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DETERMINATION OF HEAVY METALS (ARSENIC, CADMIUM AND LEAD) FROM DIFFERENT BODY LOTIONS

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ABSTRACT

In this work we analysed some mostly used body lotion available in market. The samples are collected of different types. Here the deviation is observed in amount of metals present in product (body lotions). In this study we found that some body lotion contain high amount of heavy metals beyond WHO limit. The cosmetics were analysed for heavy metals (Arsenic, Cadmium, Lead) after digestion with aquaregia solution. The concentration of the selected toxic heavy metals was determined in duplicate using atomic absorption spectrophotometer. The samples analysed for amount of the metals of interest. The concentration of the heavy metals in the samples ranged from 0.046 to 18.46 ppm. It is obvious from the present study that the use of some cosmetic products expose users to low concentrations of toxic heavy metals which could constitute potential health risk to users, since it has known that heavy metals can accumulate in the biological system over time and are known to induce skin problem or diseases such as cancer. Further research to better understand the sources of heavy metals in cosmetic product is recommended. It has been shown that heavy metals toxicity to humans is as a result of long term or high level exposure to pollutants common in the environment including the air, water food and numerous consumer products such as the cosmetics and toiletries. In this study we assessed the levels of toxic metals in different cosmetics product sold at local shops in Nashik.

KEYWORDS: heavy metals, toxicity, body lotions, pollutants.

INTRODUCTION

Cosmetic is defined as "Any article intended to be rubbed, poured, sprinkled or sprayed, Sprayed on, introduced into, 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". Cosmetic products are regulated for health and safety. There are concerns regarding the presence of harmful chemicals, including heavy metals, in these products. There have not been many studies on preference of heavy metals in cosmetics in India. To assess the levels of heavy metals, many studies on presence of heavy metals, PML conducted a study on commonly available lipsticks, fairness creams, body lotion, lip balms and antigens creams.

A variety of chemicals are used in cosmetics as ingredients and some are used as preservatives, these chemicals have different health effect. A cosmetic product is any substance or preparation intoned to be placed in contact with the various external parts of the human body (epidermis, hair system, nails, lips and external genital organs) or applied to the teeth and the mucous membranes of the oral cavity with a view exclusively or mainly for the purpose of cleaning, perfuming, protection, changing their appearance, correcting body dourest and keeping the surfaces in good condition.

There is a general belief that even with the regulation of many cosmetics products, there are still health concerns regarding the presence of chemicals within these products. Many cosmetics products contain heavy metals such as arsenic, lead, cadmium, cobalt and nickel as ingredients or impurities. Recent research has reported that these metals can easily cause many types of skin problems.

The use of some heavy metals in cosmetics has been controversial due to the biological accumulation of those metals and their toxicity in the human body. In most countries, it is legally prohibited to use lead, arsenic, cadmium and mercury in skin cosmetics products. It is also reported that does of metal can cause allergic contact dermatitis or other skin problems. Acceptable limits for heavy metals very according to the sub population of interest. Assessment of dermal absorption by a single component in a cosmetics product is complex and depends on factors such as the concentration in the product, the amount of product applied, the length of time left on the skin and the presence of emollients and penetration enhancers in the cosmetics product.

In a present study three body lotions of different productions are analysed for some heavy metals in, due to the biological accumulation of those metals and their toxicity in the human body. In most countries, it is legally prohibited to use lead, arsenic, and cadmium in skin cosmetic products for example lead is prohibited as part of cosmetic compositions, in Korea, the European Union, and china. The maximum allow able level of lead is 17 ppm is those jurisdictions.

It is also reported that Hostynek j (2000), Chromium, cobalt, copper and iron metals in personal care product is 115:52:65. Those metals can cause allergic contact of interest. determination of heavy metal limits in cosmetic product tested positive for nickel and over 90% are tested positive for both lead and beryllium heavy metals and found naturally in the environment in rocks, soil and water, therefore they exist in the manufacture of pigment and other raw material in all industries including cosmetics industry. Some of these metals have been used as cosmetic ingredients in the past. Example, the progressive hair dye lead acetate and a number of pigment such as red cinnabar mercuric sulphide to the presence of theses impurities. The metals of primary toxicological concern in cosmetics are lead, arsenic, cadmium and antimony.

