

Ctrophotometryric Determination of Heavy Metal (Lead) in Cosmetics (Lipsticks) in Commercial Markets

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Abstract

In the recent years an significant rise were occurred due to exposure human being of heavy metal . There are no escaping from exposure to toxic chemical and heavy metal . The aim of this study was to determine and evaluate the risk heavy metal in lipstick on the public health, so we selected one heavy metal (lead) in the randomly selected lipstick samples from local markets . We determine lead in 28 lipstick products samples. Cosmetic products have a wide number of forms and uses ,many of them contain chemical compounds that may passé through the skin. High concentration of heavy metal in lipsticks which could form potential health risk on public health , especially we know this lead accumulate in biological system . we used to determine lead spectrophotometer technique . The samples were analyzed based on international standard by using (HNO₃ ; H₂O₂) method . The concentration of maximum lead in random samples was (1.4) ppm , while the minimum lead was (0.02)ppm .This results were below the recommended limits of the united state Food and Drug Administration .In manufacturing of lipsticks must be monitoring the components and chemicals used . Also quality control take place to check the concentration of heavy metal in lipstick products in each country . .

Key words: *Lead ,Cosmetic, Heavy metal, element ,Health risks.*

Introduction

The Greek word “kosmetikos” is origin of the word cosmetic ¹ . In the 2014 the sales cosmetic in over 230 billion us dollars ² .This reflex the general acceptance cosmetics. Since the first civilization the cosmetic take compose a part of routine body care for low and middle class people also for upper of society. Recently cosmetic products constituted a big boost in industries ³ .The commonly used cosmetics in the world include facial make ,skin care ,mouth washes ,deodorant ,shampoo , hair dyes ,nail polishes , mascaras , eye line and eye shadows which are find in different applications on different body parts ,much of personal car products are industrial car chemicals ⁴ Some of heavy metal are used as coloring , while some added without intentionally ⁵ . The demand of cosmetics depends on beauty consciousness of the human health awareness as well as the side effects was attract the researchers to knowledge the causes behind their side effects ⁶ . In the past skin and its role is not more than considered a covering and protecting coat recently it's a part of immune system ⁵ . The first protective layer

in the human body is skin ,The skin sometimes allow some external materials to passé through it . Lipsticks products are directly applied on the body causes side effects, some of sensitivity is being when absorption is very high ⁷ . Cosmetic products contain heavy metal such as lead has been research subject du to biological accumulation and their toxicity in the body ⁸ . cosmetic industry consist many chemicals some of it have been associated with developmental or reproductive or other health effects , because of potential for exposure through ingestion lip stick products , there for thy have been suggested as a particular concern ⁹ .

The specification of cosmetics are include of some ingredients for stability , long lasting and effective as well as harmless use for human . Bio accumulation occur because presence of heavy metal in human tissues which they are build complication , this lead to appearance of some diseases in kidney , nervous , bone and cardiovascular ¹⁰ . Ingredients in cosmetics are linked with some diseases like cancer , reproductive harm and birth defects ¹¹ . Lipstick may provide direct oral exposure

to the contamination in addition to on other type like lotions may provide indirect percutaneous exposure¹². Lead as heavy metal is common contamination in various cosmetic products naturally lead is present in the earth crust with molecular weight 82¹⁶. Several raw materials and pigments included in cosmetics contain pb¹³. Lead toxicity has been distinguish health hazard for several centuries. Colic, anemia, neuropathy, sterility, and earing impairment¹⁴. Lead can cross the placental during pregnancy¹⁵.

Currently no international standards for impurities in cosmetics. FDA legal authority for drugs, biologics and medical devise, is different on cosmetics products and ingredients. firms are responsible for the safety of their product before marketing. Unsafe levels of lead in cosmetics and food may be skill exist sources of contamination¹⁶. The concentration of pure pigment can vary from 1 to 10% depending on the type of products¹⁷. One study tested 33 common brands lipsticks they found that 61% contained pb with level up to 0.65 ppm¹⁸. Also two other studies estimated pb in lipstick, US food and drug administration (FDA) they detected pb in all tested sample¹⁹.

Materials and Methods

-Sample preparation :- Lipsticks sample were prepared according to wet digestion method²⁰.

