حساب نسبة الرصاص لبعض انواع احمر الشفاه في الاسواق المحلية الليبية

زينب فرج اللافي ، كلية الصحة العامة ، جامعة الزاوية
نهلة فايز عبدالله ، المعهد العالي للعلوم والتقنية, طرابلس
أحمد كمال الكيلاني ، كلية طرابلس للعلوم والتقنية ، بنات

الخلاصة:

الهدف من هذه الدراسة هو تحديد نسبة الرصاص في الأنواع الرديئة من مستحضرات التجميل (أحمر الشفاه) وغير الخاضعة للرقابة، وقياس ومراقبة الجودة المستخدمة بشكل شائع من قبل مجموعة كبيرة من النساء.

اشتملت الدراسة على جزئيين: الجزء النظري الذي يوضح مخاطر الرصاص في أحمر الشفاه على جسم الإنسان وخطورة استخدامه على المرأة الحامل، بالإضافة إلى الدراسات الحديثة التي أثبتت خطورة هذا المنتج، ومستوياته العالية من الرصاص الذي يعتبر سامًا للإنسان .

الجزء الثاني من البحث يتضمن دراسة عملية لأنواع مختلفة من أحمر الشفاه، حيث تم فحص عينات أحمر الشفاه وتم حساب نسبة الرصاص باستخدام جهاز تحطيم العينة الكيميائية من أصل أسترالي وجهاز البلازما الحثي MILESTONE START E MICRWAVE المصنع بواسطة المزدوج. ، وهو جهاز أسترالي ، تم تصنيعه بواسطة Varian Vista-PRO “ICP-OES” Simultaneous CCD .

أوضحت النتائج أن التركيزات الكلية للرصاص السام في عينات مختلفة تراوحت بين 1.187ppm -45.8ppm . أظهرت عينات أحمر الشفاه الداكنة 2 و 5 و 7 و 9 و 10 نسب عالية من الرصاص السام مقارنة بعينات أحمر الشفاه ذات الألوان الفاتحة 1 و 3 و 4 و 6.

Zinab farag Ellafi, Faculty of Puplic Health, Zawia University
Nahla Faiz Abdullah, Higher Institute for Science and Technology, Tripoli
Ahmed Kamal Al-Kilani, Tripoli College of Science and Technology, girls

Determine the Amount of Lead in Some Lipstick Products in the local Libyan markets

Abstract:

The aim of this study is to determine the percentage of lead in the trace and non-regulated species, and to measure and control the quality and commonly used by a large group of women, cosmetic (lipstick).

The study included two parts: the theoretical part, which explains the dangers of lead in lipstick on the human body and the danger of using it on pregnant women, in addition to recent studies that have proven the danger of this product and its high levels of lead, which is considered toxic to humans.

The second part of the research includes a practical study of different types of lipstick, where lipstick samples were examined and the percentage of lead was calculated using the chemical sample smashing device of Australian origin manufactured by MILESTONE START E MICRWAVE device and the double induction plasma device, which is an Australian device, manufactured by CCD Simultaneous "ICP-OES" Varian Vista-PRO.

The results also revealed that, the total concentrations of toxic lead in various samples ranged from 45.8ppm – 1.187 ppm. The dark-colored lipstick samples 2, 5, 7, 9, and 10 revealed high content of toxic lead compared to the light-colored lipstick samples 1, 3, 4, and 6.

Key words: Lipstick, Cosmetics, Heavy metals, Health risks, Double induction plasma ICP.

