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THE PROBLEM OF LEAD IN LIPSTICKS IN NEPAL

Ram Charitra Sah



**Different lipstick brand samples
tested for lead contain**



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(CEPHED)

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The opinions expressed herein are those of the writer and may not necessarily reflect the official view of Swedish Society for Nature Conservation (SSNC), Sweden.

About CEPHED

Center for Public Health and Environmental Development (CEPHED) is an environmental NGO established in the year 2004, by and through the contribution, coordination from a group of activist and experienced people from medical, environment and public health sectors. CEPHED's focus is to serve Nepalese people and communities in the field of public health and environment. CEPHED has adopted the vision of bridging people with the science and technology for healthy leaving and environmental safety and taken a mission to act as bridging forum between people with science and technology to make access new scientific knowledge, technology and safety measures of environment and public health sector through research, coordination, capacity building and policy dialogue, etc. CEPHED is working with and also willing to work with group and organizations around the country with an understanding that this will help to bring the experience from the ground to the concerned authorities' notice that leads to more meaningful and sustainable solutions. From past eight years CEPHED has been engaged mainly on research, awareness raising, capacity building, policy influence especially in the area of chemical management, pesticide, obsolete pesticide, healthcare waste, POPs, heavy metals like mercury, lead and cadmium, electronic waste.

Additionally, CEPHED has been actively engaged in research, production of Information, Education and Communication (IEC) materials both in printed and electronic format widely disseminating all over the country. The research results and findings have been shared with all stakeholders especially government, business communities and general public at large scale thorough all possible means such as meeting, interaction, presentation, newspaper, radio and television programme and also through organizing series of district, regional and national level awareness and capacity building training programmes on these issues.

With its growing interest and engagement with various environmental issues of national and international importance, it became an active participating organization of several global networks working in the area of public health, environment and toxic free future. CEPHED is member organization of Toxic Link, International POPs Elimination Network (IPEN), Global Alliance for Incinerator Alternatives (GAIA), Healthcare Without Harm (HCWH), Collaborative on Health and the Environment (CHE) and Zero Mercury Working Group (ZMWG)/EEB. CEPHED has been doing research, raising awareness and at the same time setting pilot model projects. CEPHED has recently completed the feasibility study and strategy development for mercury free health care services from there pilot projects. The second intervention made by CEPHED towards curbing the release of POPs (Dioxins, Furans) is the development of environmentally sound management of health care waste and promotion of the use of dry welding machine for metal fabricating as model programme.

CEPHED has been awarded with "2011 Stockholm Convention's PEN Award" in the ceremony hosted by POPs Convention Secretariat because of organization's outstanding work on raising awareness on PCBs, their health effects and ways to prevent their release.

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Executive Summary

Cosmetics are being used from the early historical era but simply the form of the cosmetics and the way of using it was different. From the time immemorial both the men and women are equally fond of cosmetics. In earlier days people use to mix different types of chemicals and products to make cosmetics to be applied in their face which include even the heavy metals. Galena Mesdemet is one example of such cosmetic used in ancient Egyptian period. It is an eye product that is made up of copper and lead ore.

Different literatures available prove that the heavy metals are used in large quantity in cosmetics during different time period depending in the products of cosmetics they wanted to use. And these cosmetics that have been prepared as heavy metals as their ingredients is very toxic to health. It may cause various problems like damage in brain, kidney, nervous system, reproductive system and even cause a cancer and death.

Many European and African countries have banned heavy metals in cosmetics and even fix the standard. However, Nepal does not have any standards, guidelines or policies regarding the concentration of heavy metals in cosmetics or in any other products. There is no any government agencies responsible for regulating chemicals in cosmetics in Nepal. Therefore, there is no limit for such impurities in products in Nepal. For this reason, under this study the guideline considered for analyzing the result of lead in lipstick is US Food and Drug Administration's 0.1 ppm of lead in candy standard since there is no exact guidelines for lead in lipsticks.

