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Short Communication

Detection of heavy metals in lipstick brands used by the women at VIVA College, Virar-Maharashtra, India

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Abstract

The cosmetic range of products include variety of products applied externally on face, lips, eyes etc. These cosmetics are mixtures of some ingredients for effective, long lasting, stable human use. Quality of lipstick becomes major concern because of increasing consumer number per brand of lipstick. Lately cosmetics have engrossed attention as major sources of heavy metals. Heavy metals have tendency to accumulate in different organs leading to bioaccumulation, which creates various health complications. The present study encompasses determination of heavy metal concentration in lipsticks used by the women at VIVA College, Virar-Maharashtra. Five brands of lipsticks were shortlisted from survey done at College. The lipsticks purchased from market were analysed to detect presence of heavy metals such as Lead, Copper, Cadmium, Nickel, Chromium and Zinc. Lead and Cadmium were not detected in any Lipstick. Copper, Chromium, Zinc and Nickel were detected in all lipsticks but concentration levels were below the permissible limits. However, role of a consumer is most vital to keep check on the use of lipsticks on daily basis or choose product wisely to minimize exposure to heavy metals.

Keywords: Lipsticks, heavy metals and health complications.

Introduction

The quest for beauty has tended to promote the use of Cosmetics which has increased too many folds in recent times. The cosmetic range of products include powder, rouge, foundation and contour (for colouring the face, lighten and remove blemishes to produce a youthful impression), lipstick and lip gloss (for colouring the lips), nail polish (for colouring the fingernails and toenails), mascara, eye liner and eye shadow (for eye makeup)[1]. These cosmetics are produced by mixing of constituents such as surfactants, oils etc. Similarly, they need to have long lasting effect and stable for safe human use[2]. In India, various kinds of cosmetics are being used and the number of consumer of cosmetics is increasing rapidly day by day. Cosmetic is "Any article intended to be rubbed, poured, sprinkled or sprayed on, or introduced into, or otherwise applied to, the human body or any part thereof for cleansing, beautifying promoting attractiveness, or altering the appearance, and includes any article intended for use as a component of cosmetic"[3].

The most important daily ware component among cosmetics is probably the lipstick. Different shades and brands of lipsticks are available in market which also increase consumer number per brand. Therefore now a day's quality of lipstick becomes a major concern. Different components used for the manufacture of lipsticks include various surfactants, oils, colours and Pigments as they need to be long lasting, effective, as well as harmless use for human[2]. The trace heavy metals such as Copper, Lead, Chromium, Iron, Arsenic, Mercury, Cadmium, Nickel and Aluminium were found to be available in various cosmetics applications like face, body care products, hair and herbal cosmetics[4]. Previous studies on commonly available lipsticks, lip balms, fairness and antiaging creams in India conducted by Roa et.al[2], Belurkar et. al.[5], Anandhan et.al.[6], have reported presence of heavy metals in the lipsticks as well as other cosmetics[7].

The most significant route for heavy metal penetration through cosmetic products can be considered to be dermal exposure as, the majority of cosmetics are used for topical application. Though dermal absorption of heavy metals is equitably nominal, the absorption of each metals is prejudiced by chemical and physical properties of the blends. Oral acquaintance can also ensue, especially due to cosmetics used in and around the mouth like lipsticks[8].

It has been reported that Lipstick use can be a hazardous and act as an environmental trigger for development of an autoimmune disease-systemic lupus erythematosus. Heavy metals are potential threats because of pronounced degree of toxicity; cadmium, lead, arsenic, mercury and chromium rank amongst the foremost disquiet metals that are of communal well-being implication[9]. Prolonged biological half-lives of heavy metals and potential to accumulate in different organs in the body leads to bioaccumulation[10,11]. Bioaccumulation of the heavy metals in human tissues builds complications like cardiovascular, kidney, nervous and bone diseases[10,12,13].

Lipstick being an integral part of daily ware for women today, frequent dose of lipstick may cause bio accumulation of heavy metals. The Indian and other National regulations prescribe the permissible limits of heavy metal concentrations in the cosmetic products. The relative amount of lead allowed in the lipstick should not exceed 20ppm[14]. The colourant and additives added in cosmetics must comply with Drugs and Cosmetics Act, 1940; Drugs and Cosmetics Rules 1945[15], and the Indian Standards 4707 Part I, Cosmetic Standard[16], Schedule Q. Other metals present in the cosmetic should not exceed cumulatively 100 ppm as threatallied with these metals are considered not as much of significance when compared with cadmium andlead[17].