1-Introduction:

Lipstick is a cosmetic used on the lips to color, shape, and protect them from external agents such as sun, wind, and cold. Nowadays, several types of lip cosmetics are produced by manufacturers all over the world, including lip balm, lipstick, and lip gloss. Lipstick is one of the most used cosmetics, and

global sales reached $5760 million in 2016. It is expected that the lipstick market will be further expanded and reach $8670 million in 2021 [1.2]. The continuous rise of this sector occurs because the lipstick market is extremely dynamic, and new products with different textures, colors, and effects are produced almost every day. The main raw materials used for lipstick production include primary ingredients (e.g., waxes, emollients, and coloring agents) and secondary ingredients (e.g., antioxidants, preservatives, perfumes, flavoring agents, and vitamins). Waxes are used to give consistency and thermal stability to the final product, and they are obtained from plants (e.g., carnauba and candelilla) or from petroleum products (e.g., paraffin, ceresin, or microcrystalline wax). Emollients used to promote hydration, gloss, and dispersion of the pigment in the lips are obtained from natural (e.g., castor oil, jojoba oil, and lanolin derivatives) or synthetic (e.g., esters and film-forming polymers) sources [1.2]. Pigments or lacquers are used as coloring agents in lipsticks. Pigments have better coverage and stability when exposed to light than lacquers. Among the pigments, micas are widely used to provide a pearly effect for lipsticks. The micas commonly used in the production of cosmetics are aluminosilicates coated with titanium dioxide, iron oxide, or titanium dioxide containing some pigments capable of producing pearly effects with different colors [1,2].

Fig. 1. Few samples of lipstick [20].

Lead is a heavy and toxic mineral, and the human body may be contaminated with it through several methods, such as air, food, drinking water, and soil. It also pollutes cosmetics, which affects the vast majority, especially women and infants, or when using cosmetics by pregnant women and affects the fetus.

Lead is one of the most important elements that contribute to affecting the brains of children in particular and adults in general, as it enters the body from many and varied sources, and therefore this mineral is one of the most important minerals that have received great attention by specialists and the

public, and studies and research on it included issues of its pollution of air and water soil and food, and its effect on most living organisms, due to its clear effects on human minds and their health, it is in various countries of the world that it may be one of the sources that work to generate mentally and healthy backward generations if exposed to high concentrations of lead, so all the bodies responsible for health, globally and locally, went to enact various laws and legislations to exclude lead metal from most sources that accompany a person in his life every day, and making him aware of his health dangers, which are not only limited to the effects on the brain and its various health damages, but may cause anemia, affect the fertility of men and women, have abdominal pain and severe colic, affect the central nervous system, and damage the whole. Lead poisoning is a chronic disease caused by the gradual accumulation of lead in the body and the time interval between the onset of exposure and the onset of the disease clinically depends on the severity of exposure, as the onset of the disease requires months to years of exposure, and the toxic effects of lead in humans must be studied through the broad spectrum of laboratory and clinical manifestations that range between subclinical biochemical effects and severe clinical emergency, it is the starting point of a continuum of the observed adverse effects sequence, which begins with inhibition of enzymes and biochemical aberration, and then progressively develops into a stage characterized by symptoms of lead poisoning, and the peripheral and central nervous system are among the targets of lead poisoning. The most dangerous form of lead poisoning is in which deep disturbances of the central nervous system are prominent and include convulsions, delirium and coma, while the other more frequent form is that at low and medium levels and the symptoms associated with the nervous system are weak and include fatigue, headache, dizziness, sleep disturbances and memory impairment. Neurological manifestations range to poisoning. Lead is among mild and non-specific complaints and severe encephalopathy, which is the most serious, and acute encephalopathy is very rare [2,3].

The market is full of many varieties of poor and cheap lipstick of unknown source and containing high levels of lead, which is considered a nerve poison and causes damage to the brain and destroys the digestive system through the

mouth. The source of these poor types of lipstick is China and Asian countries [4].

