

Study the concentration of heavy metals in some Cosmetics and their health effects on humans

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Synopsis: Lead, Nickel, Copper, Mercury and Cadmium for three brands were classified according to country of origin and five types of Cosmetics were taken for each brand. The results of the study indicated that concentrations of heavy elements in cosmetics processed from local markets after preparations such as digestion by concentrated acids such as hydrochloric acid and nitric (3:1), filtration and preparation of standard solutions. Using the atomic absorption spectrometer (AAS) (Buck-USA), the basic concentrations observed in cosmetic samples ranged from 7 to 30 mg / kg for Lead, 2 to 3 mg / kg for Nickel, 0.1 to 1.2 mg / kg for Copper, 0.03 to 0.1 mg / kg for Mercury and 0.09 to 1.5 mg / kg for Cadmium. Results showed that Lead and Cadmium in each category of the study was higher than WHO's permissible limits. Very few heavy metals were detected in Cosmetic products as impurities, which can cause skin sensitivity through skin absorption on the skin. The method used was quick, controlled and highly sensitive to determine Lead, Nickel, Copper, Mercury and Cadmium in coloring media and cosmetic products to be compared with the AAS spectrometer to determine heavy metals. Results obtained showed that Lead and Mercury were in each category of study Was higher than the permissible limits of the World Health Organization.

Key Words: Heavy metals in Cosmetics, Cosmetics and health effects, AAS to determine heavy metals.

Date of Submission: 19-08-2017

Date of acceptance: 05-09-2017

I. Introduction:

People's awareness of beauty has created demand for Cosmetics in the market, but the side effects as well as people's awareness of health has attracted the attention of clinical doctors and researchers cannot find the cause of the problem behind the side effects of cosmetics where cosmetics are one of the important sources of heavy metal release in the environment, the risk of skin allergies / skin infections is increased by contact or Osculate. Because the toxicity of heavy metals has given an example of environmental pollution, it is necessary to identify all possible sources [1,2]. Many Cosmetic products contain heavy metals such as Lead, Nickel, Copper, Mercury and Cadmium as components or impurities. These minerals can easily cause many health problems, especially skin problems [3,4]. The use of heavy metals in cosmetics has become controversial because of the bioaccumulation of these minerals and their toxicity in the human body [5]. In most countries, health laws prohibit the use of Lead and Mercury in cosmetic products. For example, the Prevents of Lead as part of cosmetic components in Korea, the EU and China, the maximum allowed is 20 parts per million within the jurisdictions of those areas [5,6]. The cosmetic is a substance or preparation that is formulated to touch different parts of the human body (skin, hair, nails, lips and external genitalia) or is smeared with teeth and mucous membranes of the oral cavity with the opinion that they are used exclusively and essential for the purpose of cleaning, The body parts, correcting the body odor and maintaining external appearance are in good condition [7,8]. Cosmetics are mixtures of surface effects, oils and other ingredients and are required to be effective and remain long, stable and safe for human use. The various forms of cosmetics include lipstick, lip gloss (used for coloring the lips), powder and rooster (used for coloring and bleaching the face and removal of blemishes to create an impression of health and youth, mascaras (used to improve eyelashes), Daye nails to coloring Toenails and hand nails [9]. It is generally believed that even with instructions on many cosmetic products, there are still health doubts about the presence of harmful chemicals in these products; In addition to coloring additives, cosmetic products are not subject to education Food and Drug Administration (F.D. agency) [10]. Before it is put on the market, F.D. agency may only act when it is found that a product contravenes the Federal Law on Cosmetics, Medicine and Food (F.L.C.M.F) and the Right Packaging and Labeling Act, F.D. agency may take action against this violation Many products that are put on the market each season are difficult to track the safety of each product and some products may carry carcinogenic contamination [11].