Lately the focus has been attained by cosmetics and other personal body care merchandises as key sources of heavy metals in human systems[18-20]. With regard to the adverse effects of consuming cosmetic products in young women, the objective of the current study undertaken was to inspect the concentration of Chromium, Cadmium, Copper, Nickel, Zinc and Lead in the lipstick of different brands which are most commonly used for cosmetic products (lipstick).

The present study was undertaken to determine heavy metal concentration in lipsticks used by the women at VIVA College, Virar-Maharashtra.

Materials and methods

Collection of samples: Five brands of lipsticks were shortlisted from the survey undertaken among the women at Viva College, Virar. The lipsticks of those brands were purchased from the market.

Analysis of samples: 5 gm of lipstick sample is digested in 5ml of nitric acid and atomic absorption spectrometer [Thermo] Solar M-6 Series was used to estimate the heavy metal concentration.

Results and discussion

The levels of metals found in five brands taken for the studies are given in Table-1.

Table-1: The levels of concentration of heavy metals found in five samples of lipsticks in ppm.

Sample	Cr	Cu	Ni	Zn	Pb	Cd
	ppm	ppm	ppm	ppm	Ppm	ppm
L1	0.9	0.64	0.39	5.53	ND	ND
L2	9.95	6.11	2.25	7.57	ND	ND
L3	1.12	ND	1.28	2.22	ND	ND
L4	0.24	1.38	1.02	3.04	ND	ND
L5	0.45	1.45	1.16	20	ND	ND

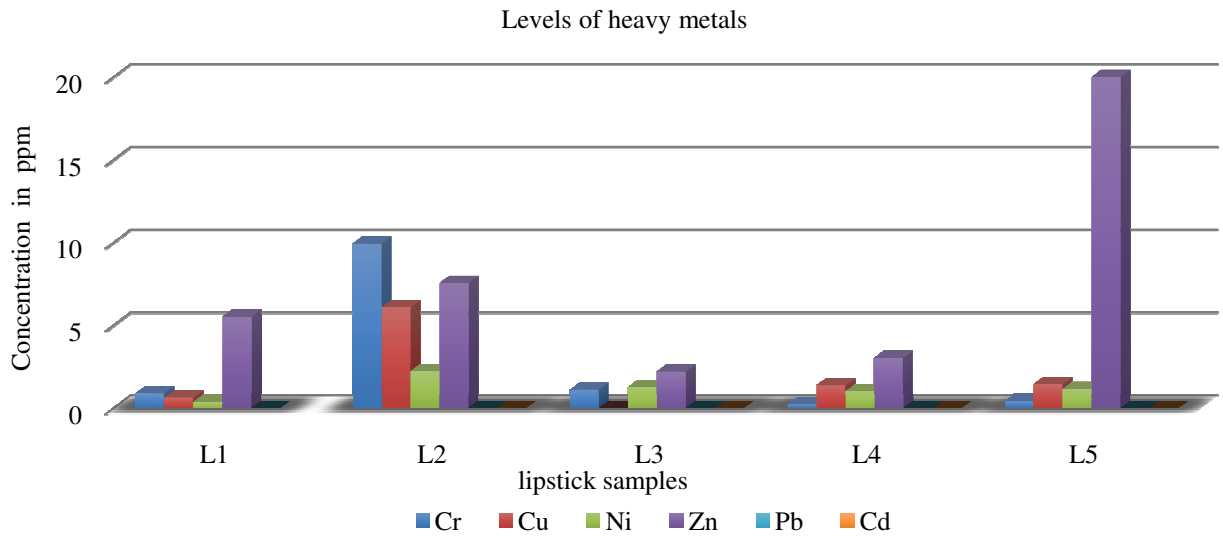

Figure-1: The levels of concentration of heavy metals found in five samples of lipsticks in ppm.

Chromium, Copper, Nickel and Zinc were the most commonly detected heavy metal in selected brands for study, whereas cadmium and lead were not detected at all in any sample.

Zinc[Zn] was detected in all tested lipstick samples; the maximum Zn concentration was found in L5 [20ppm] and the lowest was recorded in L3 [2.22ppm]. Zinc is relatively low toxic. Anintense impact on human well-being by intoxication with zinc is a fairly uncommon incident. However, zinc impacts survival on the cellular level and perhaps be a critical regulator of apoptosis as well as neuronal death subsequent brain injury[21].