Cosmetics product in india are regulated under the drugs and cosmetics act 1940 and 1945 and labelling declarations by bureau of Indian standards (BIS) sets the standards for cosmetics for the products listed under schedule ‘S ’ of the drugs and cosmetics rules 1945[18]

Bureau of Indian standards (BIS) has provided the specification for skin creams and lipstick in the Indian standards (IS) 6608: 2004 and 9875: 1990 respectively. Is 6608: 2004 says that if all the raw materials requiring test for heavy metals have been so tested and comply with the requirements, then the manufacturer may not test the finished cosmetic for heavy metals arsenic.

MATERIAL AND METHODS

Scope and Field of Application

The method describes the determination of heavy metals Arsenic, Cadmium and Lead in A body lotion, B body lotion and C body lotion.

Principle

Organic matter in sample is digested by wet digestion or dry digestion in order to determine the amount of heavy metals, i.e. Arsenic(As) cadmium (Cd),lead (Pb) by using atomic absorption spectrophotometer (AAS)

Procedure For Arsenic

- Dry ashing for arsenic.
- Accurately weigh 2.5 g sample into a silica dish and add 3 ML of 50% w/v Magnesium nitrate.
- Dry on the water bath and ash the residue first in the heating mantle unit no more fume and then in the muffle furnace at 500°C for 3 hours.
- Cool, add 25mL hydrochloric acid, filter into a 50 ML volumetric flask and dilute to volume with water.

Pre-treatment for As

Pipette 10 mL each of deionised water (as standard blank), the reagent blank, the standard solutions and the sample solution into separate 100 ML volumetric flasks. Add 10 ML of concentrated hydrochloric acid and 10 ML of reagent for Pre-treatment of as 3.5 to each of the solutions and allow them to stand for 45 minutes as ambient, dilute to volume with water. These solutions are used for analyses.

Procedure for Lead & Cadmium

About 4.0g of each sample was digested in 20 ML mixture of concentrated acid HNO_3:$HCLO_4$ (3:1) FOR 2-3 hours on a hot plate at 90°C. Then 3.0 ML of acid mixture was again added andthen again heated for 2-3 hours to complete the digestion. The above digested samples were cooled and about 0.5 ML ultra-pure water was added mixed well and volume made 25 ML in volumetric flask. The solution was then finally filtered through what man filter paper (Number 41). The clear solution was used for metals quantification.

Analysis of constituent by AAS

Atomic Absorption Spectroscopy

AAS technique has become the most powerful tool of analysis. It has popular among analyst for several reasons. If analyst is confronted with the problem of analysing several samples within a day such analysis is possible only with AAS. The second advantage is, it possible to determine all elements at trace concentration. Thirdly it is not always essential to separate

elements in question before analysis because it is possible to determine one element in presence for another provided. We have requisite hallow cathode with us for such analysis. AAS can utilize for analysis of as many as 61 metals. The non-metals which can be analysed are us for phosphorus and boron.

AAS is sensitive means for determination for 67 elements usually two terms i.e. sensitive and concentration of an element in aqueous solution (mg/ml) which absorbs 1% incident radiation intensity passing through cloud of atoms being determined. Generally 1% absorbance in corresponding to 99% transmittance or approximately coined. The detection limit is the concentration of an element in solution which gives a signal equal to twice the standard deviation of the series of measurements near bank level or the background signal.

RESULT

Arsenic

Sr. No.	Name	Absorbance	Conc. (ppm)
1	Standard	0.061	2.5
2	Standard	0.105	5.0
3	Standard	0.196	10.0
4	B	0.251	10.29
5	A	0.395	16.21
6	C	0.419	17.20

Graph of conc. VS absorbance.