Skin exposure is the most dangerous way of cosmetic products because most cosmetics are used on the skin. Skin absorption of heavy metals is really the least, with the absorption of single elements affected by a

number of factors that concern the physical-chemical properties of mixtures. Injuries can occur when oral exposure to cosmetics used in the mouth or around it or through hand to mouth after exposure, which contains impurities of heavy metals. In addition, exposure to heavy metals by inhalation is minimal, [12,13] and many heavy elements are essential for life, even if used in trace amounts but toxic if they are increased in the body. Lead poisoning is a class of hazardous elements that are contaminated with the environment,[14] and are used in various industries. The symptoms of poisoning and disease depend on the extent of the person's response to this compound on the period between absorption and removal, when the absorption is slow and continuous for a long time, Lead in the bone tissue is deposited in a third Lead Phosphate that is Non-solvent[15], and the permissible limit of Lead in cosmetics is 20 parts per million, while the permissible limit in drinking water according to the Iraqi standard 417 is (0.02) part per million [16,17] Cadmium is a metal was until the beginning of the twentieth century something new but in this days, uses in large quantities in many industries and its wastes or residues is a major source of environmental pollution and causes lung problems and respiratory entry causes lung stiffness [18], did not specify the limit in cosmetics and all Iraqi specifications ,in Drinking water according to Iraqi Standard 417 is 0.003 part per million[19,20].

That the entry of Lead into the blood circulation is the beginning of a series of many functional problems in blood and nervous system when the arrival of Lead is linked to a type of proteins called sulfhydryl as well as its effect on the enzyme Gama Amino-FolicDehydrates, which works to form a ring of Borfobplenogen, which is the main step of the formation of hemoglobin and lead damage to The effect on the enzyme is important for the manufacture of blood is the enzyme Fbrochylanase, which leads to the level of porphyrian, which is used to confirm the diagnosis of Lead poisoning at high blood level It is the most common in the accompanying symptoms, namely, cerebral anemia, preceded by symptoms such as vomiting, spasmodic, constipation or loss of balance when walking, convulsions, falling consciousness level may end in fainting added to the feeling of numbness in the limbs, which often affects adults and the child suffers from Strange movements and behaviors in addition to nervousness may develop into mental retardation, If untreated, it causes iron, zinc and calcium deficiency and leads to lead absorption [21,22,23].

Nickel is a white metal silver resist corrosion and has a high degree of shine and is in large quantities on the surface of the crust, seas and oceans as it enters the composition of human tissue and plant Recent studies have shown to be a cause of diseases of carcinogens did not specify the amount allowed in cosmetics and the limit allowed in water and according to the standard Iraqi recipe 417 is 0.2 part per million. Copper is used in many electrical and alloy metal industries. It is an important factor in chemical reactions. The degree of probability of infection varies according to the people exposed to it. The permissible limits in the form of steam are $0.2 \text{ mg} / \text{m}^3$ and dust is $1 \text{ mg} / \text{m}^3$ and the permissible limit in drinking water is one part per million . The use of Cadmium in cosmetic products is due to its color properties as it is used as a dye in many industries[24,25]. Although many studies have recorded the presence of minerals above in cosmetic products especially in lipstick and nail dye and in any case that the data on their presence in soap, powder, shaving cream etc ... is considered insignificant. Thus, the important aspect of this study is to know whether cosmetics are contaminated with heavy elements and how they affect human health. The study of the presence of Mercury at dangerous levels ranging from 878 to 36,000 parts per million was also recorded in a number of researches in the analysis of Mexican cosmetics [26]. There is growing concern about the behavioral and physiological effects of toxic metals on human populations in general, For example, the toxicity of Lead at high concentrations when exposed has been well documented, but there is a major concern at the moment that the continued exposure even to relatively low levels of toxic metals in cosmetic products may pose potential health risks []. Skin allergies and dermatitis may be increased by contact due to the presence of heavy metals in cosmetics[27,28].

Aim of study:

The main objective of the research is to determine the types and concentrations of heavy metals and identify their health effects on humans.

