ISSN: 2638-1974

madridge PUBLISHERS
Interconnecting Scientific World

International Journal of Petrochemistry and Research

Research Article

Open Access

Measures of harm from heavy metal contents (Lead and Cadmium) in Women's Lipstick and Lipgloss in Yenagoa Metropolis, Bayelsa state, Nigeria

Raimi Morufu Olalekan[1]*, Omidiji Adedoyin O[2] and **Tonye V. Odubo[2]**

[1]*Department of Community Medicine, Environmental Health Unit, Faculty of Clinical Sciences, Niger Delta University, Wilberforce Island, Bayelsa State, Nigeria*

[2]*Department of Geography and Environmental Management, Faculty of Social Sciences, Niger Delta University, Wilberforce Island, Bayelsa State, Nigeria*

Article Info

***Corresponding author:**
Raimi Morufu Olalekan
Department of Community Medicine,
Environmental Health Unit
Faculty of Clinical Sciences
Niger Delta University
Wilberforce Island
Bayelsa State, Nigeria
E-mail: ola07038053786@gmail.com;
olamuf001@outlook.com

Received: November 23, 2018
Accepted: December 17, 2018
Published: December 24, 2018

Citation: Olalekan RM, Adedoyin O, Odubo TV. Measures of harm from heavy metal content (Lead and Cadmium) in Women Lipstick and Lipgloss in Yenagoa Metropolis, Bayelsa state, Nigeria. *Int J Petrochem Res.* 2018; 2(3): 236-242.
doi: 10.18689/ijpr-1000141

Published by Madridge Publishers

Abstract

Despite the glittering appeal of cosmetics, their public health risk continues to mount. The US Food and Drug Administration (FDA) and European Union's Restriction on Hazardous Substances (ROHS) reported that some cosmetic materials used by humans especially women contain hazardous substances. The aim of this research is to assess the public health risk in certain brands of lipsticks and lipglosses sold at Yenagoa metropolis. This study focuses only on the presence of lead and cadmium in randomly selected lipsticks and lipglosses. 10 samples of different brands made from different countries were randomly selected for analysis. The samples were analyzed according to standardized international protocols by wet digestion method, by Atomic Absorption Spectrophotometry. The highest concentration of lead and cadmium was detected in the lipsticks while the lipglosses contain no lead and cadmium. The safety assessment of cosmetic products is a complex issue that is not only affected by scientific questions, but should be monitored by the responsible regulatory organizations, as well as consumers, health ministry and the government for health risks. The study concludes that there is need for more women advocacy and studies on other brands of cosmetics be assess for risks of heavy metal toxicity.

Keywords: Women; Advocacy; Cosmetics; Lipsticks; Heavy Metal; Lead and Cadmium.

Introduction

There are more than twenty heavy metals, but four are of particular concern to human health and the environment namely Lead (Pb), Cadmium (Cd), Mercury (Hg), and Arsenic (As), are toxic and can cause damaging effects even at very low concentrations. Interestingly, right from time immemorial, cosmetics of one form or another have been used by humans especially women to beautify themselves as they have greatly impacted on history, fashion, culture and even lives of people. The use of cosmetics is widespread among females, though an increasing number of males are gradually using cosmetics in order to enhance their facial appearances. A cosmetic product is any substance or preparation intended to be placed in contact with the various external parts of the human body (epidermis, hair system, nails, lips and external genital organs) or applied to the teeth and the mucous membranes of the oral cavity with a view exclusively or mainly for the purpose of cleaning, perfuming, protection, changing their appearance, correcting body odours and keeping the surfaces in good condition [1, 2]. Cosmetics or makeup as often called are substances or preparations used to enhance the beauty of the human

body apart from simple face cleaning. The different forms of cosmetics finds different applications such as lipsticks and lipglosses used to colour the lips; foundation, concealer, powder and rouge used to colour the face, lighten and remove flaws to produce an impression of health and youthfulness; mascara used to enhance the eyelashes; while eyeliners and eye shadow to colour the eyelids; nail polish used to colour the fingernails or to nails; creams and lotions usually clean the face and body, unclog the pores, enable proper perspiration and keeps the skin safe from acne, pimples or blemish. More than just enhancing beauty, Actors uses specialized forms of cosmetics too to change physical appearances [3]. Over the past decades the term heavy metal has been widely used. It is often used as a group name for metals and semi metals (metalloids) associated with contamination, potential toxicity or Eco-toxicity. The term heavy metal has been called a misinterpretation due to the contradictory definitions and its lack of a coherent scientific basis [4]. Arsenic, cadmium, lead and mercury are described as heavy metals which in their standard state have a specific gravity (density) of more than about 5g/cm^3 (Arsenic, 5.7; cadmium, 8.65; lead, 11.34; and mercury, 13.549) while metals like copper, nickel, chromium and iron are essential in very low concentration for the survival of all forms of life, but, when present in higher concentration can cause metabolic anomalies [5].

