in lead toxicity is its capacity to replace calcium in neurotransmitter systems, proteins, and bone structure, altering function and structure and thereby leading to severe health impacts. Lead is also known to affect and damage cell structure.[10]

Children are more sensitive to the harmful effects of lead than adults for several reasons, including:[11]

- A child's brain undergoes very rapid growth, development, and differentiation, and lead interferes with this process. For example, it has been shown that moderate lead exposure (5 to 40 μg/dL) during early childhood is connected to region-specific reductions in adult gray matter volume. Moderate blood levels have been linked to an increased likelihood of impaired cognition and executive function, impulsiveness, aggression, and delinquent behavior. The loss of gray matter in the brain constitutes a potential explanation for cognitive and behavioral problems associated with lead exposure.[12] 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. For example, gene alterations caused by prenatal lead exposure have been implicated in the development of Alzheimer's disease.[13]
- 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.)[14]

10 Verstraeten, S.V., et al, Aluminium and lead: molecular mechanisms of brain toxicity, (Archives of Toxicology 82:789–802. DOI 10.1007/s00204-008-0345-3, 2008)

11 World Health Organization, Childhood Lead Poisoning, http://www.who.int/ceh/publications/leadguidance.pdf, 2010

12 Cecil, K.M., et al., Decreased Brain Volume in Adults with Childhood Lead Exposure, (PLOS Medicine (2008) 5(5): e112. DOI:10.1371/journal.pmed.0050112)

13 Mazumdar, M., et al., Prenatal Lead Levels, Plasma Amyloid β Levels, and Gene Expression in Young Adulthood, (Environmental Health Perspectives (2012) 120 (5))

14 World Health Organization, Childhood Lead Poisoning, http://www.who.int/ceh/publications/leadguidance.pdf, 2010

Lead Exposure Reduces Intelligence

Lead exposure in children may be measured in micrograms of lead per deciliter of blood (μg/dL) or in micrograms of lead per liter of blood (μg/L). At the low end of the lead exposure spectrum, an increase in blood lead level in a pre-school child from less than 1 μg/dL to 10 μg/dL is associated with a six point decrease in IQ (intellectual quotient) points. For children whose blood lead level is in the range of 10-20 μg/dL, a quarter to a half of an IQ point is lost for each 1 μg/dL increase in the blood lead.[1]

1 World Health Organization, Childhood Lead Poisoning, page 25, 2010

According to WHO: "Lead has no essential role in the human body, and lead poisoning accounts for about 0.6% of the global burden of disease."[15] Evidence of reduced intelligence caused by childhood exposure to lead has led the World Health Organization (WHO) 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.[16]

In recent years, medical researchers have been documenting significant health impacts in children from lower and lower lead exposures.[17],[18] According to the World Health Organization: "There is no known safe level of exposure to lead."[19]

15 World Health Organization, Childhood Lead Poisoning, 2010, page 11: http://www.who.int/ceh/publications/leadguidance.pdf

16 A. Prüss-Üstün and C. Corvalán, World Health Organization, Preventing Disease Through Healthy Environments: Towards an estimate of the environmental burden of disease, 2006, page 12: http://www.who.int/quantifying_ehimpacts/publications/preventingdisease.pdf

17 Herbert Needleman, Lead Poisoning,(Annual Review of Medicine 2004, http://www.rachel.org/files/document/Lead_Poisoning.pdf)

18 World Health Organization, Childhood Lead Poisoning, page 26 (citing the work of Lanphear et al., 2000): http://www.who.int/ceh/publications/leadguidance.pdf, 2010

19 World Health Organization, Frequently Asked Questions,International Lead Poisoning Awareness Campaign, Week of Action, 19-25 October, 2014, page 1: http://www.who.int/ipcs/lead_campaign/faq_lead_poisoning_prevention_campaign_en.pdf?ua=1

CHAPTER THREE

ECONOMIC IMPACTS OF LEAD PAINT EXPOSURE

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.[20] 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.[21] 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 as measured by lifelong earnings.

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 dollars[22] per year.[23] 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. The study identified many different sources of lead exposure in children, with lead paint as one major source. Broken down by region, the economic burden of childhood lead exposure as estimated by this study was:

- **Africa:** $134.7 billion of economic loss, or 4.03% of Gross Domestic Product (GDP)
- **Latin America and the Caribbean:** $142.3 billion of economic loss, or 2.04% of GDP

20 Mielke, H.W. and Zahran, S., The urban rise and fall of air lead (Pb) and the latent surge and retreat of societal violence (Environment International. 43 (2012) 48-55)

21 World Health Organization, Childhood Lead Poisoning, page 28: http://www.who.int/ceh/publications/leadguidance.pdf, 2010

22 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. The data from the table (at: http://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD) was accessed by the report's authors in February 2012.

