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Heavy Metals Concentration In Body Creams Commonly Used In Delta State Tertiary Institutions And Their Implications For Human Health

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ABSTRACT
In this study, the concentration of heavy metals in some body creams or lotions were determined to ascertain how healthy and friendly they are to the body; and whether accidental tasting, swallowing or inhaling them can be of devastating consequences, especially within tertiary institutions environment. The creams used for these study were obtained from the business centres of College of Education Warri (COEW) and College of Education Mosogar (COEM); which were selected as representatives of tertiary institutions in Delta State. Twenty (20) creams ranging from toning creams, petroleum jellies, coloured jelly creams, bleaching creams and many others were purchased from the premises of these two colleges of Education. They were assessed to pinpoint those that have toxicological, dermatological or other effects. Ten (10) heavy metals of interest were selected for this study. They were lead (Pb), cadmium (Cd), cobalt (Co), arsenic (As), manganese (Mn), silver (Ag), zinc (Zn), nickel (Ni), chromium (Cr) and mercury (Hg). Samples were collected and digested using accepted analytical methods. The analyses were carried out using atomic absorption spectrophotometer; Buck AAS model 210 VGP. From the results obtained for both COEW and COEM, Ag and Hg were less than 0.001ppm; As: <0.001 – 0.063ppm; Cd: 0.004 – 0.044ppm; Co: <0.001 – 0.362ppm; Cr: <0.001 – 0.201ppm; Mn: <0.001 – 1.104ppm; Ni: 0.016 – 0.291ppm; Pb: 0.010 – 0.136ppm and Zn: 0.113 – 0.700ppm. However, when the two sample zones were considered, the range of heavy metals is in the order Mn > Zn > Ni > Cr > Pb > Co > Cd > As. for COEW. In the case of COEM, the order is Mn > Zn > Co > Pb > Ni > Cr > As > Cd. While Ag and Hg are less than 0.001 in both sample zones. The concentration values for Mn, Zn, Co and Ni were high; even though they are still within the required standard. However, there is the need to carryout enlightenment on the long term effects of some of these creams due to bioaccumulation and negative effects from constant accidental licking and ingestion of some of them; which can result into poisoning of the organs and dermatological problem.
Keywords: Creams, Tertiary institution, Heavy metals, Concentration

INTRODUCTION

Heavy metals intake in the body is widely referred to as micronutrients because it is required in microgrammes. Hence heavy intake of these essential metals results in one defect or the other. However, their importance in the body cannot be under estimated. For instance, zinc is used to raise immunity level in the body. This is also applicable to plants, in which the absence of manganese results in ineffectiveness of the chlorophyll. Unfortunately, they needs to be regulated since excess of them can lead to deformities. Heavy metals are important in most processes because they act as active ingredient in most cases. Hence,

they are employed in food, medicinal, cosmetic and many other production processes (Balogun et al., 2019).

Cosmetics generally are materials or substances prepared with the intention to smoothen be or create some effects when in contact with the external parts of the human body or other surfaces. They are mainly used for the purpose of cleaning, perfuming, protection, changing appearances, eliminating body odour, and keeping the surfaces in good condition, apart from dermatological modifications (Ahmadi-Jouibari et al., 2017). They contains multiple chemical substances; a group of these substances are active, but sometimes can be dangerous when in high concentrations, especially the heavy metals. This include substances such as lead (Pb), cadmium (Cd), nickel Ni), arsenic (As), mercury (Hg), chromium (Cr), iron (Fe), copper (Cu), cobalt (Co) and other substances (Ayenimo et al., 2010). Those heavy metals and their compounds are in use for different purposes in the cosmetic industry, mainly as ultraviolet filters in face and body care. Cosmetics are substances or products used to enhance or alter the appearance or fragrance of the body. Many cosmetics are designed for use of applying to the face and hair. They are generally mixtures of chemical compounds; some being derived from natural sources (such as coconut oil), and some being synthetics. Common cosmetics include body creams, lipstick, mascara, eye shadow, foundation, rouge, skin cleansers and skin lotions, shampoo, hair styling products (gel, hair spray, etc.), perfume and cologne (Nnorom, 2011). Though the body requires some low quantities of certain heavy metal ions such as Zn^{2+}, Mn^{2+}, Fe^{2+}, Cu^{2+} for growth and body health, high levels of them can prove to be toxic (Salama,2016). On the other hand, some of them, such as Pb^{2+}, Hg^{2+}, As^{3+} and Cd^{2+} are regarded as contaminants and are toxic; even at very low concentrations. This is regarded as a serious risk to the human health and environment (Singh *et al*, 2011; Patrick, 2016). Heavy metal poisoning can also be caused through industrial exposure, contaminated air, water, food cycles, medicines, etc. (Sainio et al., 2000). Accumulation of heavy metal ions in the living organisms and soft tissues can have effects on the normal functioning of neurological, immune, and cardiovascular systems and so on. Therefore, in recent years, the determination of trace amounts of heavy metal ions has become very important issue (Ladizinski et al., 2011; Mahurpawar, 2015). The use of heavy metals as ingredients in cosmetics is prohibited in many advance countries though metallic impurities cannot be avoided even under good manufacturing practice because they exist naturally in the environment (Ayenimo et al., 2010). It was reported that some metallic compounds are routinely used to manufacture cosmetic products as they possess properties to peel and whiten the skin. However, use of metal components in the manufacture of cosmetic products is based on regulatory law of a particular country (OJEU, 2009).