These heavy metals have been indicted in varying concentrations in various cosmetics, also bearing in mind that some of these metals have been banned as intentional ingredients coupled with their known or probable negative effect, [6], yet these heavy metals are still being found to be alarming [7]. Eye shadows and lipsticks have been reported to contain relatively high concentration of heavy metals [8], kohl a customary cosmetic used for beautifying the eyes in the Middle East is found to contain lead [9]. Lead and cadmium were present in cosmetics products which include soap, face cream, shampoo, shaving cream and talcum powder [10].

Creams and cleansing milk, shampoos, hair dyes, eye shadows, rouge, lipsticks, powders, foundation and toothpastes were found to contain lead and copper. [11]. Significant level of cadmium, chromium, copper and zinc were found in cosmetic products, in spite of the fact that cadmium and chromium are prohibited in any amount in cosmetics [12]. As the issue of the use of these heavy metals as deliberate ingredients are being addressed, the presence of these metals as impurities contaminants or byproducts is still of grave concern. These metals may be released into the environment from metal smelting and refining industries, scrap metals, plastic and rubber industries, various consumer products and from burning of waste containing these elements, on release to the air, the metals travels distances and are deposited, once deposited, they are not degraded and persist in the environment for years poisoning human through inhalation, ingestion and skin absorption [5]. Due to the spuriousness of these cosmetic products in developing and under developed countries such as Nigeria, the facial cosmetics are being sold under the brand name of well reputed national and international companies in both open markets and superstores in the country.

The quest for beauty has tended to promote the use of cosmetics by men and women. In spite of the profound interest in heavy metal hazards of cosmetics, very little attention has been given to metal contamination of cosmetic products in Nigeria and most sub-Saharan African countries. According to Health Canada, 100% of all cosmetics product tested positive for nickel and over 90% tested positive for both lead and beryllium and on the average contained at least 4 of the 8 metals of concern (arsenic, cadmium, lead, mercury, beryllium, nickel, selenium, and thallium).

Toxic metal content in cosmetic products is prohibited or at least restricted in regulations of many countries; however, the regulations are inconsistent and concentrations of metals permissible by particular regulations are different for various products and countries. Humans are exposed simultaneously or consecutively to large numbers of chemicals of diverse structures from various sources and via multiple routes. Cosmetics especially the skin lightening types are widely used in most African countries, especially by women. Since these products are used for long duration, on a large body surface area and under hot humid conditions, percutaneous absorption is enhanced.

The complications of these products can be serious. Some studies have documented an association between some ingredients of cosmetics and various health problems. Females are at greater health risk in developing countries due to inadequate nutrition, unhealthy lifestyle, and environmental deterioration. Physiological changes also can alter the bioaccumulation pattern of these metals in female body. Most of the metals act as endocrine disrupters interfering with female hormonal system. The ever-glowing interest in cosmetics and the lack of their regulations in Nigeria necessitated this study. We have analyzed different types of cosmetics, using Atomic Absorption Spectroscopy, for the presence of lead and cadmium concentrations. The study will provides scientific data on the levels of these heavy metals to which an average Nigerian woman may be exposed from cosmetics.

Objectives of the Study

The aim of this study is to determine the concentrations of toxic metals in cosmetics sold in different shops at Swali Market in Yenagoa Metropolis with a view of assessing the potential risks that such cosmetic may pose to consumers. To achieve this, the following specific objectives were to determine the levels of selected heavy metals in lipsticks and lipgloss. To assess the content of heavy metal in women lipstick and lipgloss, Also, to assess the cadmium concentration in lipstick and lipgloss and to assess the concentration of lead in lipstick and lipgloss.

Research Methods

Description of the Study Area

Yenagoa became a state Capital when Bayelsa state was created in 1996, Yenagoa is geographically located between latitude 4° 47‟15‟ and 5° 11‟ 55” Nothings and Long. 6° 07‟ 35” and 6° 24‟ 00” Eastings (Figure 1). The LGA has an area of 706 km^2 and a population of 353,344 comprising of 187, 791

male and 165, 553 females with an annual exponential growth rate of 2.9 as at the 2006 National Census [13]. Yenagoa Local Government Area (LGA) is bounded by Mbiama communities of Rivers State on the north and East, Kolokuma/Opokuma LGA on the north west, Ogbia LGA on the south and Sourthern Ijaw on the west, Ogbia LGA on the South East and Sourthern Ijaw on the South west [14, 15].

Yenagoa Local Government Area is located on the banks of Ekole Creek the latter being one of the major river courses making up the Niger Delta's river [16], with only one political/ administrative ward namely: Epie-Atisa [15]. There are 21 communities within the study area namely; Igbogene, Yenegwe, Akenfa, Edepie, Agudama, Akenpai, Etegwe, Okutukutu, Opolo, Biogbolo, Yenizue-Gene, Kpansia, Yenizue-Epie, Okaka, Azikoro, Ekeki, Amarata, Onopa, Ovom, Swali, Yenagoa.