This was the first ever study carried out by CEPHED in Nepal about chemicals in product especially in cosmetics to inform the wide users about the level of contamination and associated health impacts. Basically the study was done in very popular and most used cosmetic products: lipsticks. The concentration observed in these products were Lead, a very toxic chemical at very alarming level of health concern.

8 Samples of different most common and popular brand of Lipsticks were collected from different market areas of Kathmandu.

The collected lipsticks samples were tested for lead (Pb) at Nepal Environmental and Scientific Services (P) Ltd, Kathmandu, Nepal. Lead in lipsticks samples were tested by AAS method. The result shows that the popular lipsticks available in the Nepalese market contain very high level of lead enough to cause different kinds of disabilities and problems in human health up on continuous use.

The test result of lead in lipstick shows the alarming amount of lead contamination. All the samples of lipsticks have lead level higher than USFDA guidelines of 0.1 ppm. The highest amount of lead concentration was found in blood red color of MAC brand lipstick (i.e. 145 ppm, 1450 times higher than USFDA guidelines). The lowest amount was found in berry- berry 18 of Loreal Paris brand (i.e. 30 ppm, 300 times higher than the USFDA guidelines).

The market survey shows that there is no any monitoring regarding quality, sell, import and distribution of cosmetics in Nepalese market. There is no proper labelling of ingredients in the cosmetic products and specially regarding heavy metals. So, general people are not aware of such contamination in the product they are relying on. Therefore, there is an immediate need to formulate a guidelines and standards regarding the heavy metal concentration in cosmetics to minimize the exposure of general public with toxic heavy metals as well as there should be some institutional arrangement to regulate the sector. The mass awareness about the chemicals in products especially in cosmetics needs to be launched.



Acronym

AAS	:	Atomic Absorption Spectroscopy
CDC	:	Centers for Diseases Control and Prevention
CEPHED	:	Center for Public Health and Environmental Development
DNA	:	Deoxyribonucleic Acid
DTH	:	Delhi Test House
EU	:	European Union
H_3BO_3	:	Lead Borate
HCL	:	Hydro Chloride
Hg_2Cl_2	:	Mercurous Chloride
$HgCl_2$:	Mercuric Chloride
HNO_3	:	Nitric Acid
ISO	:	International Organization for Standardization
IUPAC	:	International Union of Pure and Applied Chemistry
ICP MS	:	Inductively Coupled Plasma Mass Spectrometry
kg	:	Kilogram
mg	:	Milligram
mL	:	Milliliter
NABL	:	National Accreditation Board for Testing and Calibration Laboratories
NESS	:	Nepal Environmental and Scientific Service (P) Ltd.
NIST	:	National Institute for Standards and Technology
$PbCO_3$:	Lead Carbonate
$PbSO_4$:	Lead Sulphate
ppb	:	Parts Per Billionss
ppm	:	Parts Per Million
SSNC	:	Swedish Society for Nature Conservation
USA	:	United State of America
USEPA	:	United State Environment Protection Agency
USFDA	:	United State Food and Drug Administration

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Lead in Lipsticks

1. Introduction to Lead

Heavy metals are sometimes defined on the basis of their density, atomic weight, atomic number and sometimes on chemical properties of toxicity. Due to the contradictory definition and its lack of “coherent scientific basis” the term heavy metal has been called a “misinterpretation” in International Union of Pure and Applied Chemistry (IUPAC) technical report.^[1] Article 1 of Convention of Long Range Transboundary Air Pollution on Heavy Metal (1979) has defined heavy metal as: “those metals or, in some cases, metalloids which are stable and have a density greater than 4.5 g/cm³ and their compounds”. Lead is one of the heavy metal that occurs naturally in environment. It is a bluish-white lustrous metal. It is very soft, highly malleable, ductile, and a relatively poor conductor of electricity. It is very resistant to corrosion but tarnishes upon exposure to air. Lead isotopes are the end products of each of the three series of naturally occurring radioactive elements.^[2]



A women usign lipsticks

Toys made colorful soft plastics available in Nepali market aren't the only products laced with dangerous heavy metals. Cosmetic such as Lipsticks and skin whitening creams manufactured, imported, sold, distributed and marketed in Nepal and used daily by millions of Nepalese women and children also contain surprisingly high levels of lead.