Government and industry sources have identified 24 industrial chemicals or groups of chemicals as potential impurities in several cosmetic products, with health 266 concerns including reproductive problems, cancer, and neurotoxicity [5,6,7,8]. Several official institutions have limited or prohibited the presence of some of the identified impurities from cosmetics. The European Union (EU) prohibits the presence of any concentration of several compounds and elements in cosmetics, including, lead Pb [9]. Several countries and/or regions have used the EU model to elaborate their cosmetic regulations. These include the Association of Southeast Asian Nations (ASEAN), the El Mercado Común del Sur of South America (Mercosur), and the Comunidad Andina (Andean Pact) regions. Other countries, including China, Algeria, India, , Morocco, and Saudi Arabia, have reproduced certain aspects of the EU model, such as the definition of cosmetics and/or the list of regulated ingredients [10-11-12]. In the United States, the Food and Drug Administration FDA establishes a maximum limit for Pb in cosmetics applied to the lips and other external regions of the body (10 ppm), as well as in all coloring agents used in the production of cosmetics (20 ppm) [7, 8]. In New Zealand, cosmetic products are regulated by the Hazardous Substances 283 and New Organisms (HSNO) Act via the Cosmetic Products Group Standard, and it establishes chemical elements and molecules that are prohibited as ingredients for use in cosmetics [13].

The list of prohibited chemical elements in any concentration includes 286 the following: Au, Ba, Br, and Cl, as well as As, Be, Cd, Hg, Pb, Sb, Te, Tl and their compounds and Se and its compounds [14]. The Japanese cosmetic industry approved only those cosmetic ingredients included in an official positive list (CLS, comprehensive licensing standards of cosmetics by category), and among the prohibited raw materials there are some containing metals such as Cd (and its compounds) and Hg (and its compounds) [15]. The Korean Food and Drug Administration (KFDA) specified a list of banned (including As, Cd, and Hg) and restricted substances, and this list is fairly similar to the EU legislation [16]. The Canadian and German competent

authorities conducted specific studies to determine the level of chemical contaminants that could be technically achievable in cosmetic products. Thus, they conducted tests to determine the concentration of metals in various cosmetic products sold in those countries, and metal impurities were limited to the concentrations commonly found in these cosmetics. In Canada, Health Canada sets out a list (the Cosmetic Ingredient Hotlist) of banned or limited ingredients in cosmetics, where some chemical elements, such as As, Sb, Cd, Pb, Cr, and Hg (and its compounds), were banned. In addition, Health Canada established maximum limits of 10 ppm for Pb, in all cosmetic products [17]. In Germany, levels of Pb as impurities in cosmetic products were 20 ppm [18]. However, the German Consumer Protection and the Food Safety authority (BVL) published an up-to-date overview of the technically preventable contents of heavy metals in cosmetic products, and the previous maximum limits were significantly reduced. The new maximum limits were set at 2 ppm for Pb, which are 10 to 50 times lower than the previous ones [19]. South Korea demands the determination of some elements in cosmetics, and it established a limit of 20 ppm for Pb, in cosmetics used for make-up [16].

Lead contents were determined in 26 different brands of lipsticks using the Zeeman atomic absorption spectrophotometer coupled to graphite tube atomizer after an acid digestion procedure by Iman Al-Enazi & others in February 2009, they found that Lead was detected in all the studied samples. There were four brands of lipsticks with lead content above the FDA lead limit as impurities in color additives (20 PPM). Nevertheless, few brands had lead content above 20 PPM that might put consumers at the risk of lead poisoning. Lead is a cumulative, and applying lead-containing cosmetics several times a day or every day, can potentially add up to significant exposure levels. Pregnant and nursing mothers are vulnerable population because lead passes through placenta and human milk and affect fetus or infant's developments [20] .

In another study puplished in July, 2018 by Marian Asantewah Nkansah & others using atomic absorption spectroscopy (model 210 VGP) Determine of lead and cadmium contents in lipstick they found that, the concentrations of

Pb in lipsticks ranged from 0.20±0.00 to 36.70±0.26ppm. The actual Pb concentration measured in 18 lipstick samples was far below the recommended limits of the United State Food and Drug Administration (20 ppm), and Health Canada (10 ppm). [21].