Heavy metals contamination in cosmetic products is a serious threat. Hence, this study was conducted to evaluate the concentrations of heavy metals in various brands of body cosmetic products with special emphasis on their health risk assessment. These heavy metals become a part of cosmetic product intentionally in the form of pigments, preservatives, UV filters as well as antiperspirant, anti-fungal and antibacterial agents (Bocca et al., 2007). It has been reported that human exposure to UV radiations can cause chronic as well as acute health effects on human skin, eye and immune system. Thus, cosmetic manufacturers use UV filters as important ingredients in sunscreens and other daily used cosmetic products. Though, UV filters are designed for the cosmetic products that are intended to apply on topical skin surface but derivatives of the products can bind to plasma protein and get circulated in the blood, then through phase I and II bio-transformation reaction that get metabolized in the liver. Afterwards they may either be excreted through urine or they can be bio-accumulated within the organism and results in some abnormalities (Flora & Pachauri, 2010; Arshad et al., 2020). Some heavy metals as well as parabens are incorporated as preservatives in cosmetic products because they possess antibacterial and antifungal properties. However, recent studies has shown that these heavy metals and parabens used as preservatives are also endocrine disruptors and can get easily absorbed through skin thus causing adverse effects on human health (Ullah *et al.*, 2017).

Cosmetic can be classified based on their purpose. Based on this, it can be classified into different types such as skin cream, lips make-up, face primer, concealer, facial make-up, eyes make-up, nails cosmetics, face mask and cleaner, hair cosmetics, and perfume and deodorant. Skin creams are semi-solid emulsions of oil and water. They are divided into two types: oil-in-water (O/W) creams which are composed of small

droplets of oil dispersed in a continuous water phase, and water-in-oil (W/O) creams which are composed of small droplets of water dispersed in a continuous oily phase. Oil-in-water creams are more comfortable and cosmetically acceptable as they are less greasy and more easily washed off using water. Water-in-oil creams are more difficult to handle but many drugs which are incorporated into creams are hydrophobic and will be released more readily from a water-in-oil cream than an oil-in-water cream. Water-in-oil creams are also more moisturising as they provide an oily barrier which reduces water loss from the outermost layer of the skin (Mohiuddin, 2019).

Heavy metals are elements that are primarily found in the d and p-blocks of the periodic table showing a metallic character and an ability to form salts. Some sources specify that heavy metal should have a high density (Al-Trabulsy et al 2013). Such metals include lead, cadmium, nickel, mercury and arsenic amongst others. The main concern is that heavy metals are ubiquitous and are present in several matrices both living and non-living. Particularly in living matrices, heavy metals may interfere with beneficial metals some of the latter being replaced by heavy metals that would result in the erratic physiological functioning of bodily systems. This is not an issue related only to mammals and humans, but such erratic behaviour, in terms of morbidity and mortality has been observed in other animals, such as insects (Benz, et al 2011), and also in plants. Some of these heavy metals accumulate in biological systems and one source for such accumulation is the daily and/or repeated use of cosmetic products such as face powders, lipsticks and eye shadows (Saadatzadeh et al., 2019). Some heavy metals are commonly found in cosmetics (Sukender et al., 2012; Bocca et al., 2012; Borghi et al., 2019).

The kinetics and dynamics of metals present in these cosmetic products vary significantly in their fate and their extent of effects. With the application of cosmetic products, the mode of entry of heavy metals in the body is via dermal or topical application. These metals may have either topical and/or systemic effects in humans (Chakera et al., 2011).