23 Teresa M. Attina and Leonardo Trasande, Economic Costs of Childhood Lead Exposure in Low- and Middle-Income Countries, (Environmental Health Perspectives; DOI:10.1289/ehp.1206424; http://ehp.niehs.nih.gov/1206424/)

- **Asia:** $699.9 billion of economic loss, or 1.88% of GDP

CHAPTER FOUR

GLOBAL LEAD PAINT ELIMINATION EFFORTS

An international convention limiting the use of white lead was adopted by the General Conference of the International Labour Organization and ratified by 63 countries as early as 1921. Many 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 other child-occupied facilities. The standard adopted by the United States imposes an upper limit of 90 ppm on total lead (dry weight) for decorative paints and many other paint categories. Other countries have adopted mandatory limits such as 90 or 600 ppm total lead (dry weight).

Analytical data from paint studies show that in countries where no national law, binding regulation, or other legal instrument specifically forbids it, some or most of the brands of enamel decorative paints for sale on the national market contain high levels of lead. This suggests that national laws, binding regulations, or other legal instruments are a key tool for controlling the lead content of paints.

At the second session of the International Conference on Chemicals Management (ICCM), held in 2009, several chemical issues were identified by consensus to be international priority issues of concern. One of these was lead in paints, and there was a decision to establish it as an international emerging policy issue.[24] In response to the ICCM decision, the United Nations Environment 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).[25] GAELP's broad objective is to phase out the manufacture and sale of paints containing lead, and eventually to eliminate the risks from such paints.[26]

24 http://www.saicm.org/images/saicm_documents/iccm/ICCM2/ICCM2%20Report/ICCM2%2015%20FINAL%20REPORT%20E.doc)

25 http://www.unep.org/hazardoussubstances/LeadCadmium/PrioritiesforAction/LeadPaints/tabid/6176/Default.aspx

26 http://www.unep.org/hazardoussubstances/LeadCadmium/PrioritiesforAction/GAELP/GAELPObjectives/tabid/6331/Default.aspx

In establishing a national legislative or regulatory framework to control the lead content of paints, the Global Alliance to Eliminate Lead Paint proposes the objectives should include the following:

- Prevention of the manufacture, import, use, and export of lead paint;
- Development of a system with effective means of enforcement and compliance;
- Establishment of institutional responsibilities and arrangements for management and enforcement of legislation and/or regulation.[27]

27 Ibid

CHAPTER FIVE

ETHIOPIA FRAMEWORK FOR ELIMINATING LEAD PAINT

Most highly industrialized nations endorsed laws, regulations or obligatory standards to protect human health hazards in the 1970's and 1980's. The paint manufacturers, importers and sellers in these countries are prohibited from using lead paint for interior or exteriors of homes, schools and commercial buildings. The regulatory standard used by the United States enforces an upper limit of 90 ppm on total lead (dry weight) for house and many other paint categories. Many other nations have approved obligatory limits in the range of 90 – 600 ppm total lead (dry weight).

Presently, there is no law or regulation in Ethiopia that prohibits or limits the amount of lead added in paints used for household/school decorations in the country. The high lead concentrations in paints analyzed in this report illustrate the need for a regulatory system that can limit the use of lead during the production process in order to protect children's health.

Ministry of Health (MoH), Ministry of Environment and Forest (MoEF) and Ministry of Industry and Trade (MoIT) are the ministries that have primary responsibility and a great stake in the elimination of lead from enamel decorative paints. Following the publication of the alarming results from the 2012/13 lead paint study, the Ministry of Environment and Forest of Ethiopia supported further studies and efforts to raise public awareness about the human health and economic impacts of lead poisoning arising from lead in decorative paints. This process and the involvement of concerned ministries has the potential to result in a legal framework that can support legislation limiting the use of lead in the paint manufacturing industry.

CHAPTER SIX

LEAD PAINT MARKET IN ETHIOPIA

There are nine enamel decorative paint manufacturing industries in Ethiopia. Each of these industries has its own brands and produces different types of enamel paint colors sold in the local market (Table 1). All the paint industries found in Ethiopia are established and owned by national owners.