-Instrumentation :-

We used Flame atomic absorption spectrometer for determination the concentration of lead in cosmetic samples. The analytical condition are (wavelength is 246, lamp current 6, slit width 0.25). Standard solution were prepared in five different concentration for each separately to obtain calibration curve quantitative analysis.

Results

Lead detected in all lipstick (28 samples) in the range (0.02 – 1.4) ppm. The US food and drug administration (FDA) limit for pb as a colure additive is (20) ppm. All sample was less than FDA limit. The highest pb content was 1.4 ppm and the lowest was 0.02 ppm.

Table 1: the concentration of pb in ppm in lipstick

Sample no.	Concentrate of Pb (ppm)	Sample no.	Concentrate of Pb (ppm)
1	0.21	15	1.20
2	0.82	16	0.09
3	0.57	17	0.12
4	0.14	18	0.29
5	0.01	19	0.13
6	0.04	20	0.67
7	0.02	21	0.13
8	0.43	22	0.10
9	0.05	23	0.51
10	0.31	24	0.71
11	0.72	25	0.42
12	0.11	26	1.40
13	0.34	27	1.01
14	0.50	28	0.17

Tale 2 : concentration of heavy metal lead (pb) in lip sticks (ppm).

Group number	mean	Std. deviation	Std. error	P value
(28)	0.40	0.37	0.07	0.001

*p<0.05

Table 3: International limits for heavy metal lead in lip sticks (ppm)

WHO	10
EU	0.5
US	1.0
GERMANY	1.0
CANADA	10

Table 4 : comparison to literatures values

Concentrate of pb in (ppm)	Reference
0.04 - 3.75	Picinip; et.al 2013 [21]
0.77 -15.44	Zakaria, A. 2015 [22]
0.02 -1.32	Liu, S; Hamond 2013 [23]
0.30 - 2.44	Al-Saleh et.al 2011[24]
10.9 - 15.25	Ackah-M 2015 [25]
0.09 - 3.06	Hepp.NN et.al 2004 [26]
18.7 - 87.3	Nnovomic et.al 2005 [27]
0.02 -1.40	Our study

Discussion

Trace elements in cosmetics like lead according to FDA may be is un avoidable under condition of good manufacturing practice . It is very important to find relation between to investigate of the safety of cosmetics and personal care products and their ingredients on daily basis. Ingredients found in lipstick are wax ,oil ,alcohol ,and dye . Lead is not an ingredient of the lipstick it might be present as impurities in the color additives . To reduce

the side effect lipstick must make the international cooperation between personal car products and their ingredients and toxicologists .The FDA has established 20 ppm as a maximum amount of lead allowed in color additives used to make cosmetics for external use , produced using good manufacturing practice. There are no legislation for regulation the level of toxic metal in Asia , Europe and US . USFDA determine the level of lead in a number of different lipstick . Although lead found in lipstick is only minor source when compared

to other sources, such as air, food and water, we can not overlooked lead exposure from lipstick. The variance between Pb concentration may be because added pigment components during the production process. Some of sources of Pb contamination in lipstick can also be the added auxiliary materials. The dust and water used in manufacturing of lipstick product may be another reason for contamination. Due to increasing usage of cosmetics, it is very important to be noted these problems therefore monitoring should be tightened for all process in cosmetics production. Heavy metal gradually accumulate in the human body by continuous uses. In addition to these risks, lipsticks may also have the higher risk of direct oral take in side of negative effect of their chemicals. Serious chronic health risks occurs because the accumulation of these metals in the body, therefore the consumers must knowledge of the various products and keeping update to check and choose the best quality to minimize exposure to the heavy metals.

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Conflict of Interest: None to declare.

Ethical Clearance: All experimental protocols were approved under the DNA Research Center, University of Babylon, AL-Hila, Iraq and all experiments were carried out in accordance with approved guidelines.