The exposure of the skin to heavy metals may extend the dermal inflammation to the systemic system (Chavatte et al., 2020). Ni can only penetrate and reach the general circulation, when damage is provoked by other metals (Mahurpawar, 2015). Other metals such as Hg, Pb and Cd may enter the general circulation through the skin layers and transported to various organs within the body (Sun et al., 2002). This permeation can occur via sweat glands and hair follicles. Besides direct contact, oral ingestion of heavy metals may occur by the application of cosmetic products either to the lips (e.g., lipstick, lip gloss and lip balms) or within the buccal cavity (toothpastes, mouthwashes and breathe sprays) or by hand to mouth transfer of any cosmetic applied to any body part (Sainio et al., 2000). Thinner facial skin is more permeable than skin elsewhere. Several studies show that certain heavy metals (such as Pb, Hg and Cd) found in topical cosmetics are found in high concentrations in the blood, urine and internal organs of individuals who use cosmetics when compared to individuals who do not (Li et al., 2010; Benz et al., 2011; Chakera et al., 2011; Dickeson et al., 2013). Cosmetics that are applied directly to the skin may contain moisturizing agents that increase skin permeation that may allow the entry of xenobiotics, to which some heavy metals may be bound, into the general circulation (Salama, 2016). Apart from the binding of heavy metals to exogenous substances (Flora & Peachauri, 2010), these may also bind to endogenous biological molecules, hence replacing the beneficial metals. These metals may bind to several functional groups such as the amine, carboxylic and thiol function groups present in several proteins, some of which have functional roles (such as enzymes), while others have structural roles (such as collagen, keratin, actin and myosin). These metals can also bind to nucleic acids which may lead to defective DNA and RNA synthesis that may result in carcinogenesis.

The application of underarm products has been hypothetically associated with the possibility of breast cancer. Therefore, heavy metals provoke several toxic effects at the cellular and molecular levels (Alam et al., 2019; Ullah et al., 2017).Several authors reported the presence of heavy metals in cosmetic products. This review gives an insight into the presence and effects of the most notorious and underestimated heavy metals in cosmetics products. The metals under discussion are lead, cadmium, nickel, mercury and arsenic

One of the most studied heavy metals is lead. Lead is not normally used for its potential properties but it is rather considered as a contaminant with serious effects on human health. When a lead comes in contact with vital organs, it is neurotoxic, nephrotoxic and hepatotoxic (Patrick, 2016) and may provoke effects

also on the reproductive system (Chauhan et al., 2010). Lead can also affect fetal development through its passage via the placenta (Ayenimo et al., 2010, Horowitz et al., 2002). Some studies have shown that it is considered a potential carcinogen to humans. It has been reported that the level of Pb in the blood of consumers who use eye cosmetics was threefold higher than that of non-consumers (Mohiuddin et al., 2019). Lead is acquired from industrial dust and fumes, car emissions, industrial chemicals such as old paints and pesticides, and a burning of fossil fuels. Food contamination may occur from some of these sources. Authorities worldwide are in a continuous struggle to establish permissible limits for Pb. The World Health Organization established a limit of 10 ppm (Sukender et al., 2012). The permissible level according to (Singh et al., 2019) is 0.1 mg/l. The FDA established a maximum permissible content of 10 ppm for Pb in color additives for the manufacture of cosmetics using Good Manufacturing Practices (USFDA, 2020). However, in color additives, the Pb content should not exceed 20 ppm. Lead and its salts are prohibited in any cosmetic product within the EU. Health Canada established a limit of 10 ppm for lead in cosmetic products (CIHI, 2012).

Cadmium has been associated with several toxicities in humans, mainly attributed to its absorption after topical application of several cosmetics (Ayenimo et al., 2010; Alam et al., 2010; Ahmad et al., 2007). It may cause irritant dermatitis (Guy et al., 1999). The main concern with Cd is that it tends to accumulate in human tissues and then release slowly into the general circulation. However, it normally binds to the keratin. Systemically, it mainly affects the skeletal, reproductive, metabolic, respiratory and renal system (Bocca et al., 2007; Rebelo et al., 2016, Mahurpawar et al., 2015). It has been associated with osteoporosis, diabetes, lung cancer and kidney damage. It also contributes to ageing since it can provoke oxidative stress (Alissa et al., 2011; Chavatte et al., 2020). Arsenic has been found in high quantities in cosmetic products, especially from underground market (Saadatzadeh et al., 2019).

There are some concerns with skin-lightening creams as some exceed the 3 ppm threshold for arsenic (Sukender et al., 2012; Alqadami et al., 2017) and other creams with levels up to 10.74 ppm. In some toothpaste, it is up to 26.94 ppm (Salama, et al., 2016). Most likely, as contaminant with other heavy metals used for this purpose. In spite of these findings, it is one of those elements that is rarely found in cosmetics. However, its presence may raise concerns particularly in legal products that are used on a long-term basis and in illegal cosmetic products in the underground market (Borowska, 2015).