2. Use of Lead in Cosmetics

There is an old saying that “necessity is the mother of the invention”, as there was a much emphasis for looking good for ancient Egyptian women, they had to find the way to do it. Then they came up with *galena mesdemet*. It was made of copper and lead ore.^[3] It was not safe to put constantly in the face but however, it worked and they used it. Similarly, Kohl is a eye cosmetics used to darken the eyelids and as a mascara for eyelashes. It was made by grinding galena (lead sulfide) and other ingredients.^[4]



Poison kiss

A study by US consumer group *Campaign for Safe Cosmetics*, in October 2007 found 60 percent of lipsticks tested contained trace amounts of lead, especially in red lipsticks.^[5] The levels of lead varied from 0.03 to 0.65 parts per million. One third of the lipsticks containing lead exceeded the 0.1 ppm limit set by the U.S. Food and Drug Administration (USFDA) for lead in candy.^{[6] [7]} **Lead is being used in Lipstick mainly for the pigments required to obtained needed colours.**

- 1 John H. Duffus ““Heavy metals” a meaningless term? (IUPAC Technical Report)” Pure and Applied Chemistry, 2002, Vol. 74, pp. 793–807
- 2 <http://www.lenntech.com/periodic/elements/pb.htm>
- 3 <http://www.thehistoryof.net/the-history-of-cosmetics.html>
- 4 [www.wikipedia.org/wiki/Kohl_\(cosmetics\)](http://www.wikipedia.org/wiki/Kohl_(cosmetics))
- 5 My Product Alert: [Extensive Report on Lead in Lipsticks](#)
- 6 US FDA: [Document on Lead in Candy](#)
- 7 [FDA Lipstick and Lead: Questions and Answers](#)

3. Impacts of Lead on Health and Environment

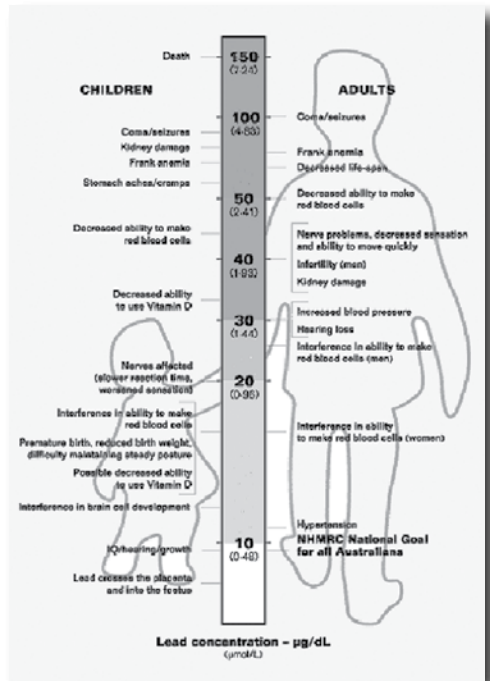
3.1 Impact of Lead on Health

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.

