



ICP/OES ANALYSIS OF SOME MOISTURIZERS MARKETED IN SUDAN FOR HEAVY METAL CONTENT

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ABSTRACT

This study was designed to detect heavy metals in some moisturizers marketed in Khartoum(Sudan) for beautification purposes. A total of four cosmetic samples marketed under different commercial names and extensively used by Sudanese women for beautification purposes were analyzed by inductively coupled plasma/optical emission spectroscopy (ICP/OES). The analysis revealed absence of the potentially harmful mercury, lead, nickel and cadmium in test samples. However it showed that common heavy metals in test samples are: zinc and calcium. whereas iron is common in samples 1, 2 and 3. Samples 1 and 3 contained barium, while samples 2 and 3 contained manganese. Aluminium appeared only in sample 3.

KEYWORDS: Health hazards, Cosmetics, Moisturizers, Analysis, Heavy metals.

INTRODUCTION

Cosmetics are defined as products which are applied to the body for improving appearance and assuming attractive features. Cosmetics include, among others, powders, lotions, creams, lipsticks, perfumes and styling gels.

Some cosmetics, like black antimony which is used as eyeliner, have been used by ancient Egyptians.^[1] Cosmetics containing white lead and mercury have been used by the Romans and Greeks.^[2]

Nowadays cosmetics are extensively used worldwide in entertainment industry and continually new products are added to the long list of cosmetics. Some cosmetics are reported to contain, among others, graphite, amorphous carbon, zincite, hematite, talc, goethite beside some heavy metals like mercury and cadmium.^[3,4]

Skincare products may cause serious adverse reactions.^[5,6] Moisturizers can cause exfoliation and irritation. On the other hand hydroquinone is a potentially harmful ingredient included in skin lightening products. Long term application of hydroquinone can cause ochronosis and potential mutagenicity.^[7] Some sun-screening agents can cause irritation, phototoxicity and some allergic reactions. Particular ingredients in these products like, cinnamates and p-aminobenzoic acid may cause dermatitis.^[8]

The adverse reactions of fragrances have also been reviewed.^[9] This class of cosmetics may enter human body through lungs or skin causing fatigue, dizziness, eye and throat irritation beside headache.^[9]

Bearing in mind some health hazards associated with some cosmetics, this study was designed to detect heavy metals in some moisturizers widely used by Sudanese women for assuming attractive features.

MATERIAL AND METHODS

Cosmetics samples

A total of four cosmetic samples marketed in Khartoum(Sudan) under different commercial names and extensively used by Sudanese women for beautification purposes were purchased from the local market-Khartoum, Sudan.

Inductively coupled plasma/optical emission spectroscopy(ICP/OES) analysis

Cosmetic powder (5g) was heated at a temperature of 800°C for three hours and then dissolved in 10 ml of 10% HCl. The sample was placed in a 500 ml flask and the volume was adjusted to mark with deionized water. The sample was then directly injected into the spectrophotometer.

RESULTS AND DISCUSSION

In this study a total of five samples of moisturizers marketed in Khartoum and used by Sudanese women for improving appearance have been analyzed by inductively

coupled plasma/optical emission spectroscopy(ICP/OES) for heavy metals content. Such metals could be absorbed through the skin causing serious adverse reactions. The health hazards associated with heavy metal-containing cosmetics have been outlined.^[10-12]

The accumulation of heavy metals in human body is a risk factor in cancer, reproductive disorders, cardiovascular diseases and kidney failure. Heavy metals can cause vomiting, nausea, brittle hair, lung damage, headache and contact dermatitis.^[13]

Cadmium, lead, mercury and nickel implicated in some cosmetics are absorbed via dermal contact and are stored in liver and kidney. Such heavy metals are classified as known carcinogenic agents. Lead is a constituent of leaded eye-powders and is associated with increased blood –lead level in women using such products.^[14,15] Accumulation of lead in human body is a risk factor in reduced fertility, menstrual irregularities and hormonal changes.^[14] Some cosmetics contain nickel. Nickel and its alloys are classified as possible carcinogenic agent.^[14] High levels of lead may cause severe contact dermatitis.^[16]

In skin-lightening agents, mercury is a common ingredient.^[17] The major adverse effect of mercury-containing cosmetics is kidney damage¹⁷. This metal can reduce skin resistance towards microbial infections.^[17]

The inductively coupled plasma/optical emission spectroscopy(ICP/OES) is a powerful analytical tool. (ICP/OES) analysis of test samples revealed absence of mercury, lead, nickel and cadmium. However it showed that common heavy metals in test samples are: zinc and calcium. whereas iron is common in samples 1, 2 and 3. Samples 1 and 3 contained barium, while samples 2 and 3 contained manganese. Aluminium appeared only in sample 3(see Table 1 and Figures 1-4).

Table 1: Heavy meals in test samples.