TABLE 1. PAINT COLORS SAMPLED FROM DIFFERENT PAINT MANUFACTURERS/PAINT BRANDS IN ETHIOPIA, 2015.

Name of paint manufacturer	Paint Brand	Paint Colors			
		White	Yellow	Orange	Red
Zemily Paint Factory	Mega Paints	✓	✓	✓	✓
Nefas Silk Paint Factory	Kokeb Paints	✓	✓	✓	✓
Mural Paints & Chemicals Plc	Mural Paints	✓	✓	✓	✓
Modern Paint Industry	Dil Paints	✓	✓	✓	✓
Kangaroo Industry Group	Rainbow Paints	✓	✓	✓	✓
Kadisco Industry Group	Kadisco Paints	✓	✓	✓	✓
Abay Paint Factory	Abay Paints	✓	✓	✓	✓
Bright Paint Industry	Bright Paints	✓	✓	✓	✓
Inter Emirates Ethiopia Plc	Nile Paints	✓	✓	✓	✓

CHAPTER SEVEN

MATERIALS AND METHODS

Paint purchase

From January 2015, PAN-Ethiopia purchased 36 cans of enamel decorative paints from various stores in Addis Ababa. These paints from 9 different brands were produced by 9 manufacturers (Fig. 1). Four colors including white, yellow, orange and red were selected from each of the paint brands for an analysis of their lead content. The paints were purchased from paint stores, building materials supplies and retail shops in Addis Ababa.

Information such as color, brand, country where manufactured, purchase details, date manufactured as provided on the label of the paint can was recorded. The formats used for date of manufacturer varied with some companies providing day, month and year and others providing only month and year. In addition, some paint companies used only a single word to describe some colors, such as "red," while others used "bright red." Colors were recorded as provided on the can. For the red and yellow paints the protocol called for obtaining "bright" or "strong" red and yellow paints when available. Dates of purchase were recorded in the day/month/year format in most cases.

Figure 1. Samples of purchased decorative paints of different brands

Paint sampling processes

Paint sampling preparation kits containing individually numbered, untreated wood pieces, single-use paintbrushes and stirring utensils made from untreated wood sticks (Fig. 2) were assembled and shipped to PAN-Ethiopia by the staff of the IPEN partner NGO, Arnika,Czech Republic.

Personal protective clothing was used by the samplers to avoid exposure. Sampling was done after the necessary materials and pre-sampling procedures were prepared (Fig. 3). Each paint color from different brands had its own sampling

materials which had to be used once for sampling one color to avoid cross contamination between the different colors. Three replicates were prepared for each paint color. One of the three replicate was sent to USA for the laboratory analysis. The second one was sent to IPEN while the third replicate was maintained in PAN-Ethiopia.

Samples were put in a room away from human contact and allowed to dry at room temperature for five to six days. After drying, the painted wood pieces were placed in individual plastic bags and shipped to Forensic Analytical Laboratories, in the US. Paint samples were analyzed using method Environmental Protection Agency (EPA) 3050B/7420 (atomic absorption), a method recognized as suitable by WHO.[28]

Figure 2. Paint sampling materials, 2015

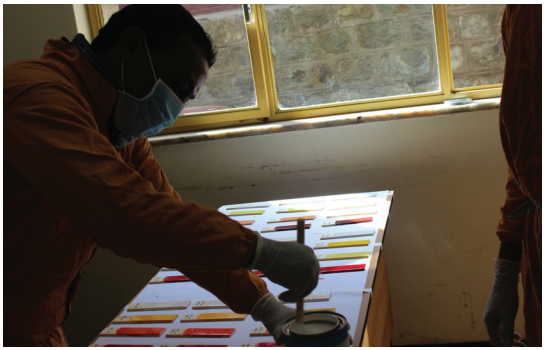

Figure 3. Paint sampling, PAN-Ethiopia

28 WHO (2011). Brief guide to analytical methods for measuring lead in paint. http://www.who.int/ipcs/assessment/public_health/lead_paint.pdf

CHAPTER EIGHT

RESULTS

This report presents new data on the lead content of solvent-based, enamel, decorative paints offered for sale in the Ethiopian market. This is the second time that PAN-Ethiopia has analyzed paints sold in Ethiopia for their lead content. A previous study, conducted in 2012/13, analyzed eight enamel paint samples from eight brands.