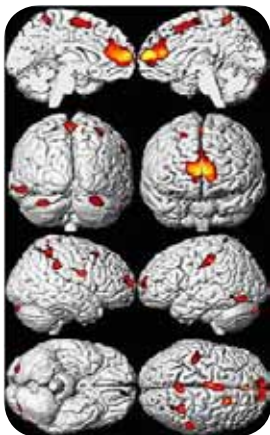
The more toxicologists and other researchers investigated the health effects of lead, the more they realized that even very low levels of lead exposure were hazardous [8]. Lead may cause neuro developmental effects in children. [9] Other effects include cardiovascular, renal, gastrointestinal, hematological and reproductive effects. [5] Children of six years old and below that are more at the risk. [10]

When the person is exposed to the lead, the blood lead level of the person raise up that leads to the lead poisoning. [11] 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. [12] Children exposed to high levels of lead show similar symptoms, including anemia, kidney damage, colic, neurological impairment, and impaired vitamin D metabolism. [8] According to World Health Organization, no blood lead level is safe.

The Campaign for Safe Cosmetics is particularly concerned about lead exposure for children and pregnant women. The [CDC's Advisory Committee for Childhood Lead Poisoning Prevention](#) recently stated that there is no safe lead level for children.



Impact of Lead on Health



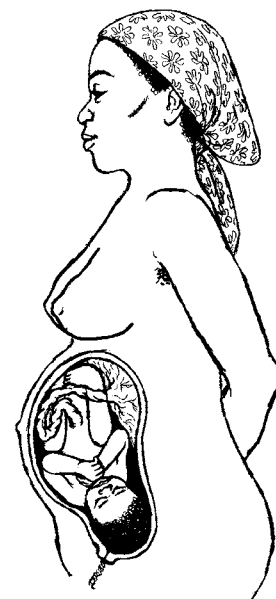
Brain damage caused by lead

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 [13]. Exposure to lead can cause a range of deleterious health effect from behavioral problem and learning disabilities to seizures and death. Children 6 year old under 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 nutrients is “available” to the body to make bones, muscle, and brain connections, permanent harm to health can occur. [14] 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. It causes loss of neurons’ myelin sheaths, reduces numbers of neurons, interferes with neurotransmission, and decreases neuronal growth.

- 8 Gilbert SG. and Weiss B. “A Rationale for Lowering the Blood Lead Action Level From 10 to 2 µg/dL.” *Neurotoxicology*. 27(5), September 2006, pp 693-701.
- 9 NEP 2008a, *Interim review of scientific information on lead*, Taken 2008-05-18 from http://www.chem.unep.ch/Pb_and_Cd/SR/Files/2008/UNEP_Lead_review_Interim-mar102008.doc
- 10 <http://www.epa.gov/lead>
- 11 Stellman, Jeanne Mager (1998). *Encyclopaedia of Occupational Health and Safety*. International Labour Organization. pp. 81.2–81.4.
- 12 <http://www.atsdr.cdc.gov/toxprofiles/tp13.pdf> ATSDR Toxicological Profile for Lead
- 13 www.forbes.com/.../is-that-lead-in-your-lipstick-fda-tests-reveal-raise.
- 14 <http://www.kingcounty.gov/healthservices/health/ehs/toxic/Leadgeneral.aspx>

3.2 Effects of lead exposure during pregnancy¹⁵

A pregnant woman's past or present exposure to lead puts her unborn baby at risk. When she breathes in or swallows lead, it goes into her blood. Once the lead is in the bloodstream, it passes through the placenta into the baby and into the baby's developing bones and other organs. If a pregnant woman has had past exposure to lead, her body may store the lead in her bones and teeth. If the pregnant woman's diet does not contain enough calcium, the body may substitute lead in the bones for the calcium that the baby needs. Lead exposure can affect the unborn child's brain, causing developmental problems later in life. Fetuses exposed to lead before birth may be born early or underweight.¹⁶



