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COSMETICS AND THEIR TOXICOLOGICAL STUDIES: A REVIEW

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Abstract:
The word "cosmetics" is taken from a Greek word "kosmetics" which means to adorn. Since early days materials used for beautification. Generally, all the people wants to look beautiful & the concept of cosmetics is as old as mankind & civilization. The urge of beautify one's own & look beautiful has been an urge in the human race since the tribal days. Chemicals in the skin care products are very critical because they donot only have an influence on the safety of cosmetics but also on all the aspects of the human body & life. For sensitive skin types, all the products are not suitable. That types of skin products should avoid, that is the cosmetics which are containing harmful chemicals. It's significant to evaluate cosmetic toxic & protective mechanism of products by using scientific methods. The research in this article is also helpful for people to use skin care products reasonably & promote skin health.

Keywords: Health, Skin, Hazards, Cosmetics, Chemicals. Tones.

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INTRODUCTION:

Cosmetics are products applied to the body for the purpose of beautifying, cleansing or improving appearance & enhancing attractive features. Cosmetics consists of a vast range of products like shampoos, conditioners, mascaras, after shave lotions, styling gels, creams, lotions, powders, dyes, hair sprays, deodorants, & antiperspirants, foundations, etc..The word "make up"is defined as a cosmetic which is primarily to coloured products intended to alter the user's appearance [1].Note few important aspects of this legal definition of cosmetics.First, in the United states cosmetics in theory donot contain "active drug"entities of any type nor can they be promoted as altering any physiological state either in disease or health. This is an under representation of the true incidence because most patients who experience reactions to newly purchase cosmetic seldom consult a physician & just stop using the suspectced cosmetic.In addition they reported that 59 percent of the reactions caused by the cosmetics occurred on the face including the periorbital area & 79 percent were females.Half of the cases later proven to evoke reactions to cosmetics were initially unsuspected.Reactions to cosmetics can have a wide variety of presentations. Including subjective irritation, allergic contact dermatitis, contact urticaria, photosensitive reactions, pigmentation, hair & nail changes[2].

Introduction of sensitive skin and cosmetics :

Sensitive skin is a kind of skin with extraordinarily sensitizing and highly intolerant to any slight external irritation and is prone to itching, tingling, burning, and tightness. The clinical manifestations of sensitive skin are mainly subjective sensory abnormality, lack or slight objective symptoms, high sensitivity, poor tolerance, and strong responsiveness. With the widespread use of cosmetics, various problems have also appeared, such as low quality of cosmetics, excessive levels of toxic substances, the addition of glucocorticoid-prohibited drugs, and consumers' failure to choose cosmetics based on their skin type. Hospital visits make the appearance of cosmetic dermatitis endless in the crowd. Cosmetic toxicity, in the broad sense, refers to abnormal changes in the physiological state of the skin caused by the use of cosmetics. It mainly manifests as cosmetic photodermatitis, irritating cosmetic dermatitis cosemtic allergic contact dermatitis,cosmetic hormone-dependent dermatitis, andcosmetic pigments. Also, cosmetics may cause abnormal dermatitis and hair damage. The narrow sense of cosmetic dermatitis refers only to cosmetic allergic contact dermatitis and cosmetic irritant dermatitis. In future research, there will be more studies about the pathogenesis of sensitive skin and the ingredients in cosmetics that cause the formation of sensitive skin, providing compelling evidence for the development of more sensitive cosmetics for sensitive skin[3].

Toxicity analysis and recognition of chemicals in common skincare products :

In the past, for people's skincare they have mainly used natural raw materials (such as plant and rock ingredients). However, since the 20th century, the petroleum industry has greatly developed, and petrochemical raw materials are used widely in our daily life. for example, most cosmetics and daily necessities are made from petrochemical raw materials. Hazardous substances in cosmetics mainly comes from chemical raw materials and excessively added banned restricted chemical substances. In fact, some manufacturers did not strictly implement the requirements of the Cosmetics Hygiene Regulations, resulting in some unqualified cosmetics entering the market. After using these unqualified products, the light ones will cause skin irritation, erythema, and edema, which will cause obvious damage to the skin and mucous membranes, and the serious ones will cause teratogenesis and cancer. China's "The Cosmetics Hygiene Regulations" stipulates lead content ≤40 mg / kg; mercury content ≤1 mg / kg; arsenic content ≤10 mg / kg. The fact is that the ingredients in cosmetics are straight forward to get into the skin and blood. Once these substances enter the body, they can damage the endocrine and nervous system and may cause reproductive developmental problems. The following are common chemicals in daily personal care and hygiene products, to understand their toxicity to human health[4].

Skin sensitization :

According to OECD test guideline for skin sensitization OECD TG406, "Skin sensitization (allergic contact dermatitis) is an immunological mediated cutaneous reaction to a chemical substance", and is also characterized by pruritic, oedema, erythema, papules or a combination of these in the

human skin. The goal of estimating the skin sensitization potency of chemicals is to evaluate whether exposure of the chemical to the human initiates allergic reactions and whether the chemical has a skin sensitization potential when exposed to the skinof the animal. Skin sensitization is mainly performed on guinea pigs and mice as a pre clinical test. The mouse ear swelling test (MEST) or local (auricular) lymph node assay (LLNA) was performed on the surface of the mouse ear. When a guinea pig is used for testing, the chemical is applied on the surface or injected under the skin of the animal. And observe it for the result[5].

