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International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Effect of Heavy Metals on Cosmetics

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ABSTRACT:

This review provides a thorough analysis of the presence of few heavy metals in cosmetics and their potential effects. Millions of consumers use daily personal care products and facial cosmetics, making the skin vulnerable to various ingredients due to direct application. Recent research indicates that cosmetic product can cause various skin issues due to presence of heavy metals like mercury, lead , arsenic, chromium, nickel , etc. Skin dermas protect body organs, and beauty care products on external skin affect cell climate through follicles of body hair, body opening pores .Long-term use of beauty products increases fixation, but heavy metals in the product can cause harmful issues. Electrophilic replacement with biomolecules is more dangerous.

In cosmetics rare element like mercury has been found in very minor amounts in skin lightening creams. Nickel is known for its association with allergic contact dermatitis cause a rash that may be itchy but is often painful. The study found that lipsticks, eye shadows, face paints, foundation, and skin lightening creams generally contain a high amount of heavy metals. Thus, in this review article we are focusing on hazardous effect of the toxic heavy metals found in cosmetics.

Keywords : cosmetic, heavy metal , mercury, lead , cadmium, arsenic , nickel .

Introduction:

It is a product applied externally to the body to maintain good health without changing the body's characteristics functioning known as cosmetics (1). A cosmetic product Is a substance or preparation used to clean, defend, change look, and maintain good appearance on outer body parts of the body(2,3).

Now a days ,Metals have become essential in cosmetics, used by various countries for color, UV absorbers, and making soft , with latent applications in cosmetics(4,5,6)Cosmetic products, despite analyzing, still potentially danger due to hazardous chemicals. The FDA only takes action after a product violates the FD&C Act, as new products are released each season, making it difficult to monitor product safety and potentially carry carcinogenic contaminants (7)Cosmetic products often contain some heavy metals like mercury ,arsenic, mercury, cobalt, and nickel, which can cause various skin problems, according to the research(8,9)The regulation prohibits certain ingredients from being used in cosmetic products, including some heavy metals like mercury ,tin, lead, cadmium, arsenic, and nickel. Other metals and their salts are allowed with a specific limit. Heavy metals can also be found in natural cosmetic raw materials like, olive oil, argan oil, and citrus essential oils (10-13)

Cosmetic products in Iran are regulated for safety and the healthy of people ,but worry about the heavy metals in cosmetics have not been extensively studied. Pollution observing labs estimate heavy metal levels in lipsticks, lip balms, creams and anti-aging creams. Heavy metals can cause skin problems, and their use is controversial due to their toxicity(1417)Researchers have explored heavy metals in an cosmetics, goal to complete studies on their potential harm to humans

MECHANISM OF HEAVY METALS ABSORPTION:

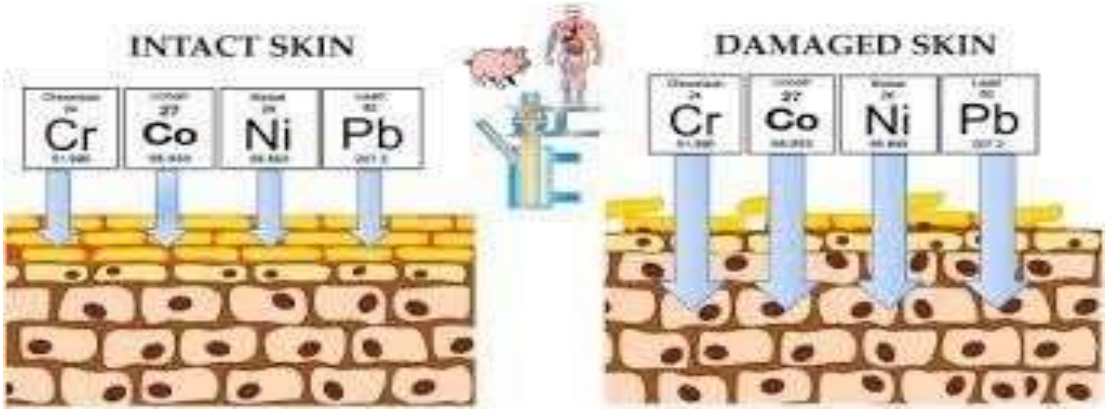

Fig 1 .Percutaneous metals absorption .