Effects of lead during pregnancy

Lead is a proven neurotoxin that can cause learning, language and behavioral problems such as lowered IQ, reduced school performance and increased aggression. Pregnant women and young children are particularly vulnerable to lead exposure because lead easily crosses the placenta and may enter the fetal brain, where it interferes with normal development. Lead has also been linked to miscarriage, reduced fertility in both men and women, hormonal changes, menstrual irregularities and delays in the onset of puberty. Lead builds up in the body over time and lead-containing lipstick applied several times a day, every day, combined with lead in water and other sources, could add up to significant exposure levels. The most recent studies conclude that there is no safe level of lead. No amount of exposure is without harm. Miscarriage, reduced fertility in both men and women, hormonal changes, menstrual irregularities and delays in when puberty begins for girls have all been linked to lead exposure. At puberty, boys' developing testes appear to be especially vulnerable to lead's impact. **“Women inadvertently (but harmlessly) eat about 4 lbs of lipstick” in a lifetime. Unfortunately, the latest science shows that no level of lead is “harmless.”**¹⁷

3.3 Impact of Lead on Environment

US Environmental Protection Agency (USEPA) has suggested that the uneven distribution of lead in the ecosystem can displace other metals from the binding sites on the organic matter. It may hinder the chemical breakdown of inorganic soil fragments and lead in the soil may become more soluble, thus being more readily available to be taken up by plants.¹⁸ Near industrial areas the low concentration of lead in soil can slow down the vegetation growth.^[19] Lead accumulates in the surface ground layer in soil.^[20] These lead is easily taken up by plants which is in turn taken up by animals, human and starts accumulating in different organs in them. Animals also show same symptoms of lead poisoning as in human.

4. International guidelines for Lead in Cosmetics

There is no exact guideline for lead in cosmetics. However some comparative, guidelines are used to limit the lead in lipstick. U.S. Food and Drug Administration, has set up 0.1 ppm limit for lead in candy- to protect the people from directly ingesting the lead which is used for lipstick as well. Similarly, Health Canada Product Safety Laboratory while reviewing and analyzing the results of heavy metal testing on a number of

15 <http://www.lead-safe-illinois.org/family-safety/pregnancy.asp>

16 http://safecosmetics.org/downloads/A_Poison_Kiss_report.pdf

17 <http://www.lead.org.au/lanv1n2/lanv1n2-8.htm>

18 <http://www.extraordinaryroadtrip.org/research-library/air-pollution/understanding-air-pollution/lead/health.asp>
de Abreu CA, de Abreu MF and de Andrade JC (1998), Distribution of lead in the soil profile evaluated by DTPA and Mehlich-3 solutions, *Bragantia* 57: 185-192.

cosmetics sold in Canada determines the limit for the heavy metal impurities. According to which, lead level exceeding 10 ppm is considered technically avoidable.

5. National Law and Standards for Lead in Cosmetics

Nepal does not have any standards, guidelines and legislation regarding lead in any cosmetic products. There are no government agencies responsible for regulating lead in cosmetics. Neither a government agencies nor private sectors monitor the heavy metal impurities in cosmetics imported, produced, marketed, distributed and used in Nepal. There is absolute lack of awareness among the users and consumers of such products and no bodies bother about the content and even labelling as well as expiry dates of products.

6. Rational of the Study and Problem Statement

Lead has been used in so many products but not been recognized its impact yet fully, thus it has been in the invisible site. The reason behind this could be the low level of awareness about lead and its impact in health and environment. But the scenario in Nepal seems to be challenging in products like cosmetic as well as artificial jewelry where there is absence of any legal framework and institutional arrangement.

However, there is still lot to change especially the Nepalese cosmetic manufactures and traders of the lead based products such as cosmetics. Among which the, contamination of lead in cosmetics is also one. The lipsticks have been very common and mostly used cosmetic products were taken as a sample under this study to test for the total lead concentration in them.

The cosmetic products that enter to the Nepalese market are not monitored by any sectors and even there are no standards, guidelines or policy regarding chemicals in such products. Specific Laboratory for examination of heavy metals in cosmetics is lacking as well.

7. Objectives of the Study

Broad Objective:

☞ To study the Lead concentration in the Lipsticks.

Specific Objectives:

☞ To study the amount of lead in different brands of lipsticks available in the market of Kathmandu.