Carcinogenicity :

The substances which induce tumours (benign or malignant) are known as carcinogenic substances. When they are ingested, inhaled, injected or dermally applied, they may increase their malignancy or shorten the time of tumour occurrence. There are mainly consists of two types of categories of carcinogens are known: One is genotoxic (induce cancer through interaction with the DNA and induce mutations) and another is non-genotoxic (induce cancer through a mechanism other than DNA damage, like hormonal effects). Most commonly, two species of rodent's mice and rats are used for the carcinogenetic study. Carcinogenicity testing requires more animals than another toxicity testing. At least 100 animals (50 male and 50 female) rodents are used for each of 3 doses. The latency period of tumour formation in rodent's animals is 1 or 2 years. The test substance should be administered 7 days a week for a fraction of life span comparable to the fraction of human life span over which the substance is likely to be used. Generally, the period of dosing should be 24 months for animals like rats and 18 months for mice[6].

Fragrances :

Fragrances often added to the daily deodorants, perfumes, and collagens that people usually contact. Furthermore, it finds in almost all personal care products, including soaps, shower gels, shampoos, creams, lotions, and humectants.Most of the people likes the fragrances. Therefore, fragrances are essential additives. This chemical is contained even in products labeled as odourless or fragrance-free.We have different types of flavours. One reason why it is more difficult to know exactly what the chemicals contain is that cosmetic manufacturers have so-called "rights" to protect their trade secrets, which gives them the right not to disclose the full list of ingredients, so consumers sometimes do not know what they are buying. However, usually, these chemicals are not tested for toxicity individually or in combination. Studies have shown that skin irritation, and runny nose is often associated with the use of fragrances. Perfume is one of the main allergens in the eyes of the chemist. Maybe not everyone knows how harmful fragrance is to skin. The essence itself is a mixture consisting of artificial or natural species which are also a variety of chemical components, and some of them are mainly allergens and even carcinogenic[7].

Mineral oil :

Mineral oil is a highly hydrophobic and occlusive fatty substances (waterproof) derived from hydrocarbons (coal or petroleum distillates). Because, it prevents water from evaporating, it moisturizes by indirect action. It is widely used in a variety of skin creams and moisturizers, as well as in hair care products. However, mineral oils are often susceptible to contamination by polycyclic aromatic hydrocarbons (HPA). Long-term exposure to these substances may also links to a scope to cancer. HPA can also cause allergies and skin irritation. There is a standard for acceptable daily intake's mineral hydrogen carbon. For lip care products, people should use not more than an acceptable daily intake (ADI). Eating natural mineral oil is toxic because it settles and accumulates in the user's stomach. People need to avoid using all kinds of balsams and lipsticks whose ingredient is a mineral oil. Therefore, breastfeeding women should avoid using all the cream on their chest when they are in oral contact with the baby[8].

Acne and comedones :

Acne is a most common defect for all the people in recent days.Acnegenesis and comedogenesis are distinct but often related types of adverse skin reactions to facial, hair and other products. Acnegensis refers to the chemical irritation and inflammation of the follicular epithelium with resultant loose hyperkeratotic material within the follicle and inflammatory pustules and papules. Comedogenesis refers to the non inflammatory follicular response that leads to dense compact hyperkeratosis of the follicle. Mills and Berger (1991) indicated that the time courses for the development of facial acne and comedones are different.Acne can cause through many hormonal changes & food change in our day to day habitats also. While facial acne will appear in a matter of days, comedone formation in the human back and rabbit model takes longer to occur [9].

Pigmentation :

Pigmentation is also a common disorder in all the people because of vitamin deficiencies in the people.Hyperpigmentation of the face caused by contact dermatitis to ingredients in cosmetics occurs

more frequently in dark complexioned individuals . An epidemic of facial pigmentation reported in Japanese women was attributed to “coal tar” dyes principally Sudan I, a contaminant of D&C Red No. 31 . The following fragrance ingredients have also been implicated-benzyl salicylate, ylang-ylang oil, cananga oil, jasmin absolute, hydroxycitronellal, methoxycitronellal, sandalwood oil, benzyl alcohol, cinnanuc alcohol, lavender oil, geraniol, and geranium oil . Histologic examination shows hydropic degeneration of the basal layer, pigment incontinence and little evidence of inflammation . Dermatologists should search scrupulously for a causative agent in patients with hyperpigmentation.By the pigmentation upon the face becomes darker in black colour. Eliminating the product results frequently in gradual fading of the pigment. Unfortunately, until a predictive assay is 14 identified, most patients will be incorrectly indentified as Idiopathic [10].