References

- Faruruwa M, Bartholomew P. study of heavy metals content in facial cosmetics obtained from open markets and super stores within Kaduna metropolis" *American journal of chemistry and application*. 2014; (2): 27-33.
- Romanowski A. A cosmetic industry Overview for cosmetic chemists Vvailable from <http://www.chemistscorner.com>. 2014.
- IA Saleh, SA Enazi, N Shinwari. Assessment of lead in cosmetic products," *Regulatory Toxicology and Pharmacology*. 2009; 54: 105-113.
- St-Onge E. chemical to avoid in cosmetic and personal care products. 2015.
- NOVAK N, BIEDER T. The skin as a target for allergic diseases. *Allergy*, 2000; 55: 103-107.
- C Nnorom, JC Igwe, CG Oij-Nnorom. *African J. Biotech*. 2005; 4: 1133-1138.
- Corazza M, Balod F, Pagnoni A, Miscioscia R, Virgili A. Measurement of nickel, cobalt and chromium in toy make-up by atomic absorption spectroscopy, *Acta Dermato-Venereologica*. 2009; 89(2): 130-133.
- E Sainio, R Jolanki, E Hakala, L. Kanerva. Metal and arsenic in eye shadows," *Contract Dermatitis*. 2000; 42: 5-10
- Loret Z LJ, Api AM, Barraj LM, Burdick J, Dresster WE, Gettings SD. Exposure date for cosmetics products lipstick, body Lotion, and face cream, *foud che. Toxical*. 2005; 43: 279-291.
- Marian A. Determination of lead and cadmium contents in lipstick and their potential health risks to consumers. *Journal of protection and food safety*. 2018.
- Hussain U, Noreen S, Fozia, Ali Rahman A. Comparative study of heavy metals content in cosmetic products of different countries marketed in Khyber pakhtunkhwa. Pakistan. *Arabian Journal of chemistry*. 2013; 1-17.
- Code of Federal Regulations (2012) Title 21 (U.S. Government Printing Office, Washington, DC), Parts 73, 74, and 82 and section 700.13.
- Beatrice B, pino A, Alimonti A. Toxic metals contained in cosmetics- A Status report. *Regulatory Toxicology and Pharmacology*. 2014; 68(3): 447-467.
- G Saxena; GM Kannan; N Saksenad; RJ Tirpude; SJS Flora. *J Cell Tissue Res*. 2006; 6: 763-768.
- AL-Saleh, M Nester, E Devol, N Shinwari, S AL-Shahira. *Int. J. Occup. Enviro. Health*. 1999; 5: 107-114.
- E Sainio, R Jolanki, E Hakala, L Kanerva. Metal and arsenic in eye shadows," *Contract Dermatitis*. 2000; 42: 5-10.
- S Amparo, C Alberto. Analysis of cosmetic products," Elsevier, Amsterdam, the Netherlands. 2007.
- Campaign for safe cosmetics 2007. A poison Kiss. The problem of lead in lipstick, Available <http://www.safecosmetics.org/articale>. (Accessed 23 may 2012).
- Hepp NM, Mindak WR, Cheng J. Determination of total lead in lipstick *J Cosmet Sci*. 2008; 60: 405-415.
- Aldjain IM, Al-Whaibi MH, Al-Showiman SS and

- Siddiqui MH. Determination of heavy metals in the fruit of date palm growing at different cations of Riyadh, Saudi J. Biologi. Sci. 2011; 18(2): 175-180.
21. Piccini P, piecha M, Fortaner T. European survey on the content of lead in lip products . J.Pharm. Biomed. Anal. 2013; 76: 225-233.
22. Zakaria A, Ho Y. Heavy metals contamination in lipsticks and their associated health risks to lipstick consumers. Regul . Toxicol. Pharmacol. 2015; 73: 191-195.
23. Liu S, Hammond K, Rojas- Cheatham A. Concentrations and potential health risks of metal in lip products. Environ . Health perspect. 2013; 121: 705-710.
24. Al- Saleh I, Al-Enazi S. Trace metals in lipstick . Toxicol. Environ .chem. 2011; 93: 1149-1165.
25. Ackah M. Status of some metals contained in imported nail polish and lipsticks on the Ghanaian market. Proc Int Acad Ecol Environ Sci. 2015; 5:142-147.
26. Hepp NM, Mindak WR, Cheng J. Determination of total lead in lipstick: Development and validation of micro-wave –assisted digestion, inductively coupled plasma- mass spectrometric method. J Cosmet Sci. 2009; 60: 405-414.
27. 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.