II. Materials and methods of work:[29]

1-Materials:

- Fifteen models of different beauty products were purchased from the local market for three international companies specialized in the cosmetics industry, a Chinese company (CH), a Turkish company (T) and a UAE company(E).
- Pure Estalin gas, Pure Arcon gas, H.C.L lamp , AAS Instrument (Buck-USA).

2-Digest Samples

All samples were digested using a combination of hydrochloric acid and Nitric acid (3: 1) for each Sample. The digested form was placed in a glass flask on the hot plate for 30 minutes. To complete the digestion, the digested samples were allowed to cool down to room temperature and 50 mL of distilled water

was added and the samples were then filtered using Millipore (USA 0.45) filtration papers. Concentrations 1, 2 and 3 parts per million of the elements were prepared after digestion.

3-Preparation of standard solutions:

Standard solutions were prepared in 1000 parts per million for (Lead, Nickel, Copper, Mercury and Cadmium), the standard solutions diluted to give concentrations of 1, 2 and 3 parts per million for each element. All samples were transferred into a volumetric flask for the purpose of analysis by absorption spectrometer Atomic (AAS).

4-Estimation of heavy metals:

The heavy metals were estimated using the atomic absorption spectrometer(AAS) for standard solutions (Pb, Ni, Cu, Hg and Cd). The atomic absorption spectrometer was calibrated and the heavy elements were Determinatefor all samples that taking to the experiment were measured for each samplesby using the atomic absorption technique ,whenthe concentration for any metal is greater than the calibration curve,the solution is diluted with the deionize water and the absorption is measured with the amount of dilution is taken into consideration. Using the H.C.L lamp, *the concentration of metals is calculated by applying the following equation:*

$$(Coefficient\ of\ dilution\ /\ volume) \times Concentration\ (mg/l) = Instrument\ reading \times Original\ solution\ volume$$

$$Concentration\ \% = Concentration\ (mg/l) \times 10^{-4}$$

Concentrated form solutions were diluted within the calibration curve limits of standard prepared solutions.

The concentrations of the heavy metals obtained from the above mathematical relationship were converted frompart per millionunits (in Solutions) into mg/kg Units of the SolidSamples used for analysis.

III. Discussion:

In the present study, we have identified Lead, Nickel, Copper, Mercury and Cadmium in various cosmetics for different brands. Based on the results, we have concluded that Lead is one of the most toxic heavy metals prevalent in cosmetic products, however the Lead was below the limit. The continued use of products contaminated with such heavy metals may cause slow penetration of these metals into the human body and thus show their harmful effects. Therefore, the increasing uses of those products should be avoided. We examined various cosmetic products for the purpose of confirming the presence of Lead, Nickel, Copper, Mercury and Cadmium. A total of five products A, B, C, E and D were taken from each cosmetic brand for the purpose of study. These three brands were classified based on their use by different groups of people. For example, preparations A, B, C, E and D are used to return to (CH) brand with low commercial prices and are often used by lower class members and K brand cosmetics with medium commercial prices and are used by middle class and expensive E brand products Before the upper class of society. The results of concentrations of Lead, Nickel, Copper, Mercury and Cadmium, which were installed in tables 1, 2 and 3, respectively, in various cosmetic products of the three brands.

Table:1:Concentration of Lead, Nickel, Copper, Mercury and Cadmium by (µg/kg) Unite in (CH) cosmetic .

Metals (mg/kg)	Pb	Ni	Cu	Hg	Cd
Sample Name					
LipstickMagic	15	3	0.1	0.07	1.5
Face powder	10	2	1.0	0.06	1.0
Eyeliners	7	2.5	0.8	0.04	1.2
Hair Dye	20	2.5	1.2	0.1	1.5
Face Ointment cream	7.1	1.8	1.0	0.05	0.09

Table:2:Concentration of Lead, Nickel, Copper, Mercury and Cadmium by ($\mu\text{g}/\text{kg}$) Unite in (K) cosmetic .