Nickel [Ni] was the second most common heavy metal found in all lipstick samples. Highest Ni content was recorded in L2 [2.25ppm] and the lowest in L1[0.39ppm]. Elevated levels of Nickel exposure may result in hazardous health effects depending on route and its kind[22]. Nickel most commonly causes contact allergy of all skin sensitizers, and it is also a significant reason of hand eczema. Sensitization to nickel is usually triggered by direct and obstinate skin contact. As per the trends of fashion, females of all ages use cosmetics like lipsticks and are exposed to nickel from it. Therefore, nickel allergy is substantially seen more in women than in men. Around 15–20% of the women are allergic to nickel[23].

Certain varieties of nickel [sulphidic, oxidic and soluble nickel] are regarded ascarcinogenic[24] [Environment Canada, c1994]. Alloys of nickel and metallic nickel have also been observed as conceivably carcinogenic to humans[25].

Chromium [Cr] was also detected in all the tested lipsticks with highest content in L2 [9.95ppm] and lowest in L4 [0.24ppm]. The toxicity of chromium composites is subjected to the state of oxidation of the metal, Hexavalent form of chromium is observed to be more toxic than trivalent form. Hexavalent chromium is documented as a human carcinogen if it is inhaled and persistent inhalation of hexavalent chromium has been revealed to escalate risk of lung cancer and may also damage the small capillaries in kidneys and intestines. According to the National Institute for Occupational Safety and Health [NIOSH], further adverse health effects associated with Hexavalent chromium exposure, include skin, nasal and respiratory irritation or ulceration, allergic contact dermatitis, occupational asthma, perforated nasal septa, rhinitis, nosebleed, sinus and nasal cancer, irritation and damage to the eye, perforation of eardrums, liver and kidney damage, pulmonary congestion and oedema, erosion and discoloration of teeth and epigastric pain[26].

Copper [Cu] was noticed in all the lipstick samples except L3. Highest copper contents were discovered in L2 [6.11ppm], whereas the lowest was recorded in L1 [0.64ppm].Copper in a small amount required for maintenance of human health however along with other heavy metals it produces hazardous complexes.

According to the BIS[14,15], the amount of heavy metals in cosmetic Through acceptable Synthetic Organic Colours and Natural Organic coloursshall not surpass following limits: i. arsenic calculated as arsenic trioxide: 2 parts per million. ii. Lead calculated as lead: 20 parts per million. iii. Heavy metals other than lead calculated as the total of the respective metals: 100 parts per million of.

Though the heavy metals concentrations in present study were found to be in prescribed limits by BIS, it should be noted that, the consistent application of cosmetic[s] containing heavy metal- may result in significant and harmful levels of exposure. Though, lipstick is a minor source of heavy metal exposure equated to other sources of heavy metals such as water, food and/or air; exposure from lipsticks should not be disregarded. More or less of the ingredients in lipsticks can penetrate the skin and possibly will influence vital internal organs via the systemic circulation. Besides, lipsticks also have an elevated risk of direct oral consumption which may intensify the deleterious effects of its chemicals[27].

Heavy metals tend to accumulate in the tissues over the course of time, through the repetitious use of product[s] containing heavy metals, this is called bioaccumulation. The probability of various skin allergies and contact dermatitis may also intensify as a result of the occurrence of heavy metals in cosmetics. The toxic effects of lead exposure are well familiar and include impairment of kidneys and the central nervous system leading to loss of memory and other symptoms[28].

Conclusion

Heavy Metals Cadmium and Lead were not identified in any of the samples of Lipstick. Other metals such as Chromium, Copper, Nickel and Zinc were detected in all samples and the concentration levels were below the permissible limits. With the upsurge of various trends in cosmetic industries and influence western life style there is a very increase in the usage of these products. However, it should be kept in mind that heavy metals gradually accumulate in the human body over a persistent uses. Furthermore to these risks, lipsticks may also have the higher risk of direct oral ingestion, provoking the negative effects of their chemicals[29,30]. The accumulation of these metals may cause serious chronic health risks. Therefore, the role of a consumer is at most vital and the knowledge of the various cosmetic products and keeping oneself updated is advisable to check on the use of lipsticks on daily basis or choose a product wisely to minimize exposure to the heavy metals.

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