In 2014/15, a total of 36 cans of new solvent-based, enamel decorative paints from 9 paint brands were purchased in Addis Ababa in Ethiopia and analyzed for their lead content. Four colours from each brand were analyzed: yellow, orange, red, and white. Results are given in parts per million (ppm) lead, dry weight

Lead Levels in Paint

- ***Most of the paints in this study would not meet regulatory standards set by most of the highly industrialized countries.*** In 28 of the 36 paints sampled (78% of paints) the lead content was greater than 90 ppm – the regulatory limit in the United States. The same number of paints had lead content greater than 600 ppm lead, the regulatory standard in some countries (e.g. Sri Lanka, Argentina, Chile and Uruguay).
- ***Paints with extremely high levels of lead are still easily available.*** Seventeen of the thirty-six paints had a lead concentration greater than 10,000 ppm. Brands selling paints with extremely high lead levels include: Mega, Kokeb, Mural, Dil, Kadisco, Abay Bright and Nile Paints. The orange Abay brand paint had a lead content of 110,000 ppm which is 1222 times greater than the regulatory standard of the United States.
- ***Some Ethiopian paint brands are producing low lead paints.*** Eight (22 percent) of the thirty six samples contained lead levels below 90 ppm, demonstrating that the technology and ingredients are available in Ethiopia to produce paints with low lead levels. These producers are: Rainbow Paints (white, orange and red colors), Kadisco Paints (white), Bright Paints (white, orange and red colors) and Nile Paints (white color).

Lead Concentrations by Brand

- ***Four paint brands produced paints with a lead content less than 90 ppm.*** However, each of these same four manufacturers also produced paints with lead levels above 90 ppm. Three out of four paints analyzed from Bright and Rainbow paints contained less than 90 ppm lead. One of four paints analyzed from Nile and Kadisco Paints contained less than 90 ppm lead. All paints from all other producers contained more than 90 ppm lead.
- ***At least one product from all the brands/colors of paint, except the Rainbow brand, had lead content greater than 10 000 ppm lead.*** Seventeen of the thirty six samples brands/colors (47 percent) had lead content greater than 10,000 ppm lead. At least one or more products from all the brands/colors of samples tested, except the Rainbow brand, had lead content greater than 10,000 ppm lead.

Lead Concentrations by Color

- ***White paints had the lowest lead content.*** White colored paints had, on average, the lowest lead content, and four of nine white paints (44 percent of white paints) contained lead levels below 90 ppm. Only one of the nine white paints analyzed had a lead content greater than 5,000 ppm lead.
- ***Yellow, orange and red colored paints had the highest lead content.*** A total of 24 brightly colored paints were analyzed for total lead content in Ethiopia. One or more colored decorative paint from each brand had a lead content greater than 10,000 ppm except the Rainbow Paint brand. On average the yellow, orange and red colored decorative paints had 47,900 ppm, 31,100 ppm, and 10,200 ppm lead content respectively.

Comparison with 2013/14 Analysis Results

Lead levels haven't changed since the 2012/2013 analysis. Most (19) of the brand/colors analyzed in 2014/15 were also analyzed in 2012/13. Results for 17 of the 19 sampled paints were virtually the same in both studies.

Consumer Information

None of the paint can labels carried information about the type and amount of ingredients including lead. All of the paint can labels did carry information on how to mix, how to paint, area coverage with one gallon of paint, the estimated time it takes to dry after applying on the surface, etc.

CHAPTER NINE

CONCLUSIONS AND RECOMMENDATIONS

This study demonstrates that there are still many enamel paint manufacturing industries in Ethiopia that produce paints with high lead content and at levels hazardous to human health, particularly children.

All stakeholders need to now work to formulate a regulatory framework for eliminating lead in paint, raise public awareness on the hazards of lead in paint and encourage manufacturers to take voluntary action to eliminate Lead in household decorative paints and provide information about lead content on labels.

Regulatory Framework

National efforts should be encouraged to promote the establishment of appropriate national regulatory frameworks to control the manufacture, import, export, sale, and use of lead paints and products coated with lead paints. In setting priorities and timeframes for implementation, special attention should be given to the elimination of lead decorative paints and lead paints for other applications most likely to contribute to childhood lead exposure.

In the design of the regulatory framework, consideration should be given to the inclusion of provisions for compliance, monitoring, and enforcement.