Metals (mg/kg) Sample Name	Pb	Ni	Cu	Hg	Cd
LipstickMagic	8	2.5	0.09	0.08	1.0
Face powder	9	2	0.07	0.1	1.2
Eyeliners	23	2.5	1.0	0.1	1.0
Hair Dye	25	3	1.1	0.09	1.1
Face Ointment cream	7.5	2	0.5	0.08	1.4

Table:3:Concentration of Lead, Nickel, Copper, Mercury and Cadmium by ($\mu\text{g}/\text{kg}$) Unite in (E) cosmetics .

Metals (mg/kg) Sample Name	Pb	Ni	Cu	Hg	Cd
Magic Lipstick	10	2	0.08	0.07	0.9
Face powder	9	2.2	0.2	0.09	0.8
Eyeliners	30	2	0.8	0.1	1.0
Hair Dye	22	2.5	0.09	0.08	1.0
Face Ointment cream	7	2.7	0.09	0.06	0.9

The samples that were analyzed, the highest concentration of Lead was found in Eyeliners (UAE) with the symbol of (F. No: 404) followed by the Chinese Eyeliners (3XL). The Eyeliners in the Turkish brand is the least concentration of Lead while the face cream (Beauty Cream), and the powder of the same brand showed the lowest Lead content. The study also showed that the Cadmium concentration is medium in the Kokuryu face powder of Chinese origin as well as the Turkish and the UAE while the Copper concentrations are high in Hair Dye of the three brands of Chinese.

The brand (CH) has high concentrations of Nickel in Magic Lipstick compared to the average Nickel ratios in Turkish and UAE marines. Hair Dye concentrations are the highest concentration in the three (CH) brands followed by Brand (K) and then Brand (E). Lead concentrations also have high concentration of the three brands Lead is not an essential metals of unknown biological value. Although the presence of some metals such as Cadmium in the samples was in the least amount of analysis, but its slow low-amount consumption may also causes harmful effects of the human body. In fact, the results from the tests showed that when the Cadmium was injected directly into the organism causing a low tension.

Results have been found indicating the presence of Nickel in many of the magic lipstick, which causes blackness and fear of the skin, so the small amounts of it is unsafe. The presence of Mercury, even in small amounts, targets blood vessels and heart tissue as well as diseases of the kidneys, lungs and brain, causing heart disease, hypertension, liver damage, inhibiting the immune system and other unsightly symptoms.

IV. Conclusions:

The presence of heavy metals in the composition of cosmetics, even in small percentages cause to negative effects may be a cause of cancerous disease has been the study of the accumulation of Nickel, Cadmium, Mercury and Lead higher than its presence in non-cancerous samples and that some metals act as estrogen with some cancer cells such as cancer Breast. Lead, which may be considered as a deficiency, has been shown to be a neurologic marker associated with behavioral, linguistic and educational problems and is also associated with abortion, low fertility in men and women, hormonal changes, irregular menstrual cycles, and girls' puberty. Lead in pregnant women may pass through the placenta It may enter the fetal brain and cause miscarriage. Mercury is associated with the toxicity of the nervous system as well as the toxicity of the reproductive system, respiratory system and immune system. Lead, Nickel, Copper, Mercury and Cadmium were identified in many cosmetic brands. The results showed that heavy metals were highly toxic even if they

were present in small quantities. However, it is feared that the continued use of cosmetics products contaminated with these heavy metals may cause these minerals to enter the human body and cause harmful effects to consumers over time. The widespread use of such metals should be avoided until the situation is fully clarified[30].

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Noor Abdul Hakeem Abdul Razzaq Al-Baheley. "Study the concentration of heavy metals in some Cosmetics and their health effects on humans." *IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT)*, vol. 11, no. 8, 2017, pp. 50-54.