Mercury is one of the heavy metals that is widely used in cosmetic formulations. It is used for skin lightening. In the organic form, such as phenyl mercuric and ethyl mercuric salts, it is used as a preservative in mascaras and eye makeup cleansing products (Ladizinski et al., 2011). After dermal application, Hg penetrates through the skin via the hair follicles and sweat glands. During this process, part of the Hg is reduced to the metallic form that accumulates in the skin tissue. Mercury blocks tyrosinase in situ, inhibiting the melanin-forming enzyme, thus its danger as ingredient in skin-lightening creams (Hostynek et al., 2003; Borowska, 2015).

Systemically, Hg may exhibit a range of signs which include vomiting, nausea and kidney damage, central nervous system effect which include irritability, tremors, weakness, nervousness, and fatigue and memory loss. It may affect also the sensorial systems, that is, loss in hearing, taste and vision. Finally, high Hg content may lead to death (Agorku et al., 2016). In some instances, following dermal absorption and systemic uptake, Hg may induce autoimmune glomerulonephritis. Studies reveal significant accumulation of mercury in several organs and body fluids, such as hair was found to be 22.5 ppm, which is twice that in non-cosmetic users and in blood was up to 233 nmol/l, which is more than four times than that in non-cosmetic users and in urine was up to 2531 nmol/day, which is fifty times more than that in non-cosmetic users (Agorku et al., 2016).

A variety of heavy metals present in cosmetics has different health implications. In some countries, lead, arsenic, and mercury are legally prohibited in skin cosmetic products. These metals can cause allergic contact dermatitis or other skin problems. Since some of these heavy metals are deliberate cosmetic ingredients, attention is now turned to the presence of these substances as impurities of higher concentrations. Heavy metals have been shown to have negative effects. Lead, which may be an impurity, is a proven neurotoxin linked to learning, language, behavioural problems, miscarriage and reduced fertility (Horowitz et al., 2002; Ayenimo et al., 2010). Some of the metals have tendency to get

accumulated with stratum corneum and cause allergic effects while others are diffusible in sweating, tears and sebum excretion and may penetrate through the skin appendages or through trans-cellular and intracellular pathways and reach blood circulatory system of human body. Therefore, daily application of many cosmetic products may results in increasing exposure of heavy metals to human body (Chavatte et al., 2020).

MATERIALS AND METHODS

This research was on heavy metals presence and contents in body creams or lotions, especially those that are sold within the premises of tertiary institutions under study. They are purchased and used by the populace in these institutions concerned; most importantly students, lecturers and other people that work or visit the premises of Colleges of Education in Warri and Mosogar; which are among the Delta State owned tertiary institution. College of Education Warri is located within Lat. 5^{o}54359'E and Long. 5^{o}74238'N; while College of Education Mosogar is located within Lat. 5^{o}87731'E and Long. 5^{o}73292'N. These institutions have designated areas as business centres or mini markets where body creams/lotions can be purchased. Apart from using global position system (GPS), other notable physical landmarks were also utilized. This consist of things like hostels, sick bays, designated buildings and other settings.

Twenty samples of different brands of body creams or lotions commonly used by students, workers and other occupants within the premises of College of Education, Warri (COEW) and College of Education, Mosogar (COEM) were purchased from the business centres. In all, four selling points consisting of two shops each from COEW and COEM respectively were the designated buying area. Five different body creams were purchased from each of the shops in the two areas. The twenty body creams/lotions were coded and kept in a cool, clean and safe laboratory tight cupboard for digestion. For obvious reasons, these samples were coded to conceal their identities. Based on this, College of Education Warri samples were coded CWBCA to CWBCJ; while College of Education Mosogar samples were coded CMBCA to CMBCJ.

Digestion of these samples were carried out in accordance with the method employed by Chauhan *et al*. for the digestion of creams, lotions and jellies in other to determine heavy metals concentrations (Chauhan *et al*., 2010). Twenty samples were digested for the determination of ten different heavy metals. Heavy metals involved were lead (Pb), cadmium (Cd), cobalt (Co), arsenic (As), manganese (Mn), silver (Ag), zinc (Zn), nickel (Ni), chromium (Cr) and mercury (Hg).