No. Sample	Metals					
	Zn	Fe	Ba	Ca	-	-
1	Zn	Fe	Ba	Ca	-	-
2	Zn	Fe	-	Ca	Mn	-
3	Zn	Fe	Ba	Ca	Mn	Al
4	Zn	-	-	Ca	-	-

Barium is an alkaline earth metal with wide industrial applications. However, accumulation of barium in human body poses serious health hazards including: pulmonary edema, respiratory paralysis, gastric hemorrhages, cardiac failure and kidney damage.^[18]

Many reports addressed the adverse effects associated with ingestion of aluminium in humans. The accumulation of this metal in the body has been linked with Alzheimer and Parkinson diseases.^[19] Also the effect of manganese in the central nervous system has been studied.^[20]

Iron is found in human body and it is an essential trace element.^[21] As far as excessive amount of iron is avoided, this metal does not pose serious adverse effects.^[21] Also zinc is an essential trace element, but zinc over-exposure^[22] can not maintain homeostasis.

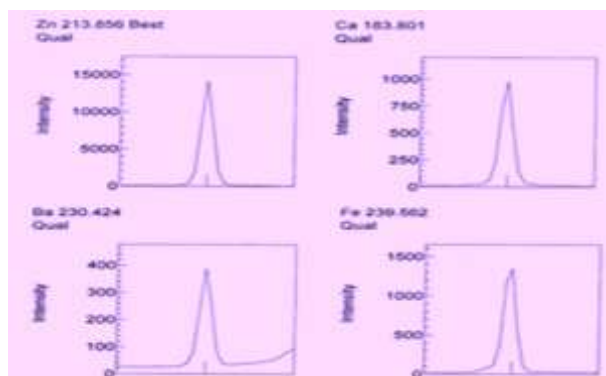


Fig. 1: Sample 1- ICP/OES chromatograms.

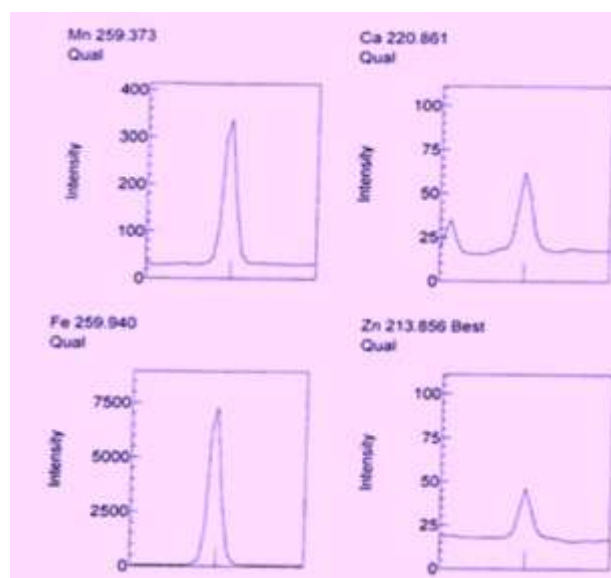


Fig. 2: Sample 2- ICP/OES chromatograms.

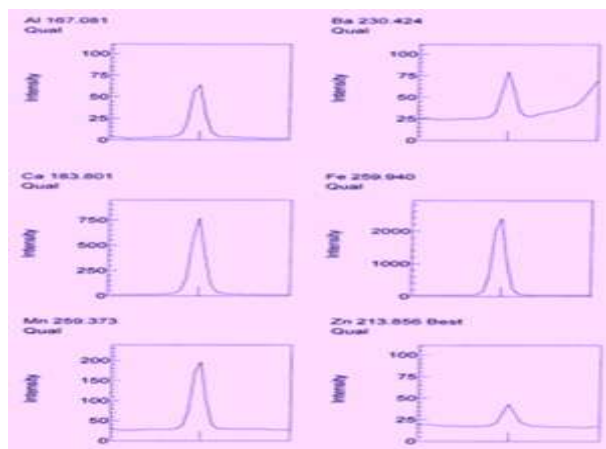


Fig. 3: Sample 3- ICP/OES chromatograms.

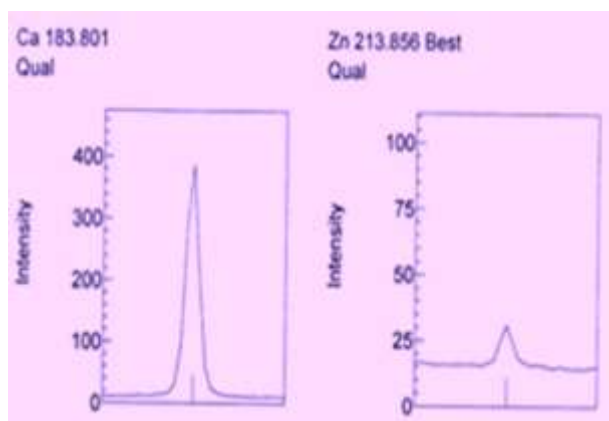


Fig. 4: Sample 4- ICP/OES chromatograms.

On the basis of the above argument, it is highly recommended that heavy metal-containing moisturizers should be used with care.

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