Public Awareness

Given the serious impact childhood lead poisoning has on both an individual's and the nation's future, there is a need for public information campaigns in Ethiopia and other countries where results show the presence of lead paint on the market. These campaigns should inform the public about the hazards of lead exposure, especially in children; the presence of lead decorative paints for sale and use on the national market; lead paint as a significant source of childhood lead exposure; and the availability of technically superior and safer alternatives. There is also a need to raise awareness of the need to take special precautions when preparing a previously painted surface for repainting; the need for training in lead-safe work practices for painters and others

working on previously-painted surfaces; and the need for resources to conduct such training.

Government agencies, NGOs and other organizations of civil society, as well as health professionals and others, are encouraged to carry out awareness-raising in the above-mentioned areas. Stakeholders are encouraged to foster voluntary initiatives by paint manufacturers, importers, and vendors to phase out the use of lead compounds in their products, even before any national legal instrument is adopted or enters into force.

Voluntary Action and Labeling

In some countries, some paint manufacturers have acted voluntarily to eliminate lead compounds in the formulation of their paints. Paint manufacturers in countries that lack a well-enforced national lead paint control regime, such as Ethiopia, should be encouraged to act voluntarily to eliminate lead compounds in the formulation of their paints – particularly, their enamel decorative paints and paints for other applications likely to contribute to lead exposure in children and others.

Paint manufacturers are also encouraged to consider voluntary participation in programs that provide third-party certification of no added lead, and product labeling to enable consumers to identify paints that do not contain added lead. In addition, paint manufacturers could provide information on paint can labels warning of the serious risk that may arise from lead dust when preparing a previously painted surface for repainting.

APPENDIX A

TABLE 1. SOLVENT-BASED, ENAMEL DECORATIVE PAINTS PURCHASED AND ANALYZED FOR LEAD CONTENT IN ETHIOPIA

Sample Number	Brand Name	Color of Paint	Paint Can Size	Purchase Price Per Litre (Birr)	Date Manufactured	Batch Number	Date of Purchase	Website on Label
ETH-30	Mega Paints	White	1 Lt	69.56	Not stated	69780	Jan. 2015	NA
ETH-31	Mega Paints	Yellow	1 Lt	69.56	Not stated	69930	Jan. 2015	NA
ETH-32	Mega Paints	Orange	1 Lt	69.56	Not stated	66848	Jan. 2015	NA
ETH-33	Mega Paints	Red	4 Lt	216.00	Not stated	68817	Jan. 2015	NA
ETH-34	Kokeb Paints	White	1 Lt	61.74	Not stated	311974	Jan. 2015	NA
ETH-35	Kokeb Paints	Yellow	4 Lt	202.61	Not stated	111834	Jan. 2015	NA
ETH-36	Kokeb Paints	Orange	1 Lt	55.65	Not stated	107489	Jan. 2015	NA
ETH-37	Kokeb Paints	Red	1 Lt	61.74	Not stated	109916	Jan. 2015	NA
ETH-38	Mural Paints	White	1 Lt	73.91	Not stated	NA	Jan. 2015	Muralpaints.eth@gmail.com
ETH-39	Mural Paints	Yellow	1 Lt	73.91	Not stated	NA	Jan. 2015	Muralpaints.eth@gmail.com
ETH-40	Mural Paints	Orange	1 Lt	73.91	Not stated	NA	Jan. 2015	Muralpaints.eth@gmail.com
ETH-41	Mural Paints	Red	1 Lt	73.91	Not stated	NA	Jan. 2015	Muralpaints.eth@gmail.com
ETH-42	Dil Paints	White	1 Lt	73.91	Not stated	234342	Jan. 2015	Midroc-ethio-techgroup.com

