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Levels of Lead and Chromium Ions in Different Brands of Lipstick Sold at Local Markets in Iraq

Abstract-Lead and Chromium ion samples of five commercial samples of each of twenty brands of lipstick sold at locally markets in Iraq were determined by atomic absorption spectrophotometer. Samples of digested Lipstick were used, acid digestion method using acids HCl: HNO₃ in ratio 1:3 were used before analysis. Average for analyzed samples were Pb, 0.10-4.85 ppm; Cr, 0.18-5.2 ppm. Samples No.9 and No.4 showed the least concentrations of Pb and Cr respectively. These values are not expected to be toxic to humans. However, exposure over long periods might cause accumulation of the elements in the body and even at low concentration; some metals could initiate allergic reactions.

Keywords- Samples of Lipsticks, Pb, Cr and AAS

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1. Introduction

Heavy metals were presented in lipsticks. Some of them were used as coloring agents and some of them were added as intentionally ingredients while the other added accidentally from environment.

Skin care products are part of cosmetics, used to improve the appearance and health of skin. Cosmetics finds different applications such as lip glosses and lipsticks used as lips coloring; foundation, concealer, rouge and powder used as face coloring, impression of health and youthfulness produced as a result of removing and lightening flaws; mascara, used to enhance the eyelashes; while eyeliners and eye shadow to color the eyelids; nail polish used to color the fingernails or toenails; 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 [1]. Some cosmetics products are directly applied to the skin such as lipsticks. These enter into the body and cause the hazardous effect to the internal body organs [2].

A cosmetic product which apply to be placed with different parts of external human body like hair, nails, external genital organs, epidermis and lips or used to apply the teeth and oral cavity mucous membranes to glamorization of

perfuming, changing their appearance, cleaning, protection, so the body odors were correcting and good surfaces condition keeping [3,4]. Heavy metals have been indicted in varying concentrations in various cosmetics [5], 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 in alarming [7]. Eye shadows and lipsticks have been reported to contain relatively high concentration of heavy metals [8], kohl customary cosmetics 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]. Two thousand years ago, there were many risks on human health of Pb used. Problems occurred because the toxicity of lead are unconsciousness, pain in stomach, infertility, disorders of nervous systems and anemia,. Level of Pb causes abnormalities

behavior, disorders in learning and hearing. All systems of body affected by lead like hepatic renal, reproductive systems etc. [13].

Lead in toxic amount alters the nerve transmission in the brain and decrease the transport of calcium in the body. Premature delivery can occurs because of pb crossing the placenta during pregnancy, and cause low birth weight [14].

The contamination of raw materials used or pigments with lead can cause lipstick contamination [15].

Human and animals need chromium, there are many roles of Pb in metabolism of cholesterol and glucose [16], Cr is essential as nutrient in small amount; Kidneys, stomach, and liver problems can occur because of inhaling large amount. Skin ulcers can occurs because of chromium compounds contacting [17].

Cosmetic products with heavy metals content like Pb, As, Hg, Co, and Ni as impurities or ingredients. Research has reported that these metals can easily cause many types of skin problems [13, 14]. Due to the heavy metals accumulation their human body toxicity, the using of those metals in cosmetic has been questionable, other elements, such as cobalt, nickel, and copper have no specific rules on other [15]. Skin diseases or allergic contact dermatitis due to those metal [16,17]. Evaluation of skin absorption with a unicomponent in a cosmetic is complicated and there were many factors like metal concentration in a product, the applied product amount, extent of exposure on the skin also penetration and emollients presence enhance the cosmetic product [18]. It was reveal that 100% of products of cosmetics give positive test for nickel and over 90% give positive test for both lead and beryllium [19]. Human can be hurt with lead especially nervous system and brain [20]. Inhalation of lead dust and oral intake were the main method to enter the body. About 11%, adults absorbed 30–75% of lead and children respectively absorb and enters the digestive tract. Skin absorbed about 1% of lead [21].poisoning with Pb is a huge problem that affect people and consider the most considered environmental disease of children [22]. Pregnant and children with 6 years and below absorb highest quantities of lead even in low lead conc. exposure [21]. The pregnant at the first trimester more prone to lead risk, exposure may cause possible defects in the developing retina thus leading to problems in the visual system [23].