Yenagoa Local Government Area is the traditional home of the Ijaw people, Nigeria's fourth largest ethnic group after the Hausa, Yoruba and Igbo. The Ijaws form the majority of the town. English is the official language, but Epie/Atissa language, one of the Ijaw languages, is the major local language spoken in Yenagoa. Other Ijaw dialects include Tamu, Mein, Jobu, Oyariri, and Tarakiri. There are other pockets of ethnic groups such as Urhobo and Isoko. There are local dialects in some places. Other notable languages in the LGA are Epie, Atisa, Nembe and Ogbia. Christianity and traditional religion are the two main religions in the State. The culture of the people is expressed in their unique dresses, festivals, dietary habits, arts and crafts, folklore and dancing. These distinguish the people from other ethnic groups. The major crafts include canoe building, fish net and fish traps making, pottery, basket and mat making.

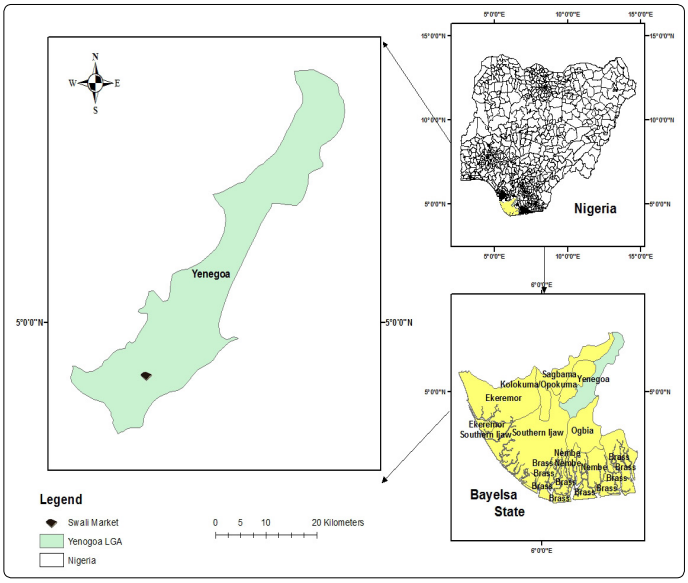

Figure 1. Map of Bayelsa State Showing the Study Area

Sample Collection

5 samples of lipstick and lipgloss each were randomly selected for Atomic Absorption Spectrophotometry Analysis at Swali Market in Yenagoa Metropolis.

Digestion

Apparatus: Beakers, glass, funnels, volumetric flask measuring cylinder, heating mantle fame cupboard.

Reagents: Concentrated Hydrochloric Acid (HCL), Nitric Acid

Methodology

- 1g of sample was weighed and placed in a beaker.
- 9ml of concentrated HCL (hydro chloric acid) was measured and into the same beaker containing the sample.
- 3ml of Nitric acid was also measure into the same beaker containing the sample and HCL.
- The beaker was heated over the heating mantle at 50˚C inside the fume cupboard until the sample completely dissolves inside the beaker.
- After dissolution, the sample was allowed to cool and 20ml of de-ionized water was added and filtered into a 100ml volumetric flask.
- De-ionized water was used to top the volumetric flask till it reached the 100ml mark.

Method of data analysis

Equipment: A Buck scientific atomic absorption spectrophotometry (Accusys 211).
Apparatus: De-ionized water.
Reagents: Cadmium standard
Lead standard

Methodology

After inserting cadmium Lamp into the AAS Equipment 4 standard solutions with known concentration (4ppm, 3ppm, 2ppm and 1ppm respectively) were used to standardize the equipment to form a series which when plotted formed a straight-line graph. After standardization the equipment was used to read the digested samples for the concentration of cadmium.

Sample Preparation

Sample Preparation

Samples were prepared according to standard operating procedures for lead in paints [17]. Cosmetics samples were applied into individual clean glass slide using different glass rod for each sample to avoid any cross contamination. Samples were left to dry for a minimum of 72 hours in the sun and in the oven for 24 hours at 50˚C. After drying, samples were scrapped off from glass slides using sharp, clean scalpel and accurately weighed to 1.000g using analytical weighing machine (Shimadzu Model ATY224) and put into an acid washed 100ml digestion tubes.

Acid Digestion

The samples were subjected to wet acid digestion, using concentrated analytical grade nitric acid and perchloric acid to destroy the organic matter. A volume of 30ml of concentrated nitric acid was added first and digested until the brown fumes were exhausted at temperature of approximately 150˚C. The samples were then allowed to cool and 10ml of perchloric acid added for complete digestion, until the white vapours of perchloric acid were liberated. The digests were then allowed to cool and diluted with 15ml of distilled de-ionized water, filtered into 50ml volumetric flasks and quantitatively adjusted to the mark with double distilled de-ionized water, labeled and stored awaiting analysis.