To 1.0 gm of each sample; 5.0 mL of aqua regia consisting of concentrated HNO_3:$HClO_4$ (3:1 by volume) was added and placed on hot plate at 90^{O}C for about 2–3 hours. This mixture was heated to almost dryness. Then another 3.0 mL of this acid mixture was added again and heated for about 2–3 hours to ensure complete digestion. This process was carried out for all the twenty samples. The digested samples were cooled to room temperature; and 5.0 mL of deionized water was added and shaken to ensure that the mixture is homogenous. This was then filtered using Whatman filter paper (number 41). The resulting filtrate was finally made to 25mL using standard volumetric flask. These digested solutions were kept in the refrigerator to prevent contamination, degradation or spoilage. These samples were sent for heavy metals identification and quantification; using Buck Atomic Absorption Spectrophotometer model 210 VGP.

RESULTS AND DISCUSSION

Table 1: Results of Heavy Metals Obtained from COEW Samples

		PARAMETERS (mg/kg)									
S/N	**SAMPLE**	**Ag**	**As**	**Cd**	**Co**	**Cr**	**Hg**	**Mn**	**Ni**	**Pb**	**Zn**
1	CWBCA	<0.001	0.011	0.004	0.009	0.068	<0.001	0.586	0.062	0.103	0.113
2	CWBCB	<0.001	0.015	0.014	0.002	0.145	<0.001	0.959	0.102	0.034	0.322
3	CWBCC	<0.001	0.008	0.015	0.044	0.172	<0.001	0.063	0.292	0.083	0.325
4	CWBCD	<0.001	0.003	0.009	0.109	0.201	<0.001	0.909	0.160	0.010	0.701
5	CWBCE	<0.001	0.011	0.044	0.061	0.019	<0.001	0.917	0.016	0.136	0.284
6	CWBCF	<0.001	0.007	0.005	0.008	0.175	<0.001	0.024	0.155	0.065	0.335
7	CWBCG	<0.001	0.017	0.019	0.065	0.159	<0.001	0.067	0.285	0.135	0.625
8	CWBCH	<0.001	0.004	0.043	0.044	0.175	<0.001	0.019	0.295	0.055	0.125
9	CWBCI	<0.001	0.011	0.044	0.107	0.067	<0.001	0.097	0.165	0.135	0.115
10	CWBCJ	<0.001	0.014	0.009	0.005	0.045	<0.001	0.072	0.291	0.035	0.225

Table 2: Results of Heavy Metals Obtained from COEM Samples

		PARAMETERS (mg/kg)									
S/N	**SAMPLE**	**Ag**	**As**	**Cd**	**Co**	**Cr**	**Hg**	**Mn**	**Ni**	**Pb**	**Zn**
1	CMBCA	<0.001	0.042	0.015	0.059	0.063	<0.001	<0.001	0.078	0.123	0.235
2	CMBCB	<0.001	0.001	0.008	0.095	0.001	<0.001	0.089	0.044	0.047	0.327
3	CMBCC	<0.001	0.043	0.016	0.001	0.043	<0.001	<0.001	0.074	0.083	0.325
4	CMBCD	<0.001	<0.001	0.027	0.008	<0.001	<0.001	<0.001	0.058	0.015	0.636
5	C MBCE	<0.001	<0.001	0.015	0.059	<0.001	<0.001	1.104	0.058	0.155	0.358
6	CMBCF	<0.001	<0.001	0.027	0.095	<0.001	<0.001	0.161	0.083	0.105	0.375
7	CMBCG	<0.001	0.002	0.025	0.001	0.055	<0.001	0.075	0.075	0.055	0.656
8	CMBCH	<0.001	0.001	0.015	0.008	<0.001	<0.001	1.005	0.045	0.037	0.322
9	CMBCI	<0.001	<0.001	0.025	<0.001	0.005	<0.001	0.159	0.044	0.025	0.225
10	CMBCJ	<0.001	<0.001	0.007	0.362	0.015	<0.001	<0.002	0.043	0.075	0.355

Table 1 shows the result of detailed analyses of the College of Education Warri (COEW) ten samples. From this result, silver and mercury concentrations in all the ten samples were all less than 0.001. The analyses revealed that these two metals are not present in all the creams. However, for the remaining eight metals, they were found to be present in various concentrations in the samples. As ranged from 0.003 – 0.017ppm. Others are Cd which is 0.004 - 0 0.044ppm, Co: 0.002 – 0.109, Cr: 0.045 – 0.201, Mn: 0.024 – 0.959, Ni: 0.016 – 0.291, Pb: 0.103 – 0.135 and Zn which is 0.113 – 0.701. The concentrations of these heavy metals is in the order: Mn > Zn > Ni > Cr > Pb > Co > Cd > As > Ag = Hg. for COEW samples These outcomes were found to be in agreement with the findings of Alqadami et al. (2017) and Alam et al. (2019). It is also in consonance with the findings of Borghi et al. (2019).