☞ To aware the general consumer of cosmetics about impact of lead in lipsticks.

☞ To advocate for formulating standard, guideline and allocate the responsible government authority to deal with the issues of chemicals in products.

8. Sample Collection, Laboratory Methods and Analysis

8.1 Sample Collection

With vision of exploring the lead contamination in lipsticks, the market of Kathmandu was explored for the most popular brands among the consumers. After the market survey, eight popular brands of lipstick samples were collected. The samples thus collected were coded sent to Nepal Environment and Scientific Service(NESS) Private Limited (NS Accreditation No. Pra. 01/053-54) for laboratory analysis to test lead in lipsticks.



Different lipstick brand samples tested for lead contain

8.2 Materials and Methods²⁰

8.2.1 Method used:

Atomic Absorption Spectroscopy (AAS).

8.2.2 Procedure:

The accurately weighed sample (0.5000g) was taken in clean and dry beaker from the homogeneous lipstick. About 25mL of triacidmixture (70:7:23) of nitric, sulfuric and perchloric acid was added and digested over electronically controlled hot plate with watch glass cover in a digestion hood. The digestion was carried out at low heat at first followed by increase in temperature. The sample was digested up to the white fumes. The digested sample was cooled and quantitative amount of distilled water was added and filtered into a 25ml volumetric flask. After cooling, the final volume was adjusted volumetrically with distilled water. The content of lead in the aliquot was calculated by aspirating through AAS. The working lead standard solutions

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that had already prepared from National Institute for Standard and Technology (NIST), USA lead stock solution were used for the AAS calibration curve generation. The result thus obtained has been presented in the table below.

Table 1: Result of LEAD content in the tested lipstick brands from Kathmandu Valley

S.N.	Sample code	Brand	Color/Shade	Lead Amount (ppm)	Remark (USFDA guidelines (0.1 ppm for colorant for Candy))
1	NPA1	Revlon	Wicked Chocolate-101	40	400 times higher
2	NPA2	Loreal Paris	Berry Berry-18	30	300 times higher
3	NPA3	Lakme	Strawberry Splash-353	50	500 times higher
4	NPA4	M.A.C.	Blood Red-13	145	1450 times higher
5	NPA5	Shiseido	Glam Shine (Holographic)-18	123	1230 times higher
6	NPA6	Dily	Pink-24	116	1160 times higher
7	NPA7	Channel	Brown -19	101	1010 times higher
8	NPA8	Midie	Light pink-540	116	1160 times higher
			Average	90.125	901 times higher

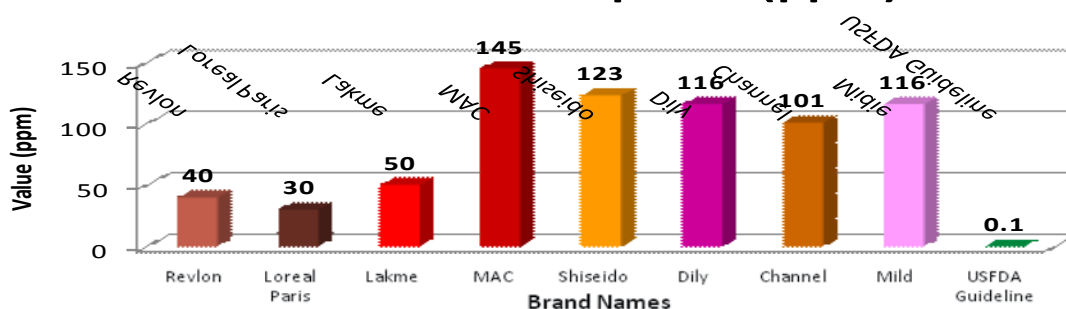
Source: NESS Pvt. Ltd. Laboratory Results

9.Key Findings

Key findings from the conducted laboratory analysis for the total lead concentration in the studied brands of the lipsticks can be summarized as follows.