The AAS Analysis

All samples were analyzed for lead and cadmium using AAS techniques (Buck scientific Model 210 VGP). The concentration of heavy metals were analyzed by the use of AAS in triplicates with acetylene flame. Validation of the AAS was checked by triplication of the samples. A series of standards were prepared in distilled de-ionized water for instrumental calibration by serial dilution of the stock solution. The standards and blank samples were analyzed for every 10 samples analyzed. The validity of the method was ascertained by cross method checks, spiked recovery and replication analysis. The main instrumental parameters such as band width, lamp current, heat of the flame and wavelength for AAS were optimized separately for each metal. The operating conditions of the AAS are given below in (Table 1).

Table 1. The AAS (Atomic Absorption Spectroscopy) Analysis Result.

S/N	Sample Code	Cd		Pb	
		D	R	D	R
1	Chanleevi		0.58		0
2	Classic		0.34		3.2
3	Jackeline		0.45		4.1
4	Zaron		0.21		2.5
5	Tara		0.8		6
6	Magic gloss		0		0
7	Incolour		0		0
8	Golden rose		0		0
9	Beyond beauty		0		0
10	Avour		0		0

D = Dilution Factor; R = Actual Reading (mg/L)

Results an d Discussion

Results

CADMIUM

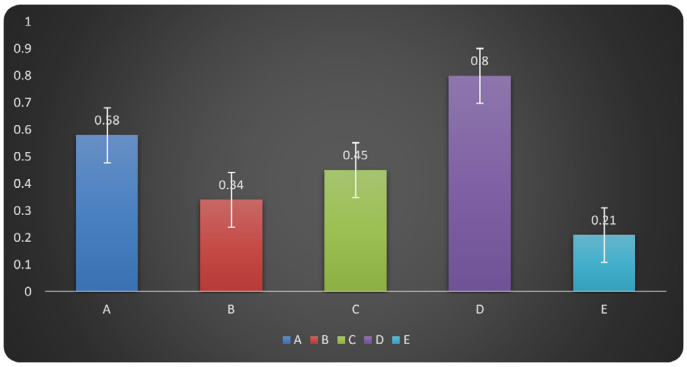

Figure 2. Cadmium Level in Lipsticks

A (Chanleevi) 0.58, B (Classic) 0.34, C (Jacklein) 0.45, D (TARA) 0.8, E (Zaron) 0.21

LEAD

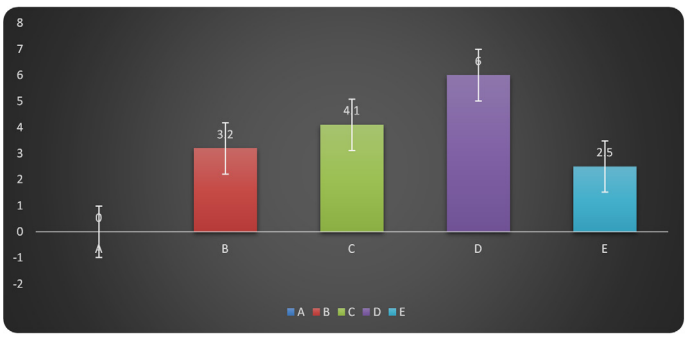

Figure 3. Lead Concentration in Lipsticks

A (Chanleevi) 0.58, B (Classic) 3.2, C (Jacklein) 4.1, D (TARA) 6.0, E (Zaron) 2.5

Discussion

Cadmium occurs naturally in the environment. Cadmium found in body and hair creams are absorbed into the body through dermal contact; stored in the kidney and the liver, although it can be found in almost all adult tissues. It is considered to be "carcinogenic to humans" by the IARC and its compound, categorized as known human carcinogens by the United States Department of Health and Human Services. Ingestion of high levels of cadmium can lead to severe stomach irritation, vomiting and diarrhea, while exposure to lower levels for a long time can lead to kidney damage, bone deformity, and the ability to bones to break easily [18]. The presence of cadmium in the lipstick in this study shows that users are predisposed to cadmium poisoning which could result to severe stomach irritation, vomiting and diarrhea, while exposure to lower levels for a long time can lead to kidney damage, bone deformity, and the ability of bone to break easily is shown in (Figure 2). Cadmium target blood vessel and heart tissue as well as the kidneys, lungs, and brain, and results in heart disease, hypertension, liver damage, and suppressed lungs and brain, and results in heart disease, hypertension, liver damage, and suppressed immune system. Cadmium also causes bone degradation because it affects calcium metabolism.