In another study published in October 2009 by M.A. Gondal & others where lead detected in lipstick using Nd-YAG LASER . The important findings of thier study are that the concentration of some of the toxic species like lead, are much higher than the safe per-missible limits, which is a matter of grave concern especially in unbranded lipstick samples which collected from local markets of Saudi Arabia.[22]

Researcher Faten M. Ali Zainy concluded through a study published in December 2017 about heavy metals in lipsticks products marketed in Saudi Arabia (The light-colored lipsticks appear to be safer than the dark-colored ones in terms of metal concentrations. Continued use of such cosmetics products containing heavy metals may result in the slow liberation of these metals into the human body, which in turn causes harmful effects)[23].

2-Material and method

Samples of usually used lipstick products were bought from local markets in Tripoli, Libya. Ten lipstick samples of imported (from developed and developing countries) and manufactured locally (by unauthorized national companies with little or no quality control measures) at the local market in Tripoli, Libya were collected. The prices of the lipstick samples ranging in price from 5LYD to 50LYD. All of the samples (Table 1) were transferred to the laboratory heavy metal analysis.

The solid samples of the lipstick were smashed using a chemical sample smashing device manufactured by MILESTONE START E MICRWAVE at the Medical Research Center / AL_Zawiya, and then these samples were analyzed after liquefying them using a plasma duplex induction device ICP manufactured by Varian Vista-PRO at the Oil Institute / Tripoli. Similar results were obtained for the results obtained through the previously mentioned research in the theoretical side of this research. The sample was shattered (crushed) for further examination using a microwave sample

smasher, an Australian device manufactured by MILESTONE START E MICRWAVE, model MLS4110. Where the solid sample was placed in special tubes, 5 ml of concentrated nitric acid was added to it, then it was diluted with 50 ml in distilled water and the tubes were closed tightly and placed in the microwave device that is adjusted to a temperature of 100-° C and left for 25 minutes after that the sample is filtered using the filter paper so that the solid part remains in the filter paper and the liquid sample is collected in special tubes. Inductively Coupled Plasma (ICP) double induction plasma device it is the device used to estimate the amount of lead in the sample. which is an Australian device manufactured by CCD Simultaneous "ICP-OES" Varian Vista-PRO and it is considered one of the best devices used worldwide in analyzing various metal elements in all materials with extreme accuracy and speed of performance and it can detect and analyze 37 metallic elements in one sample. The idea of the device is based on the same principle as measuring the emission spectrum in the flame photometer, except that the flame used in this case is a plasma whose temperature reaches 6000° c°. The plasma consists of ionization of argon ga

Table (1). Shows the types of lipstick targeted in the practical study where ten samples were taken, namely:

BRAND	Sample no.	the color	Origin	Price LYD	
108	1	Coral	USA	30	
01	2	dark Red	China	10	
12	3	Bark	China	15	
297	4	Red	French	50	
90	5	Clemantis	China	8	
Unknown	6	Hot Pink	China	12	
36	7	dark Browen	China	10	
Magic lipstick	8	light pink	unknown	5	
Magic lipstick	9	Dark Pink	unknown	5	
154	10	Bright orange	China	10	

The stages of preparing the sample are as follows:

1- Taking 1g of weight from each sample using a sensitive balance.

2- Add 5ml of concentrated nitric acid to each sample and dilute by adding 50ml of distilled water.

3- The samples were entered into a chemical sample crushing device (microwave).

4- After removing the samples from the microwave, dilute them all with distilled water by adding 30ml to each sample.

5- The samples obtained from step 4 were collected in special plastic tubes to avoid any interference during the measurement from other elements that cause contamination of the sample.

6- The plank solution was prepared by applying 5ml of pure concentrated nitric acid with

10ml of distilled water as a solution to clear the ICP.