Similarly, Table 2 shows the analytical results for College of Education, Mosogar (COEM). The Ag and Hg followed ths= same trend. Both had concentration less than 0.001ppm. As ranged from <0.001 – 0.043; Cd: 0.007 – 0.027; Co: <0.001 – 0.362; Cr: <0.001 – 0.063; Mn: <0.001 – 1.104; Ni: 0.043 – 0.83; Pb: 0.025 – 0.155 and Zn: 0.225 – 0.656. The concentrations of these heavy metals in COEW samples is in the order Mn > Zn > Co > Pb > Ni > Cr > As > Cd > Ag = Hg. These outcomes were found to be in agreement with the findings of Alqadami et al. (2017) and Alam et al. (2019). Also in agreement with the work of Borghi et al. (2019).

The concentrations of Mn and Zn are consistent for the two sample zones. However, Ni, Cr and Pb are in third, fourth and fifth positions for COEW samples while Co, Pb and Ni occupied those positions in COEM samples. Cd and As are minimal in all the samples. These heavy metals are known as micronutrients when consumed.in meals or medicines, thus consuming them in higher dosage can spelt doom. The same way when accidentally licked, inhaled or zip into the mouth, nose or eyes. From the result obtained from the laboratory analysis, it is obvious that body creams (lotion) contains some heavy metals. This heavy metal has active ingredients and they cannot be avoided because any attempt made to avoid the use of this heavy metal might make the product not to be effective as described. Results also revealed various concentration for the purpose for which it is meant for. Just like the content of Nickel and lead in sample C and cadmium in sample D are so high compared to other samples as well as other metals. This will give the populace an idea of the type of creams (lotion) to buy that will be okay for their skins and avoid those that will have negative health effects.

CONCLUSION

From these results, it is revealed that longtime use of body creams or lotions can be hazardous to the skin and the organs, especially the skin whitening/toning creams/lotion. It also reveals that some of these body creams can end up becoming carcinogenic, particularly to the skin and body openings such as the mouth, nose, ear and eyes; from where it can escape into the body and become dangerous to the organs such as liver, lung and kidney as a result of series of interactions and bioaccumulation. This can occur with creams containing Cd, Cr, Pb and Ni; in which their long time usage can be have devastating effects on the body and its organs. Creams containing lead have been found to cause serious irritation and causes irreparable damages leading to skin burns.

There is the need for awareness campaign to sensitize the populace on the need to avoid some of these creams especially Sample CWBCE, CWBCG, CWBCI and CMBCE that contains high concentration of Nickel and Lead. Cr level in CWBCC, CWBCD, CWBCG and CWBCH are also high. We need the intervention of NAFDAC in regulating these creams. This is to be backed with strict laws and regulations since it involve life. There is need for the government to put in place strict regulations to checkmate or control the quantity of active ingredients associated with heavy metals or completely ban such creams. There is also the need for public awareness on the need to prioritise their safety rather than emphasizing on the colour of their skin or on body beauty which can result to complications.

REFERENCES

Agorku, E. S., Kwaansa-Ansah, E. E., Voegborlo, R. B., Amegbletor, P. & Opoku, F. (2016). Mercury and hydroquinone content of skin toning creams and cosmetic soaps, and the potential risks to the health of Ghanaian women. Springerplus. 2016; 5:1-5. DOI: 10.1186/s40064-016-1967-1.

Ahmadi-Jouibari, T., Fattahi, N., Mirzaei, N., Sharafi, K. & Ghafari, H. R. (2017). Determination of cadmium in cosmetics from Kermanshah, Iran by graphite furnace atomic absorption spectrometry. New Journal of Chemistry. 41:11948-11954. DOI: 10.1039/c7nj00406k

Alam, M. F., Akhter, M., Mazumder, B., Ferdous, A,, Hossain, M. D. & Dafader, N. C.(2019). Assessment of some heavy metals in selected cosmetics commonly used in Bangladesh and human health risk. Journal of Analytical Science and Technology. 2019;10:1-8. DOI: 10.1186/s40543-018-0162-0

Alissa, E. M. (2011). Heavy metal poisoning and cardiovascular disease. Journal of Toxicology.
2011:1-21. DOI: 10.1155/2011/870125

Alqadami, A. A., Naushad, M., Abdalla, M. A. & Khan, M. R., Alothman, Z. A. & Wabaidur, S. M. (2017). Determination of heavy metals in skin-whitening cosmetics using microwave digestion and inductively coupled plasma atomic emission spectrometry. IET Nanobiotechnology. 11:597-603. DOI: 10.1049/iet-nbt.2016.0212.