The value obtained for lead is presented in figure 3 with values ranging between 0 and 6 ug/g. People are generally exposed to lead by three major ways inhalation, ingestion and absorption. Routes of exposure to lead include contaminated air, water, soil, food and consumer products. The more toxicologists and other researchers investigated the health effects of lead, the more they realized that even very low levels of lead exposure were hazardous. Lead may cause neuro developmental effects in children. Other effects include cardiovascular, renal, gastrointestinal, hematological and reproductive effects. Children of six years old and below that are more at the risk. When someone is exposed to Lead, the blood Lead level of the person will rise up, causing blood poisoning. Adults that are exposed to a dangerous amount of lead can experience anemia, nervous system dysfunction, weakness, hypertension, kidney problems, decreased fertility and increased level of miscarriages, and low birth weight and premature deliveries. Children exposed to high levels of lead show similar symptoms including anemia, kidney damage, colic, neurological impairment, and impaired vitamin D metabolism. Lead poisoning causes a wide range of problems from low IQ and slowed growth in children to memory loss, mood disorders, and miscarriage in adults. Exposure to Lead can cause a range of health deteriorations from behavioral problem and learning disabilities to seizures and death. Children of six years old and below are most at risk because children are growing at a very fast rate growing bones, developing stronger muscles and creating many connections in their brain. When lead instead of essential nutrient is "available" to the body to make bones, muscle, and brain connections, permanent harm to health can occur. In a child's developing brain, lead interferes with synapse (junction for communication) formation in the cerebral cortex, neurochemical development (including that of neurotransmitters) and organization of ion channels.

There are more than twenty heavy metals, but four are of particular concern to human health and the environment namely Lead (Pb), Cadmium (Cd), Mercury (Hg), and Arsenic (As) [19]. They are toxic and can cause damaging effects even at very low concentrations. The Agency for Toxic Substances and Disease registry (ATSDR) in Atlanta Georgia, (a part of the U. S Department of Health and Human Services) compiled a priority list called the "Top 20 Hazardous Substances".

Heavy metals are found in the environment in rocks, soil and water, and therefore exist in the manufacture of pigments and other raw materials in all industries including the cosmetics industry. Some of these metals have been used as cosmetic ingredients in the past. Examples include the preservative thimerosal (Mercury), the progressive hair dye lead acetate and a number of tattoo pigments such as cinnabar (mercury sulfide), Cadmium is a deep yellow to orange pigment and mostly present in lipsticks and face powders. The use of cadmium in cosmetics products are due to color property as it has been used as a color pigment in many industries [20].

Since the dawn of civilization cosmetics have constituted a part of routine body care not only by the upper strata of the society but also by middle- and low-class people. Last few decades have shown a big boost in cosmetic industries, by the production of the various types of the cosmetics which are needed for the care and beautification of the skin, hair, nails, teeth, and body. Cosmetics comprise of creams, beauty soaps, talcum and face powders, lotions, shampoos, hair oils, hair dyes, hair colors, perfumery items, lipsticks, kajal, bindi, shaving creams, henna, rouge, body lotions, tooth paste etc. Although beauty consciousness of people has set the demand of cosmetics in market and as deliberated cosmetic ingredients has been addressed, attention of clinicians and researchers turn to the presence of these substances as impurities and their toxic effects. Heavy metals like lead and cadmium are common contaminant in various cosmetic products. However, other metals of primary toxicological concern in cosmetics are: arsenic, mercury and antimony [21].

Lead and cadmium are two potentially harmful metals that have aroused considerable concern. In fact, lead has been described as the most severe environmental contaminant to arise in human civilization [22]. Lead impairs the renal homopoietic and nervous system and reports of various surveys suggest that lead is casually related to deficiency in cognitive acuity and intelligence quotient deficits. Research has established that lead can cross the placenta during pregnancy and has being associated with intra uterine fetal death, premature delivery and low birth weight. Cadmium target blood vessel and heart tissue as well as the kidneys, lungs, and brain, and results in heart disease, hypertension, liver damage, and suppressed immune system. Cadmium also causes bone degradation because it affects calcium metabolism. Nickel is a ubiquitous metal frequently responsible for allergic skin reactions and has been reported to be dermal patch tests. Nickel dermatitis produces erythema, eczema and lichenification of the hands and other areas of the skin. Exposure to high levels of chromium has been linked not only to kidney damage but also lung and other cancers. Chromium is also linked to skin conditions such as eczema and other inflammations of the skin.

Heavy metals have been implicated in cosmetics commonly used among women. Again, hazards associated with heavy metal in facial make-ups have been discussed in literatures. Heavy metals which can build up in the body over time are known to cause various health problems, such as; cancer, reproductive and developmental disorders, neurological problems; cardiovascular, skeletal, blood, immune system, kidney and renal problems; headaches; vomiting, nausea and diarrhea; lung damage; contact dermatitis; and brittle hair and hair loss. Some are hormone disruptors while others are respiratory toxins. However, for some like Lead, there is no known safe blood level. They can be ingested or absorbed through the skin, especially broken skin.