Sample Number	Brand Name	Color of Paint	Paint Can Size	Purchase Price Per Litre (Birr)	Date Manufactured	Batch Number	Date of Purchase	Website on Label
ETH-43	Dil Paints	Yellow	1 Lt	73.91	Not stated	131541	Jan. 2015	Midroc-ethio-techgroup.com
ETH-44	Dil Paints	Orange	1 Lt	73.91	Not stated	232009	Jan. 2015	Midroc-ethio-techgroup.com
ETH-45	Dil Paints	Red	1 Lt	82.61	Not stated	233804	Jan. 2015	Midroc-ethio-techgroup.com
ETH-46	Rainbow Paints	White	4 Lt	104.35	Not stated	117	Jan. 2015	NA
ETH-47	Rainbow Paints	Yellow	4 Lt	100.00	Not stated	227	Jan. 2015	NA
ETH-48	Rainbow Paints	Orange	4 Lt	243.48	Not stated	663	Jan. 2015	NA
ETH-49	Rainbow Paints	Red	4 Lt	286.96	Not stated	625	Jan. 2015	NA
ETH-50	Kadisco Paints	White	1 Lt	73.91	Not stated	(001)14-29214	Jan. 2015	NA
ETH-51	Kadisco Paints	Yellow	1 Lt	61.74	Not stated	(172)5-39870	Jan. 2015	NA
ETH-52	Kadisco Paints	Orange	1 Lt	55.65	Not stated	(131)14-28261	Jan. 2015	NA
ETH-53	Kadisco Paints	Red	1 Lt	65.00	Not stated	(173)14-29712	Jan. 2015	NA
ETH-54	Abay Paints	White	4 Lt	224.35	03 Feb. 2015	4199	Jan. 2015	abaypaints@gmail.com
ETH-55	Abay Paints	Yellow	4 Lt	224.35	26 Nov. 2014	3911	Jan. 2015	abaypaints@gmail.com
ETH-56	Abay Paints	Orange	4 Lt	220.00	Not stated	NA	Jan. 2015	abaypaints@gmail.com
ETH-57	Abay Paints	Red	4 Lt	229.57	03 Feb. 2015	4196	Jan. 2015	abaypaints@gmail.com

Sample Number	Brand Name	Color of Paint	Paint Can Size	Purchase Price Per Litre (Birr)	Date Manufactured	Batch Number	Date of Purchase	Website on Label
ETH-58	Bright Paints	White	4 Lt	215.00	Not stated	8720	Jan. 2015	brightpaint-sfactory@ethionet.et
ETH-59	Bright Paints	Yellow	4 Lt	218.00	Not stated	8351	Jan. 2015	brightpaint-sfactory@ethionet.et
ETH-60	Bright Paints	Orange	4 Lt	110.00	Not stated	8714	Jan. 2015	brightpaint-sfactory@ethionet.et
ETH-61	Bright Paints	Red	4 Lt	220.00	Not stated	7143	Jan. 2015	brightpaint-sfactory@ethionet.et
ETH-62	Nile Paints	White	4 Lt	208.70	Not stated	E1406...SE	Jan. 2015	www.emirate-thiopaints
ETH-63	Nile Paints	Yellow	4 Lt	208.70	Not stated	E1406...SE	Jan. 2015	www.emirate-thiopaints
ETH-64	Nile Paints	Orange	1 Lt	64.35	Not stated	E1405...SE	Jan. 2015	www.emirate-thiopaints
ETH-65	Nile Paints	Red	1 Lt	64.35	Not stated	E1406...SE	Jan. 2015	www.emirate-thiopaints

TABLE 2: RESULTS OF LEAD ANALYSIS FOR SOLVENT-BASED ENAMEL DECORATIVE PAINTS PURCHASED IN ETHIOPIA

Sample Number	Brand Name	Color of Paint	Lead Content of Paint (ppm)	Country of Brand Headquarters	Country Where Manufactured	Is there information on can about lead content of paint?
ETH-30	Mega Paints	White	5,200	Ethiopia	Ethiopia	NO
ETH-31	Mega Paints	Yellow	44,000	Ethiopia	Ethiopia	NO
ETH-32	Mega Paints	Orange	16,000	Ethiopia	Ethiopia	NO
ETH-33	Mega Paints	Red	2,500	Ethiopia	Ethiopia	NO
ETH-34	Kokeb Paints	White	4,900	Ethiopia	Ethiopia	NO
ETH-35	Kokeb Paints	Yellow	81,000	Ethiopia	Ethiopia	NO
ETH-36	Kokeb Paints	Orange	15,000	Ethiopia	Ethiopia	NO
ETH-37	Kokeb Paints	Red	4,300	Ethiopia	Ethiopia	NO
ETH-38	Mural Paints	White	2,200	Ethiopia	Ethiopia	NO
ETH-39	Mural Paints	Yellow	37,000	Ethiopia	Ethiopia	NO
ETH-40	Mural Paints	Orange	28,000	Ethiopia	Ethiopia	NO
ETH-41	Mural Paints	Red	18,000	Ethiopia	Ethiopia	NO
ETH-42	Dil Paints	White	2,100	Ethiopia	Ethiopia	NO
ETH-43	Dil Paints	Yellow	90,000	Ethiopia	Ethiopia	NO
ETH-44	Dil Paints	Orange	59,000	Ethiopia	Ethiopia	NO
ETH-45	Dil Paints	Red	2,700	Ethiopia	Ethiopia	NO
ETH-46	Rainbow Paints	White	<60	Ethiopia	Ethiopia	NO