Juvenile delinquency and behavioral problems can occurs because of lead poisoning. Young children are more prone to lead risk due to hand-

to-mouth activity and the absorption of lead by their gastrointestinal tracts [24]. Low lead chronic exposure may be cause children renal tubular injury [25], whereas in adults, it was correlated with low hypertension [24].

WHO define human exposure as the amount of a substance in contact, over time and space, with the outer boundary of the body [26]. The assessment of human exposure to contaminant chemicals in the environment can be measured by two major methods, each based on different data profiles, thus permitting the verification and validation of the information. One approach involves environmental monitoring i.e., determining the chemical concentration scenario. The second methodology is based on estimations of exposure with biomarkers [27]. Safe lead levels in candy were about 0.1 ppm. Lead levels according to EPA, as a safe level is 0.5 ppm. All brands using these values it was higher than EPA (Environmental Protection Agency) and CSC (Campaign for Safe Cosmetics) safe limit values. According to EPA and CSC the safe level of lead and chromium is shown in table (1) [21].

Table (1): levels of lead and chromium in lipstick according to CSC and EPA

Element	CSC	EPA
Lead (ppm)	0.1	0.5
Chromium (ppm)	<5.0	1.0

2. Methods and Materials

I. Samples Collection

Five commercial samples of each of twenty brands of lipsticks samples were collected from many cosmetics stores from the private market of Baghdad, Iraq. Different brands in many prices were taken as samples; same colors of each brand were taken as samples were used. People were noticed in collection of samples. From the upper, middle and lower societies different class peoples and some were used by the class peoples.

II. Standard solutions preparation

Preparation of standard solutions of Pb and Cr from 10^3 -ppm solution of standard stock of GFS Fishers' Atomic Absorption Spectroscopy Standard as a Reference. Dilution of stock solutions were done serially to obtain concentrations of 0.5, 1, 1.5, and 2 ppm of chromium and 0.5, 1.5, and 2 ppm of lead

III. Samples digestion and preparation

Same method was used to digest the samples [22], in a digestion test tube 0.5 gm of a sample

and 10 ml of digested acid (3:1 HCl:HNO₃) was pipette in attention (3:1 HCl:HNO₃), and placed on a hot plate for 30 min. after digestion complete, samples were cooled to room temperature and completed to 50 ml with distilled water, filtration done to samples by using filter paper No.41, finally samples each sample placed in a volumetric flask for analysis by FAAS.

3. Results and Discussion

Five commercial samples of each of twenty brands were studied of heavy metals distribution. Values of metals for lead and chromium were showed in table2.

Table 2: Different brands metals concentration (ppm)

Brands	Lead (Mean ± S.D.)	Chromium (Mean ± S.D.)
Brand 1	2.98 ± 0.08	2.12 ± 0.11
Brand 2	3.1 ± 0.021	2.34 ± 0.87
Brand 3	1.31 ± 0.05	2.84 ± 0.34
Brand 4	2.11 ± 0.03	1.12 ± 0.21
Brand 5	2.31 ± 0.02	1.94 ± 0.18
Brand 6	0.10 ± 0.01	2.18 ± 0.09
Brand 7	1.3 ± 0.02	3.12 ± 0.12
Brand 8	2.3 ± 0.21	0.18 ± 0.01
Brand 9	3.12 ± 0.03	1.2 ± 1.01
Brand 10	2.13 ± 0.12	4.12 ± 0.9
Brand 11	1.01 ± 0.03	2.31 ± 0.5
Brand 12	3.35 ± 0.24	3.15 ± 0.65
Brand 13	4.02 ± 0.09	2.78 ± 0.12
Brand 14	3.98 ± 0.19	3.45 ± 0.31
Brand 15	1.58 ± 0.06	2.96 ± 0.81
Brand 16	3.18 ± 0.14	0.95 ± 0.01
Brand 17	4.85 ± 0.26	1.01 ± 0.02
Brand 18	3.64 ± 0.98	5.2 ± 0.12
Brand 19	2.91 ± 0.35	2.67 ± 0.31
Brand 20	1.65 ± 0.08	3.45 ± 0.51