Lipstick can become contaminated with Lead via the contaminated raw materials or through the use of pigments that contain it [23]. Skin contact with Lead occurs daily, and some have been found to be absorbed through the skin. The use of leaded eye powders (e.g Surma, Kohl, Alkol) has been associated with increased blood-Lead levels in children and women. Pregnant women and young children are particularly vulnerable become it can cross the placenta with ease and enter the foetal brain. It can also be transferred to infants through breast feeding and stored in bones. Lead exposure has also been linked to miscarriage, hormonal changes, reduced fertility in men and women, menstrual irregularities, delays in puberty onset in girls. Leads and inorganic Lead compound have been classified as a suspected carcinogenic to humans.

Due to the abundance of this metal in nature, everyone is exposed to small amounts, mostly through food, air, portable water, soil, household dust, and skin contact with products containing it, including cosmetics. High levels of exposure can lead to health effects depending on route and the kind of nickel exposed to. While certain types of Nickel are considered to be "toxic" because of their carcinogenicity, metallic Nickel and alloys have been classified as possibly carcinogenic to humans. Allergy to Nickel is also common and it can cause severe contact dermatitis. The first case of Nickel allergy caused by eye shadow has been reported; even as 1 ppm of it may trigger apre-existing allergy [24].

The bio toxic effects of heavy metals refer to the harmful effects of heavy metals to the body when consumed above the bio-recommended limits. Although individual metals exhibit specific signs of their toxicity, the following have been reported as general signs associated with cadmium, lead, arsenic, mercury, zinc, copper and aluminum poisoning: gastrointestinal (GI) disorders, diarrhea, stomatitis, tremor, hemoglobinuria causing a rust-red colour to stool, ataxia, paralysis, vomiting and convulsion, depression, and pneumonia when volatile vapours and fumes are inhaled [25]. The nature of effects could be toxic (acute, chronic or sub-chronic), neurotoxic, carcinogenic, mutagenic or teratogenic.

Cadmium is toxic at extremely low levels. In humans, long term exposure results in renal dysfunction, characterized by tubular proteinuria. High exposure can lead to obstructive lung disease, cadmium pneumonitis, resulting from inhaled dusts and fumes. It is characterized by chest pain, chough with foamy and bloody sputum, and death of the lining of the lung tissues because of excessive accumulation of watery fluid. Cadmium is also associated with bone defects, viz; osteomalacia, osteoporosis and spontaneous fractures, increased blood pressure and myocardia dysfunctions. Depending on the severity of exposure, the symptoms of effects include nausea, vomiting, abdominal cramps, dyspnea and muscular weakness. Severe exposure may result in pulmonary odema and death. Pulmonary effects (emphysema, bronchiolitis and alveolitis) and renal effects may occur following sub-chronic inhalation exposure to cadmium and its compounds [25, 26, 27, 28]. Lead is the most significant toxin of the heavy metals, and the inorganic forms are absorbed through ingestion by food and water, and inhalation [29]. A notably serious effect of lead toxicity is its teratogenic effect. Lead poisoning also causes inhibition of the synthesis of hemoglobin; dysfunctions in the kidneys, joints and reproductive systems, cardiovascular system and acute and chronic damage to the central nervous system (CNS) and peripheral nervous system (PNS) [30]. Other effects include damage to the gastrointestinal tract (GIT) and urinary tract resulting in bloody urine, neurological disorder and can cause severe and permanent brain damage. While inorganic forms of lead, typically affect the CNS, PNS, GIT and other bio systems, organic forms predominantly affect the CNS [25, 26, 29, 31]. Lead affects children by leading to the poor development of the grey matter of the brain, thereby resulting in poor intelligence quotient (IQ) [32]. Its absorption in the body is enhanced by Ca and Zn deficiencies. Acute and chronic effects of lead result in psychosis.

Zinc has been reported to cause the same signs of illness as does lead, and can easily be mistakenly diagnosed as lead poisoning [25]. Zinc is considered to be relatively non-toxic, especially if taken orally. However, excess amount can cause system dysfunctions that result in impairment of growth and reproduction [26, 33]. The clinical signs of zinc toxicities have been reported as vomiting, diarrhea, bloody urine, icterus (yellow mucus membrane), liver failure, kidney failure and anemia [34].

Poisoning by its organic forms, which include monomethyl and dimethyl mercury presents with erythrism (an abnormal irritation or sensitivity of an organ or body part to stimulation), acrodynia (Pink disease, which is characterized by rash and desquamation of the hands and feet), gingivitis, stomatitis, neurological disorders, total damage to the brain and CNS and are also associated with congenital malformation [29, 31].

As with lead toxicity symptoms depend on the chemical form ingested [35, 29]. Arsenic acts to coagulate protein, forms complexes with coenzymes and inhibits the production of adenosine triphosphate (ATP) during respiration [26]. It is possibly carcinogenic in com-pounds of all its oxidation states and high-level exposure can cause death [36, 37].