3-Results and Discussion

Table (2). Shows the results of the analysis of lead in samples:

Sample Label	(الرصاص) Pb
Unit	Ppm
Blank	(0.0258±0.001)
Sample 1	(14.189±0.001)
Sample 2	(25.427±0.001)
Sample 3	(1.869±0.001)
Sample 4	(1.790±0.001)
Sample 5	(40.401±0.001)
Sample 6	(1.187±0.001)
Sample 7	(45.822±0.001)
Sample 8	(38.103±0.001)
Sample 9	(33.921±0.001)
Sample 10	(30.532±0.001)

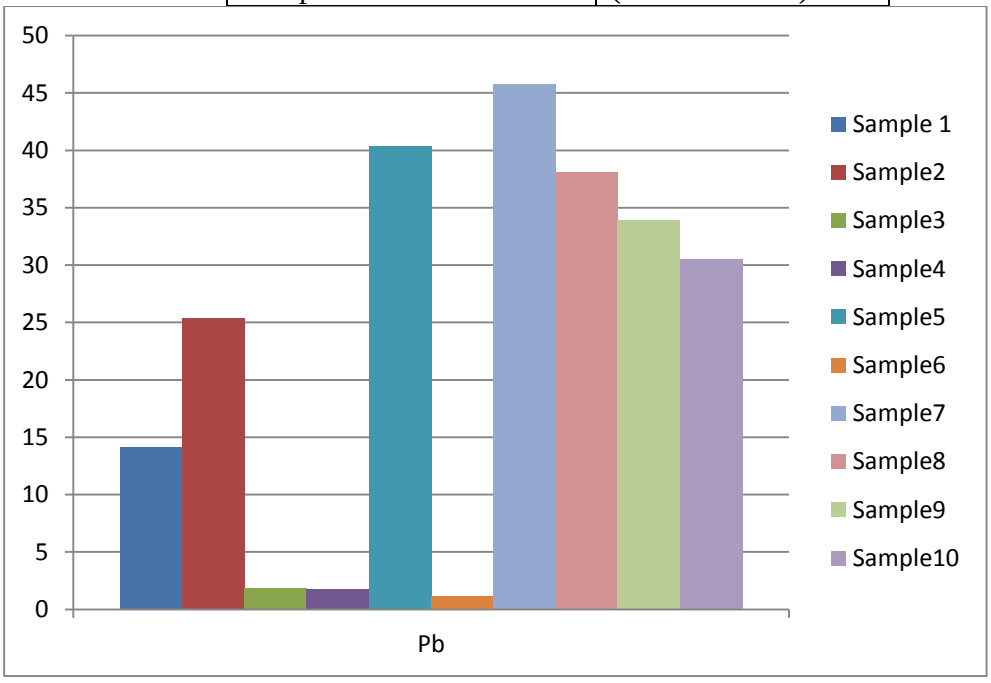

Figure (2) shows the percentages of lead in samples, in ppm.

From the results in table 2 and Fig.2, the percentage of lead in samples 7, 5, 8, 9, and 10 revealed high content of toxic lead, the concentrations of Pb in lipsticks ranged from 45.822 to 30.532 ppm were far below the recommended limits of the United State Food and Drug Administration, (20 ppm), and Health Canada (10 ppm). The percentage of lead in dark colors was higher than other colors. It was observed that the percentage of lead in samples 9 and 10 is high, although the samples are light in color. The expected reason is that the samples called magic lipstick are green or blue in color and when applied to the lips they appear pink in color. They are inferior, inexpensive and unknown source types. It was noted that Sample 4, which is French-made, had lead content of 1,790ppm less than the limit permitted by the US Food and Drug Administration.

4-Conclusions

This study determined the levels of lead in lipstick products sold on the market in Tripoli/ Libya. The results reveal that the concentrations of Pb in lipsticks ranged from 45.822ppm to 1.187ppm. The concentrations of Pb in 1, 2, 5, 7, 8, 9, and 10 samples were higher than the USFDA (20 ppm), Health Canada (10 ppm) permissible limit. This study gives intrinsic and useful data for future toxicology study on the ingestion of poisonous substances in lip cosmetic products. The findings of this study calls for an immediate mandatory regular testing program for cosmetic imports to Libya in order to curtail their access and safeguard consumer health. In addition, a regular monitoring of other heavy metals and chemicals used for the manufacturing of cosmetics that may cause health risks to consumers should be accentuated.

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