NOTE: Samples Triplicate values Average (n = 3) ± S.D., (p<0.05)

Lead analyzed by AAS in all samples lipstick brands in the range of 0.10-4.85 ppm. The USFDA (US Food and Drug Administration) limit for lead as color additive in cosmetics is 10 ppm [The Canadian orderliness limits for certain metals in cosmetics are 10 for Pb, 3 for As, Cd, Hg and 5 µg/g for Sb Health Canada, 2011]. Lead concentration of all colored brands was below the FDA limit. The 0.1 ppm lead consider a safe cosmetics in candy. According to EPA, 0.5 ppm of lead is consider safe. Lead level in used samples in most brands was higher than CSC and EPA safe limit values. In expensive brands the

lead level In the results of this study lead level was lower in expensive brands .

Chromium levels about 0.18-5.20 ppm in samples of lipsticks, it is level must be less than 5 ppm and in lipsticks were added as colorant. According to EPA 1 ppm of Cr considers a safe level [2].

Brand 6 (0.18 ppm) lead concentration was lowest than other brands, so brand 6 was an expensive lipsticks brand and the upper class society was used it, and brand 17 (4.85 ppm) lead concentration was highest than other brands and it's the cheapest brand and mostly used by people of lower class.

In brand 8 (0.18 ppm) chromium concentration was lowest than other brands, so it's a cheap lipsticks brand and used by the lower class society, and brand 18 (5.2 ppm) chromium concentration was highest than other brands and it's the expensive brand and mostly used by the higher and middle class people. Our study was agree with the study of khalid A, et al. [25]. The standard calibration curves of lead and chromium in lipsticks were shown figure 1 and 2 respectively [27]

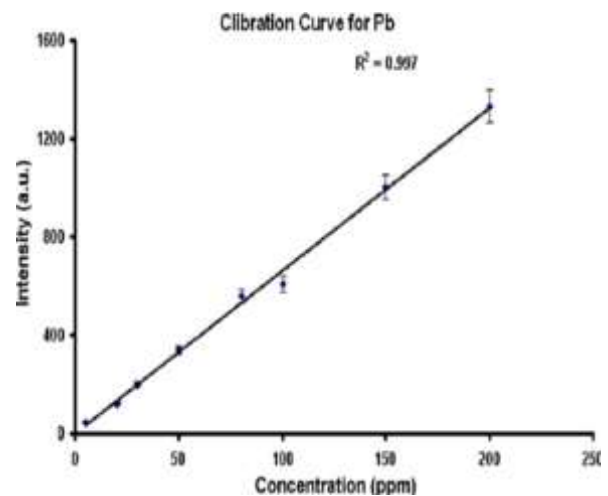


Figure 1: Standard calibration curve of lead

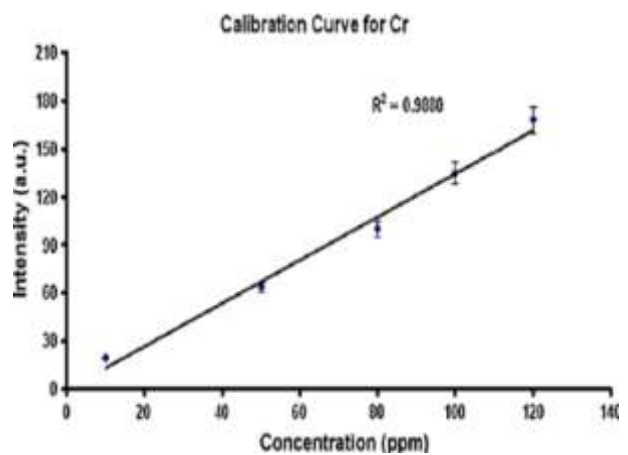


Figure 2: Standard calibration curve of chromium

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