Conclusion

This study has revealed that there are considerably high concentrations of Cadmium (cd) & Lead (Pb) in some of the lipstick products investigated. High concentrations of Cd and Pb were obtained in samples (A, B, C, D& E). These products are common lipsticks used and their continual usage may render the users at high risk of heavy metal toxicity. In view of this, regulatory guidelines on Good Analytical Practice (GAP), Good Manufacturing Practice (GMP) in the manufacturing and importation of lipsticks should be formulated and enforced by relevant authorities. At the same time, prolonged use of lipstick should be discouraged. This research study was restricted to certain aspects of lipstick due to time and resource restrictions, but further studies could be extended to cover other cosmetic products as well as their effects on humans. It is also of paramount importance to establish in the country a laboratory facility that could allow the detection of mercury being one of the common components in cosmetic products as well as its presence in the environment. Promotion of public awareness particularly among the regular users of cosmetic products about the likely health risks, especially regarding heavy metal toxicity is paramount. Periodic analysis of heavy metals levels should be encouraged on personal and family-scale on products at high risk of toxicity.

This result shows that all the brands of lipsticks and lipglosses submitted for analysis contains no lead and cadmium. It therefore assures safety in the use of these brands available in Yenagoa cosmetic stores. Further review of other brands will confirm or dispute a generalized recommendation of safety of use of lipglosses in general from lead & cadmium toxicity.

Recommendations

The following recommendations are hereby made from results of this study:

i. Mass awareness program should be initiated on the health hazards of lead and cadmium toxicity especially among children and pregnant women.

ii. Regulatory bodies such as FDA (food and drug administration), NAFDAC (National Agency for Food and Drug Administration and Control) and SON (Standard Organization of Nigeria) should be involved in the effective monitoring of the import, production, sale, distribution promotion and processing of cosmetics.

iii. Quality control and assurance standards should be enacted in order to limit the content of lead in cosmetics and other household products and items.

iv. Laws and regulations must be made to ensure standardization of products before marketing.

v. Packaging must have clear labelling about heavy metals like lead, mercury etc. so that general public could make informed decision in selecting safe products.

vi. Producers should put cautionary notice about toxic levels of ingredients used in processing of their cosmetics products.

vii. An independent monitoring agency should be established that will be responsible for testing and monitoring the heavy metals and other toxic impurities in cosmetic products and make a public dissemination of the result on regular basis.