Al-Saleh, I. & Al-Doush, I. (1997). Mercury content in skin-lightening creams and potential hazards to the health of Saudi women. Journal of Toxicology and Environmental Health. 51:123-130. DOI: 10.1080/00984109708984016

Al-Trabulsy, H. A. M., Khater, A. & Habbani, F. I. (2010). Heavy elements concentration, physiochemical and radionuclides levels along the Saudi coastline of the Gulf of Aqaba. DOI: 10.1016.arabjc.2010.10.001.

Arshad, H., Mehmood, M.Z., Shah, M.H. & Abbasi, A.M. (2020). Evaluation of heavy metals in cosmetics products and their health risk assessment. Saudi Pharm. J. 28(7): 779-790. DOI: 10.1016/j.jsps.2020.05.006.

Ayenimo, J, G., Yusuf, A. M., Adekunle, A. S. & Makinde, O. W. (2010). Heavy metal exposure from personal care products. Bulletin of Environmental Contamination and Toxicology. 84:8-14. DOI: 10.1007/s00128-009-9867-5

Balogun, M. A., Money, M. O., Omosigho, H. N. & Ataikiru, H.O. (2019). Pollution level determination using chemical speciation in the vicinity of petroleum prospecting areas in southern Niger Delta. Journal of Chemical Society. 44 (5): 686-692.

Benz, M, R., Lee, S. H., Kellner, L, Döhlemann, C. & Berweck S. (2011). Hyperintense lesions in brain MRI after exposure to a mercuric chloride-containing skin whitening cream. European Journal of Pediatrics. 2011;170:747-750. DOI: 10.1007/s00431-010-1333-1

Bocca, B., Forte, G., Petrucci, F. & Cristaudo, A. (2007). Levels of nickel and other potentially allergenic metals in Ni-tested commercial body creams. Journal of Pharmaceutical and Biomedical Analysis. 2007;44:1197-1202. DOI: 10.1016/j.jpba.2007.04.031

Borghi, A., Corazza, M., Maietti, E., Patruno, C., Napolitano, M. & Schena, D. (2019). Eyelid dermatitis and contact sensitization to nickel: Results from an italian multi-centric observational study. Endocrine, Metabolic & Immune Disorders-Drug Targets (Formerly Current Drug Targets-Immune, Endocrine & Metabolic Disorders). 2019;19:38-45. DOI: 10.2174/1871530318666180731114418

Borowski, S. (2015). Metals in cosmetics: Implication for human health. DOI: 10.1002/jat.3129.

Canadian Institute for Health Information (CIHI). (2012). www.cihi.ca.

Chakera, A., Lasserson, D. & Beck(Jr), L. H. & Roberts, I. S. & Winearls C. G. (2011). Membranous nephropathy after use of UK-manufactured skin creams containing mercury. QJM: An International Journal of Medicine. 2011;104:893-896. DOI: 10.1093/qjmed/hcq209

Chauhan, A. S., Bhadauria, R., Singh, A. K., Lodhi, S. S., Chaturvedi, D. K. & Tomar, V. S. (2010). Determination of lead and cadmium in cosmetic products. Journal of Chemical and Pharmaceutical Research. 2010;2:92-97.

Chavatte, L., Juan, M., Mounicou, S., Leblanc, A., Noblesse, E., Pays, K. & Nizard, C. (2020). Elemental and molecular imaging of human full thickness skin after exposure to heavy metals. Metallomics. 2020;12:1555-1562. DOI: 10.1039/d0mt00121j.

Horowitz, Y., Greenberg, D., Ling, G. & Lifshitz, M. (2002). Acrodynia: A case report of two siblings. Archives of Disease in Childhood. 2002;86:453. DOI: 10.1136/adc.86.6.453

Darbre, P. D. (2003). Underarm cosmetics and breast cancer. Journal of Applied Toxicology: An International Journal. 23:89-95. DOI: 10.1002/jat.899.

Dickenson, C. A., Woodruff, T. J., Stotland, N. E., Dobraca, D. & Das, R. (2013). Elevated mercury levels in pregnant woman linked to skin cream from Mexico. American Journal of Obstetrics and Gynecology. 2013; 209(2):e4-e5. DOI: 10.1016/j.ajog.2013.05.030.