- ☞ All tested samples (100%) exceeded the US Food and Drugs Administration’s lead in candy standard of 0.1 parts per million (ppm), ranging from 30 to 145 ppm.
- ☞ Highest 145 ppm was found in Sample NPA4 (M.A.C. Brand). This is 1450 times more than the 0.1 ppm, US lead in candy standard.
- ☞ Least 30 ppm was found in sample NPA2 (Loreal Paris Brand). This is again 300 times more than the US lead in candy standard.
- ☞ Other sample NPA1 (Revlon Brand), NPA3 (Lakme Brand), NPA5 (Shiseido Brand), NPA6 (Dily Brand), NPA7 (Channel Brand) and NPA8 (Midie Brand) have lead concentration of 40, 50, 123, 116, 101 and 116 ppm respectively.
- ☞ Average lead content of all 8 lipstick is 90.125 ppm (901 times higher than USFDA 0.1 ppm).
- ☞ Lead content also varies across brands and shades/colour.
- ☞ None of these samples labelled lead as in their ingredient.

Lead Content in Lipstick (ppm)



10. Conclusion

Most common and widely used lipsticks found in Nepalese market contain higher level of lead content ranges from 30 ppm to 145 ppm that is 300 to 1450 times more than the USFDA guideline value of 0.1 ppm for lead in candy. Average of lead content of all 8 brands of lipsticks is found to be 90.125 ppm that is 901 times more than the above guideline value. Lead content also varies across brands and colors. There is no any labelling about lead content in most of the cosmetics products. There are neither any legal frameworks nor any authorized government agencies to monitor this chemical in products including lead in lipsticks. Besides that there is lack of awareness among all active as well as passive consumers of the cosmetics like lipsticks. Children and pregnant and breast feeding women are the major affected groups of lead from any lead exposure coming from different sources including cosmetics call for immediate action from responsible government and business community to protect consumer health and well being.