References

1. Oyedeji FO, Hassan GO, Adeleke BB. Hydroquinone and heavy metal levels in cosmetics marketed in Nigeria. *Trends Appl. Sci. Res*. 2011; 6(7): 622-639. doi: 10.3923/tasr.2011.622.639
2. Abdel-Fattah A, Pingitore NE. Low levels of toxic elements in Dead Sea black mud and mud-derived cosmetic products. *Environ Geochem Health*. 2009; 31(4): 487-492. doi: 10.1007/s10653-008-9201-x
3. Adepoju-Bello AA, Alabi OM. Heavy metals: a review. *Nig .J. Pharm*. 2005; 37: 41-45.
4. Sun CC, Wong TT, Hwang YH, Chao KY, Jee SH, Wang JD. Percutaneous absorption of inorganic lead compounds. *AIHA J*. 2002; 63(5): 641-646.
5. Bocca B, Forte G, Petrucci F, Cristaudo A. Levels of nickel and other potentially allergenic metals in Ni-tested commercial body creams. *J. Pharm. Biomed. Anal*. 2007; 44: 11971202. doi: 10.1016/j.jpba.2007.04.031
6. Chukwuma C. Environmental lead exposure in Africa. *Ambio*. 1997; 26(6): 399-403.
7. Cosmetic Ingredients Review Expert Panel. Review publishes new 2007.
8. Basketter DA, Angelini G, Ingber A, Kern PS, Menne T. Nickel, chromium and cobalt in consumer products: revisiting safe levels in the new millennium. *Contact Dermatitis*. 2003; 49(1): 1-7.
9. Bellinger BC. Teratogen update: lead and pregnancy. *Birth Defects Res A Clin Mol Teratol*. 2005; 73(6): 409-420. doi: 10.1002/bdra.20127
10. Amit SC, Rekha B, Singh AK, Lodhi SS, Chaturvedi DK, Tomar VS. Determination of Lead and Cadmium in cosmetic products. *J. Chem. Pharm. Res*. 2010; 2(6): 92-97.
11. Slodownik D, Lee A, Nixon R. Irritant contact dermatitis: a review. *Australas J Dermatol*. 2008; 49(1): 1-11. doi: 10.1111/j.1440-0960.2007.00409.x
12. Determination of lead and cadmium in cosmetic products. J. Chem. Pharm. Res. 2: 92-97.
13. Ayenimo JG, Yusuf AM, Adekunle AS. Heavy metal exposure from personal care products. *Bull Environ. Contam. Toxicol*. 2010; 84(1): 8-14. doi: 10.1007/s00128-009-9867-5
14. National Population Commission, Yenagoa LGA, Rivers State Census, 2006.
15. Ndiwari EL. Road network Analysis for Yenagoa Local government Area, Bayelsa State. Unpublished thesis, Federal School of Surveying Oyo, Oyo State 1-3, 2014.
16. Sridhar MKC, Wahab B, Oloruntoba EO, Idachaba A. Landscape Analysis and Business Model Assessment in fecal sludge management: Extraction and transportation model in Africa. 2011.
17. Koinyan A, Nwankwoala HO, Eludoyin OS. Water resource utilization in Yenagoa, central Niger Delta: Environmental and health implication. *Journal of Water Resources and Environmental Engineering*. 2013; 5(4): 177-186. doi: 10.5897/IJWREE2013.0389
18. Forte G, Petrucci F, Bocca B. Metal allergens of growing significance: epidemiology, immunotoxicology, strategies for testing and prevention. *Inflammation & Allergy*. 2008; 7(3): 145-162.
19. Nohynek GJ, Antignac E, Re T, Toutain, H. Safety assessment of personal care products/cosmetics and their ingredients. *Toxicol Appl Pharmacol*. 2010; 243(2): 239-259. doi: 10.1016/j.taap.2009.12.001
20. Agency for Toxic Substance and Disease Registry (ATSDR). Draft Toxicological Profile for Cadmium U.S. Department of Health and Humans Services, Public Health Humans Services, Centers for Diseases Control. Atlanta, 2011.
21. Laschinsky T. Toxic metals found in make-up cosmetics. A Report Released by Environmental Defence. 2011.
22. Horowitz Y, Greenberg D, Ling G, Lifshitz M. Acrodynia: a case report of two siblings. *Arch Dis Child*. 2002; 86: 453-455. doi: 10.1136/adc.86.6.453
23. Al-Saleh I, Al-Enazi S. Trace metals in lipsticks. *Toxicological & Environmental Chemistry*. 2011; 93(6): 1149-1165. doi: 10.1080/02772248.2011.582040
24. Al-Saleh I, Al-Enazi S, Shinwari N. Assessment of lead in cosmetic products. *Regulatory Toxicology and Pharmacology*. 2009; 54(2): 105-113. doi: 10.1016/j.yrtph.2009.02.005
25. Nnorom IC, Igwe JC, Oji-Nnorom CG. Trace metal contents of facial (make-up) cosmetics commonly used in Nigeria. *African Journal of Biotechnology*. 2005; 4(10): 1133-1138. doi: 10.4314/ajb.v4i10.71343
26. Iavicoli I, Fontana L, Bergamaschi A. The effects of metals as endocrine disruptors. *Journal of Toxicology and Environmental Health B*. 2009; 12(3): 206-223. doi: 10.1080/10937400902902062
27. Batra J, Seth PK. Effect of iron deficiency on developing rat brain. *Indian J Clin Biochem*. 2002; 17(2): 108-114. doi: 10.1007/BF02867982
28. Wang J, Kay A, Fletcher B, Formica MK, McAlindon TE. Is lipstick associated with the development of systemic lupus erythematosus (SLE)? *Clin Rheumatolo*. 2008; 27(9): 1183-1187. doi: 10.1007/s10067-008-0937-6
29. Josefson A, Farm G, Styme B, Meding B. The impact of airway irritating exposure and wet work on subjects. *Contact Dermat*. 2006; 55: 286-290.
30. Koller K, Brown T, Spurgeon A, Levy L. Recent development in low level lead exposure and intellectual impairment in children. *Environ. Health. Perspect*. 2004; 112(9): 987-994. doi: 10.1289/ehp.6941
31. Gondal MA, Seddigi ZS, Nasr MM, Gondal, B. Spectroscopic detection of health hazardous contaminants in lipstick using laser induced breakdown spectroscopy. *J Hazard Mater*. 2010; 175(1-3): 726-732.
32. Ward M. Prevalence of physician-diagnosed systemic lupus erythematosus in the United States: results from the Third National Health and Nutrition Examination Survey. *Journal of Women's Health*. 2004; 13(6): 713-718. doi: 10.1089/1540999041783208
33. Hepp NM, Mindak WR, Cheng J. Determination of total lead in lipstick: development and validation of a microwave-assisted digestion, inductively coupled plasma-mass spectrometric method. *J Cosmet Sci*. 2009; 60(4): 405-414.
34. Kroes R, Renwick AG, Feron V, et al. Application of the threshold of toxicological concern (TTC) to the safety evaluation of cosmetic ingredients. *Food and Chemical Toxicology*. 2007; 45(12): 2533-2562. doi: 10.1016/j.fct.2007.06.021
35. Lee SM, Jeong HJ, Chang IS. Simultaneous determination of heavy metals in cosmetic products. *J Cosmet Sci*. 2008; 59(5): 441-448.
36. US FDA: Document on Lead in Candy. FDA Lipstick and Lead: Questions and Answers.
37. Sainio EL, Jolanki R, Hakala E, Kanerva L. Metals and arsenic in eye shadows. *Contact Dermatitis*. 2000; 42(1): 5-10.