Wonder course for permission of repair faulty skin dermas which fundamentally safeguard sub-dermal and interior body organs (18)The use of cosmetic products items on outside skin arrive at the cell climate through follicles of an hair , sweat pores opening and then blood vessels for the capability for which to be picked (19).

Against the fact that unaware through the skin is a sluggish cycle however constantly long haul utilization of beauty care products expands the obsession. it may, regar of heavy metals to impurity level speed up the gathering and furthermore cause harmfulness as various issues. The electrophilic replacement of weighty metals with fundamental components in key biomolecules show up more threatening to human body (20, 21)

Heavy metals:

Heavy metals are components that are essentially seen as in the d and p-blocks of the occasional table appearance a metallic person and a capacity to shape salts. A few sources determine that weighty metal ought to have a high density (22).Such metals include nickel, cadmium, arsenic, mercury and lead and some others. Heavy metals are potentially interfering with beneficial metals and causing erratic physiological functioning. This issue affect, humans, and other animals, including insects, leading to morbidity and mortality (23),and furthermore in plants. A portion of these weighty metals collect in natural system and potentially rehashed utilization o f selective items, for example, facial powders, eye shadows ,and lipstick (24). Heavy metals, such as lead, cadmium, nickel, mercury, and arsenic, are metallic elements found in periodic table of p and d block, with high density(59).

THE PRESENCE OF COMMONLY USED HEAVY METAL IN COSMETICS AND THEIR EFFECTS :

MERCURY:

Mercury, a hazardous ingredient in cosmetics, which are in organic, inorganic and metallic forms, causing poisonous effects on lungs, skin, Kidney, and central nervous system (25).Ammoniated Hg is used for skin brightening, where the organic forms like the phenyl mercuric and ethyl mercuric present in form of salts are used as preservative agent in mascaras and eye makeup cleansing products (26, 27) , and also used to inhibit melanin formation, resulting in skin-lightening (28). The FDA allows a maximum level up to the 1 ppm of the mercury in mercury-contaminated by the heavy metal like lead acetate when used as an color in cosmetics (29).

After dermal application, hydrogen peroxide (Hg) penetrates the skin through hair follicles and sweat glands, reducing to metallic form and accumulating in the tissue of skin. Mercury blocks tyrosinase, inhibiting melanin-forming enzyme (30-32).Over accumulation of Hg can cause symptoms like dizziness, migraines,anxity , joint pain, irritation, insomnia and acrodynia (34).

Lead :

Lead, a soft, malleable heavy metal having an 82 atomic number which is used as a coloring agent in cosmetics, food, drugs, and medical devices due to its low ionization energy and similarity to other color-imbuing metals like Ni, Mn , and Mg.. The USFDA has sets a limit of 10-20 ppm for lead as color additives in an cosmetics, and it is commonly used in lip products, lipstick, eyeliners, and superficially applied cosmetics (33).Lead is a harmful metal derived from industrial sources like chemical ,dust, fumes, car emissions ,dust, and burning of fossil fuels. It can also cause food contamination. Authorities worldwide are working to set limits, with the WHO(World Health Organization) setting a 10 ppm limit (35)

Color shades in cosmetics drive growth of industries. Misuse of these additives can lead to poor quality cosmetics, and a marketing such products is illegal (33)Cosmetics' popular consumption of an lead is a anxious due to its toxic effects on humans, including , neurotoxicity, and the nephrotoxicity when it is in contact with vital organs (36)Lead exposure is linked to the miscarriage , changes in hormone, reduces the fertility and delayed puberty onset in girls, and is suspected to be harmful to humans (37,38)

Cadmium:

Cosmetics pose a significant health risks in public, as indicated by the FDA(Food and Drug Administration) and European Union's Restriction on Hazardous Substances, particularly concerning women's use(39).Cadmium, a heavy metal with a density of over the 5g/cubic centimeter is crucial for life's survival in low concentrations, but when present in higher amount of concentrations so , it can cause metabolic disturbances (40).Cadmium, a metal, is commonly used in cosmetics for its colored salts, varying from deep yellow to orange colour (41).