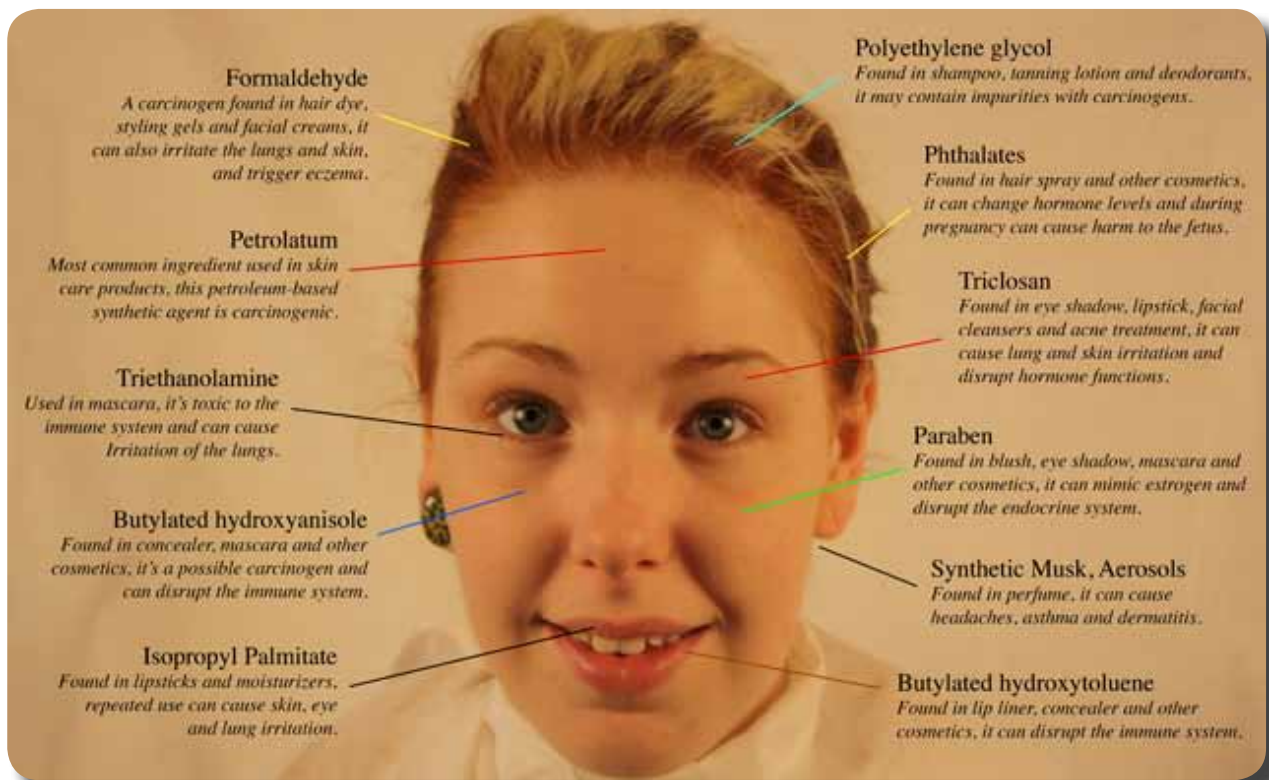
11. Recommendations

Based on the study carried out about lead in lipstick available in Nepalese market, following recommendation have been made.

- Mass awareness program should be launched with specific target group like children and pregnant women first and then for all.
- Regulatory bodies should be identified and made responsible for effective monitoring of the import, production, sale, distribution promotion and process as well as market.
- Standard should be enacted in order to limit the content of lead in cosmetics and other household products and items.
- Laws and Regulation must be made and also to enact the standard along with effective compliance monitoring mechanism in place.
- Harmonize the laws, standard of chemical in products across the globe, continents, regions and even within the country.
- Packaging must have clear labelling about heavy metals like lead, mercury etc. So that general public could make informed choice of selecting safe products.
- Producers should put cautionary notice about toxic levels of ingredients used in their cosmetic products.
- The consumers should see the label and enquire if the products they are going to use are actually safe for them or not.
- The independent monitoring agencies should be established that will be responsible for testing and monitoring the heavy metal and other toxic impurities in cosmetic products and make a public dissemination of the result on regular basis.

How Can You Contribute To Public Awareness ?

1. Email, SMS, write or call the manufacturer of your favorite lipsticks and let them know that you are aware of the hazards of using lipsticks that have lead in them. And that you know that lipsticks can be made lead-free and that is important to you.
2. One-third of all lipsticks manufactured are free from lead, so see if you can get the manufacturer to let you know the ones that are lead-free.
3. Choose colors other than red among all personal cosmetics.
4. Try herbal/natural products.
5. If you have young children or girls, make a wise choice. Find a non-lead lipstick.
6. Let other women and men friends know about the dangers and how to avoid lead lipsticks.
7. Write to the media editor and news reporter to spread the words.
8. Keep all receipts after buying any cosmetics to ensure liability.



Other Harmful Chemicals in Cosmetics



Choose Cosmetics for a Healthy Body and a Healthy Planet

Lead in the body
No safe level of lead in a child's body has been identified. Studies continue to document significant harm at far lower levels of exposure than previously known.

Blood-lead levels (µg/dL)* and their effect:

70+
Seizures, coma, possible death

45+
Chelation therapy recommended with medication that causes lead to be excreted in the urine

15+
Can trigger a home inspection by local health officials to identify lead source (level varies by department)

Less than 10
Decreased IQ, delayed puberty, reduced postnatal growth and decreased hearing

Less than 5
Decreased academic achievement, increased incidence of ADHD and problem behaviors

* µg/dL = micrograms per deciliter of blood.

Sources: CDC, National Toxicology Program, USA TODAY research