Sample Number	Brand Name	Color of Paint	Lead Content of Paint (ppm)	Country of Brand Headquarters	Country Where Manufactured	Is there information on can about lead content of paint?
ETH-47	Rainbow Paints	Yellow	890	Ethiopia	Ethiopia	NO
ETH-48	Rainbow Paints	Orange	<60	Ethiopia	Ethiopia	NO
ETH-49	Rainbow Paints	Red	<60	Ethiopia	Ethiopia	NO
ETH-50	Kadisco Paints	White	<60	Ethiopia	Ethiopia	NO
ETH-51	Kadisco Paints	Yellow	35,000	Ethiopia	Ethiopia	NO
ETH-52	Kadisco Paints	Orange	49,000	Ethiopia	Ethiopia	NO
ETH-53	Kadisco Paints	Red	20,000	Ethiopia	Ethiopia	NO
ETH-54	Abay Paints	White	4,200	Ethiopia	Ethiopia	NO
ETH-55	Abay Paints	Yellow	83,000	Ethiopia	Ethiopia	NO
ETH-56	Abay Paints	Orange	110,000	Ethiopia	Ethiopia	NO
ETH-57	Abay Paints	Red	3,400	Ethiopia	Ethiopia	NO
ETH-58	Bright Paints	White	70	Ethiopia	Ethiopia	NO
ETH-59	Bright Paints	Yellow	43,000	Ethiopia	Ethiopia	NO
ETH-60	Bright Paints	Orange	70	Ethiopia	Ethiopia	NO
ETH-61	Bright Paints	Red	<60	Ethiopia	Ethiopia	NO

Sample Number	Brand Name	Color of Paint	Lead Content of Paint (ppm)	Country of Brand Headquarters	Country Where Manufactured	Is there information on can about lead content of paint?
ETH-62	Nile Paints	White	<60	Ethiopia	Ethiopia	NO
ETH-63	Nile Paints	Yellow	17,000	Ethiopia	Ethiopia	NO
ETH-64	Nile Paints	Orange	2,900	Ethiopia	Ethiopia	NO
ETH-65	Nile Paints	Red	41,000	Ethiopia	Ethiopia	NO

TABLE 3. DISTRIBUTION OF LEAD CONCENTRATION BY BRAND OF SOLVENT-BASED, ENAMEL DECORATIVE PAINTS PURCHASED IN ETHIOPIA

Brand	Number of Paints	Average Lead Content (ppm, Dry Weight)	Number of Paints >90 ppm Lead	Number of Paints >600 ppm Lead	Number of Paints >10,000 ppm Lead	Minimum Lead Concentration (ppm)	Maximum Lead Concentration (ppm)
Mega Paints	4	16,900	4	4	2	2,500	44,000
Kokeb Paints	4	26,300	4	4	2	4,300	81,000
Mural Paints	4	21,300	4	4	3	2,200	37,000
Dil Paints	4	38,500	4	4	2	2,100	90,000
Rainbow Paints	4	268	1	1	0	<60	890
Kadisco Paints	4	26,020	3	3	3	<60	49,000
Abay Paints	4	50,200	4	4	2	3,400	110,000
Bright Paints	4	10,800	1	1	1	<60	43,000
Nile Paints	4	15,200	3	3	2	<60	41,000

** When calculating the averages, levels < 60 ppm were approximated to 60 ppm*

TABLE 4. LEAD CONCENTRATION BY COLOR OF SOLVENT-BASED, ENAMEL DECORATIVE PAINTS PURCHASED IN ETHIOPIA

Color	Number of Samples	Average Lead Concentration (ppm)	Number of Samples >90 ppm Lead	Number of Samples >600 ppm Lead	Number of Samples >10,000 ppm Lead	Minimum Lead Concentration (ppm)	Maximum Lead Concentration (ppm)
White	9	2,090	5	5	0	<60	5,200
Yellow	9	47,900	9	9	8	890	90,000
Orange	9	31,100	7	7	6	<60	110,000
Red	9	10,200	7	7	3	<60	41,000

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