Cosmetics pose a significant health risk in public as indicated by the FDA(Food and Drug Administration) and European Union's Restriction on Harmful Substances, particularly concerning women's use (42).Cadmium, a deep yellow to orange colour pigment, is mainly found in lipsticks and face powders due to its color properties. Heavy metal contamination among the various cosmetic products studied. This focus on the the importance niglate cadmium in cosmetics(43)

Cd tends to accumulate in human tissues and release slowly into the general blood circulation, primarily affecting the skeletal, metabolic, respiratory, renal system and reproductive systems, primarily which bound to keratin (44,45,46)

Arsenic :

Arsenic, a common contamination found in environment, which target the protein on sulfydryl group potentially depleting the glutathione, which is an essential antioxidant amino acid, that prevents to damage to cellular components caused by radicals and heavy metals, inactive redox being despite (47).

Arsenic is found in various cosmetic material, but only an the European Union country has a strict regulations against its use, while the USFDA and WHO have not defined acceptable levels for arsenic found in cosmetics (48,49).As is an amino acid-based antioxidant that prevents the cellular damage from radicals and heavy metals. As Long-term dermal exposure can cause hyperpigmentation and the keratosis, but in systemically it may have been carcinogenesis and vascular diseases (50,51)

Nickel:

Consumers are concerned about heavy and toxic metals found in cosmetics, with the FDA assessing various products for mercury, lead , cadmium, chromium, arsenic and nickel. Nickel, naturally present on an earth, which can cause allergic reactions to skin and rash to skin . IARC has classified nickel compounds as hazardous to humans and metallic nickel as potentially carcinogenic(52).Nickel-containing cosmetics, like eye shadows and mascara , which can cause allergic contact dermatitis, especially in the patient of an eyelids. However, the "nickel-free" cosmetics, with less than 1ppm of nickel, are safe for most sensitized patients (53,54,55).

Nickel can cause the cancer in the lung and nasal area due to its impact on the respiratory system (56).Cosmetics can potentially rejuvenate skin, but their inclusion of Ni may cause oxidative stress, thereby promoting skin aging (57).

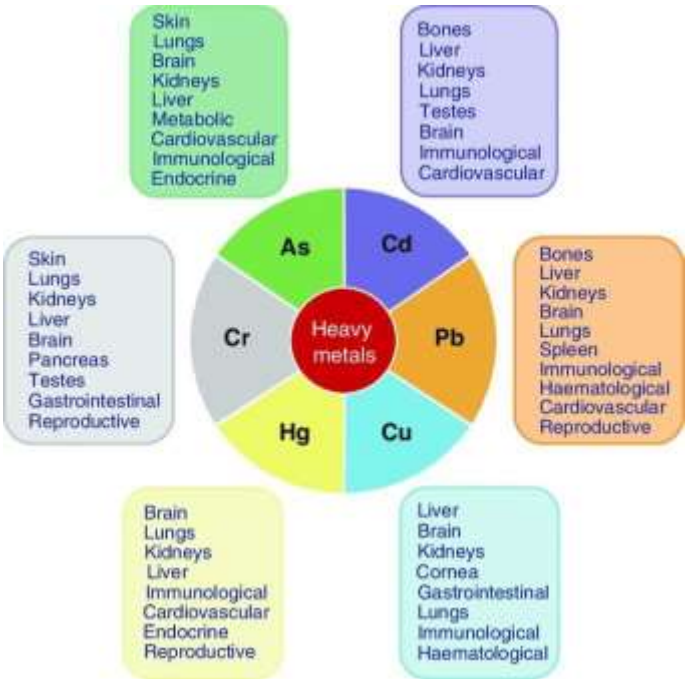

Fig 2. Heavy metal impact on human health (58)

Conclusion:

Previous studies underline the importance of specific Heavy metals as contaminants and additives in cosmetic products. The daily use of cosmetics containing harmful heavy metals like arsenic, nickel ,lead, cadmium and mercury poses significant health risks. Good manufacturing practice is crucial to determine human risk from exposure to the cosmetics, which are polluted in large amount by heavy metals.

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