Flora, S. J. & Pachauri, V. (2010). Chelation in metal intoxication. International Journal of Environmental Research and Public Health. 2010;7:2745-2788. DOI: 10.3390/ijerph7072745 Guy, R.H. (1999). Metals and the Skin: Topical Effects and Systemic Absorption. CRC Press.

Ladizinski, B., Mistry, N. & Kundu, R. V. (2011). Widespread use of toxic skin lightening compounds: Medical and psychosocial aspects. Dermatologic Clinics. 2011; 29: 111-123. DOI: 10.1016/j.det.2010.08.010.

Li, S. J., Zhang, S. H., Chen, H. P., Zeng, C. H., Zheng, C. X. & Li, L. S. (2010). Mercury-induced membranous nephropathy: Clinical and pathological features. Clinical Journal of the American Society of Nephrology. 2010; 5: 439-444. DOI: 10.2215/CJN.07571009.

Mahurpawar, M. (2015). Effects of heavy metals on human health. International Journal of Research-Granthaalayah. 2015; 3:1-7. DOI: 10.29121/granthaalayah.v3.i9SE.2015.3282.

Mohiuddin, A. K. (2019). Heavy metals in cosmetics: The notorious daredevils and burning health issues. American Journal of Biomedical Science and Research. 2019;4:332-337. DOI: 10.34297/AJBSR.2019.04.000829.

Nnorom, I. C. (2011). Trace metals in cosmetic facial talcum powders marketed in Nigeria. Toxicological & Environmental Chemistry. 2011; 93:1135-1148. DOI: 10.1080/02772248.2011.577075.

Patrick L. (2016). Lead toxicity, a review of the literature. Part I: Exposure, evaluation, and treatment. Alternative Medicine Review. 2006;11:2-22.

OJEU, (2009). Official journal of the European Union, Regulation (EC) No. 1223/2009 of the European Parliament and of the council of November on cosmetic products, Pp. 59-208.

Saadatzadeh, A., Afzalan, S., Zadehdabagh, R., Tishezan, L., Najafi, N. & Seyedtabib, M. (2019). Determination of heavy metals (lead, cadmium, arsenic, and mercury) in authorized and unauthorized cosmetics. Cutaneous and Ocular Toxicology. 2019;38:207-211. DOI: 10.80/15569527.2019.1590389.

Sainio, E. L., Gbue J. R., Hakala, E. & Kanerva, L. (2000). Metals and arsenic in eye shadows. Contact Dermatitis. 2000; 42:5-10. DOI: 10.1034/j.1600-0536.2000.042001005.x.

Salama, A. K. (2016). Assessment of metals in cosmetics commonly used in Saudi Arabia. Environmental Monitoring and Assessment. 2016;188:1-1. DOI: 10.1007/s10661-016-5550-6.

Shanker, A. K. (2008). Mode of action and toxicity of trace elements. In: Prasad MNV, editor. Trace Elements: Nutritional Benefits, Environmental Contamination, and Health Implications. Chichester: Wiley; 2008. pp. 528-555. DOI: 10.1002/9780470370124.ch21.

Singh, R., Gautam, N., Mishra, A. & Gupta, R. (2011). Heavy metals and living systems: An overview. Indian Journal of Pharmacology. 2011;43:246. DOI: 10.4103/0253-7613.81505.

Sukender, K., Jaspreet, S., Sneha, D. & Munish, G. (2012). AAS estimation of heavy metals and trace elements in Indian herbal cosmetic preparations. Research Journal of Chemical Sciences. 2:46-51.

Sun, C. C., Wong, T. T., Hwang, Y. H., Chao, K. Y., Jee, S. H. & Wang, J. D. (2002). Percutaneous absorption of inorganic lead compounds. AIHA Journal. 2002, 6: 641-646. DOI: 10.1080/15428110208984751.

Ullah, H., Noreen, S., Rehman, A., Waseem, A., Zubair, S. & Adnan, M. (2017). Comparative study of heavy metals content in cosmetic products of different countries marketed in Khyber Pakhtunkhwa, Pakistan. Arabian Journal of Chemistry. 2017;10:10-18. DOI: 10.1016/j.arabja.2013.09.021.

United States Food and Drug Authorities (USFDA). Draft Guidance for Industry: Lead in Cosmetic Lip Products and Externally Applied Cosmetics: Recommended Maximum Level. FDA-2014-D-2275. [Internet] 2016. Available from: https://www.fda.gov/regulatory-information/search-fda-guidance-documents/draft-guidance-industry-lead-cosmetic-lip-products-and-externally-applied-cosmetics-recommended [Accessed: December 13, 2021]