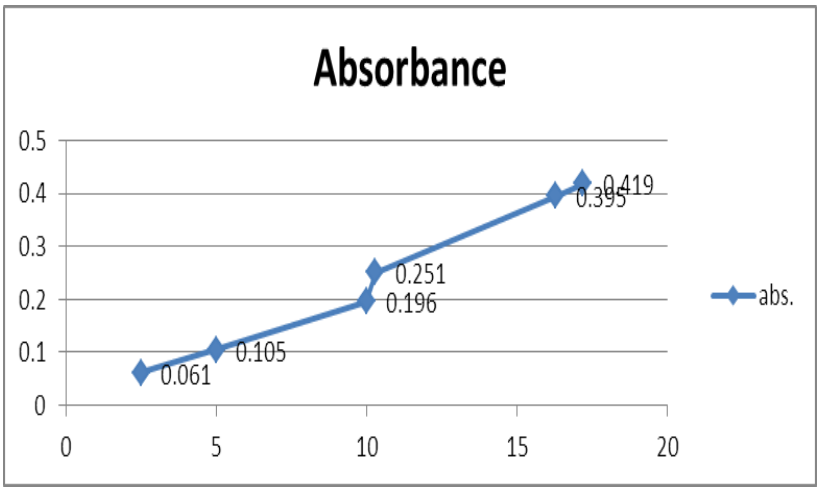
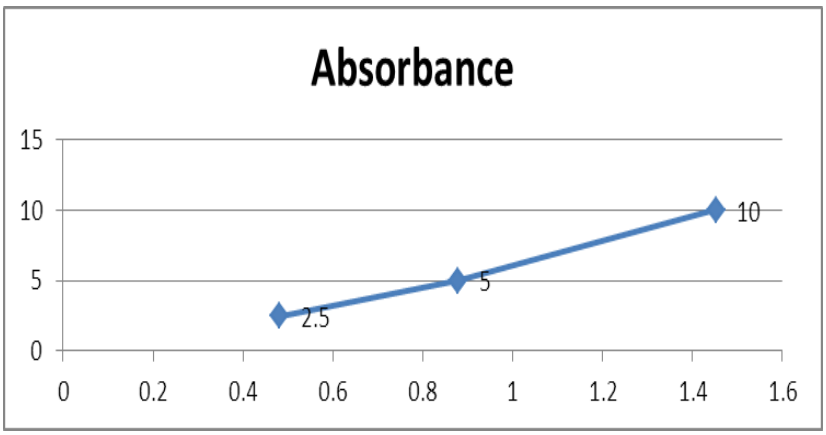


Fig 1: Arsenic content in the given samples was not found be between 10 ppm -17ppm.

Cadmium

Sr. No.	Name	Absorbance	Conc.(ppm)
1	C	0.003	BDL
2	B	0.002	BDL
3	A	0.001	BDL
4	STD	0.480	2.5
5	STD	0.878	5.0
6	STD	1.452	10

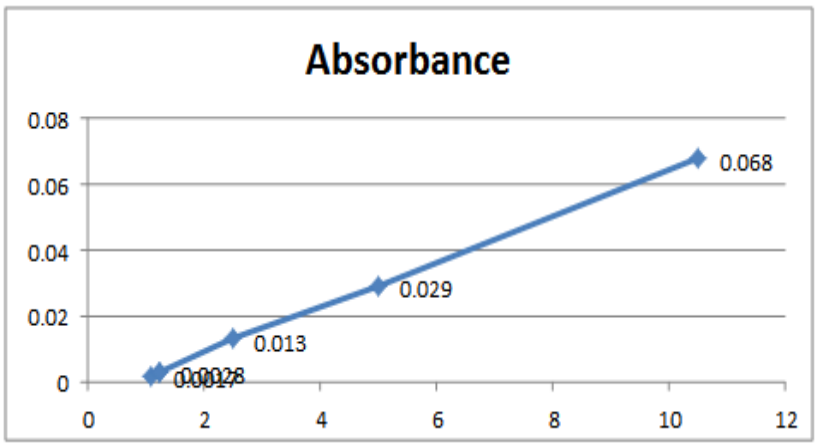
BDL: Below Detection Limit.



Cadmium content in the given samples was not found in the given sample.

Lead

Sr. No.	Name	Absorbance	Conc (ppm)
1	A	0.013	2.5
2	B	0.029	5.0
3	C	0.068	10
4	STD	0.0017	1.22
5	STD	0.0028	1.08
6	STD	0.0029	1.24



Lead content in the given sample was found between 1 ppm to 0.0029 ppm.

DISCUSSION

Cosmetic are seen as one of the most important sources of releasing heavy metals into the human biological system. Following such observation, there is an increasing need to investigate the concentration of toxic metals in some commonly used cosmetic products. It is known for instance that high doses of heavy metals can be deadly and that even long term exposure to low levels of heavy metals can cause certain cancers. There is also a growing concern about the physiological and behavioural effects of toxic metals on human population in general. For instance, the toxicity of lead at high concentration of exposure is well documented but a major concern in recent time is the possibility that continual exposure to even relatively low levels of these toxic metals in cosmetic products may pose potential health risks.

CONCLUSION

In the present study, Arsenic, Lead and Cadmium were determined in various brand of body lotion. From the results, the toxic metals were present in low quantities. It is feared how-ever that the continuous use of cosmetic product contaminated with such heavy metals may however cause slow release of these metals into the human body and cause harmful effect to the consumers over time. Extensive use of such product should be avoided unit the situation is addressed.

However A product did not have trace amount of heavy metal. Whereas all other sample analysed having amount of heavy metals.

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