Photosensitivity :

Contact photosensitivity results from UV-induced excitation of a chemical applied to the skin. Contact photosensitivity is divided into phototoxic and photoallergic reactions. Phototoxic reactions may be experienced by any individual, provided that ultraviolet light contains the appropriate wave lengths to activate the compound and that the UV dose and the concentration of the photoreactive chemical are high enough. Clinically, it consists of erythema followed by hyperpigmentation and desquamation. Sunburn is the most common phototoxic reaction. However, photoallergic reactions require a period of sensitization.This condition causes because of sensitive reactions. The reactions are usually delayed, manifesting days to weeks or years after the UV exposure. The major problem with photoallergic reactions is that the patient may develop persistent light reaction for many years after the chemical has been removed. These patients tend to be exquisitely sensitive to the sun and usually have very low UV-B and UVA minimal erythema doses. [11]

Nail changes :

By using the different types of nail products,the nails are geeting disrupt or getting damage with various defects.Paronychia, onycholysis , nail destruction and discoloration are some of the most common cosmetic adverse reactions found in the nails. The physician should obtain a detailed description of the nail grooming habits in patients who have paronychia, onycholysis, nail destruction, or nail discoloration because any of these problems may be caused by nail cosmetic usage. Nail discoloration has been reported with the use of hydroquinone bleaching creams and hair dyes containing henna[12].

Hair changes :

Hair changes with usage of different hair types of hair products like shampoos, sprays ,gels ,starightners,etc types of hair care products.Permanents and hair straighteners are intended to break the disulfide bonds that give hair keratin its strength. Improper usage or incomplete neutralization of these cosmetics causes hair breakage. Hair that has been damaged by previous applications of permanent waves, straighteners, oxidation type dyes, bleaches, or excessive exposure to sunlight and chlorine is more susceptible to this damage. The dermatologist should always take a complete history in these cases, including a detailed account of the use of drugs, to detect any causes of telogen or anagen effluvium. Careful examination of the hair shafts is essential to detect any pre-existing abnormalities. Saving a sample of these hairs in the patient record may be invaluable should litigation against the beautician or supplier occur [13].

Emulsifiers :

Creams and lotions require the presence of an emulsifier to allow the combination of water and oil. Emulsifiers may act as mild irritants especially if applied to slightly damaged skin.Emulsifying agents are used in few types of cosmetic compositions. Pugliese (1983) suggested that increased epidermal cell renewal or “plumping” of the skin may be due to mild irritant effects of nonionic surfactants. Hannuksela *et al*. (1976) patch tested over 1200 eczematous patients with common emulsifiers. Another emulsifier, stearamidoethyl diethylamine phosphate, has been implicated in four cases of cosmetic contact dermatitis .By suing these agents, oil & water phases will get mixes. Irritant reactions are seen at the same concentration as allergic responses. When 5 percent triethanolamine stearate in petrolatum was tested, 9.5 percent of the patch tests showed irritant reactions. Even positive reactions to 1 percent triethanolamine in petrolatum should be confirmed by retesting and the provocative-use testing[13].

Eye makeup preparations :

Mostly there are very vast types of products like Mascara, eyeliner, eye shadow, and eyebrow pencil or powders are the most commonly used eye-area makeups. The upper eyelid dermatitis syndrome is complex and often frustrating to the patient and dermatologist, because of chronicity and failure to respond to our well-intentioned assistance. Causes that we have documented. Although patients often consider this a reaction to eye makeup, the association is seldom

proven. In the North American Contact Dermatitis Group study 12 percent of the cosmetic reactions occurred on the eyelid but only 4percent of the reactions were attributed to eye makeup . A workup of patients with eyelid dermatitis includes a careful history of all cosmetic usage, because facial, hair, and nail cosmetic reactions appear frequently on the eyelids . Reactions to cosmetics on the eyelid are often the irritant type; and to further complicate their diagnosis, they may be due to cumulative irritancy—the summation of several, mild irritants (climatic, mechanical, or chemical) [14].

Hair preparations (non-coloring) :

Permanents :

Permanent waves are cosmetics that alter the disulfide bonds of hair keratin so that hair fiber configuration can be changed. The disulfide bonds of cystine are broken in the first step when the waving solution is applied to the hair wound around mandrels. In the second step, with neutralization, new disulfide bonds are formed by locking in the curl configuration of the hair. The waving solutions contain reducing agents that can cause irritant reactions when allowed to run incautiously on the skin surrounding the scalp. Irritant reactions range from erythema to bullous dermatitis. Hair breakage and loss may result when permanent waves are used improperly—in too concentrated a form, for too long a time, or on hair previously damaged by dyes, straighteners, or permanent waves. Old-fashioned hot waves occasionally caused chemical burns, which scarred the scalp producing permanent alopecia, but modern permanents can cause breakage, which results in temporary loss.In 1973, "acid permanents" were introduced for beauty saloon use . Acid permanents are the most widely used perm preparation today. These waving lotions, which contain anhydrous glyceryl monothioglycolate in acid form, are mixed at the time of application with a water-based ammonium hydroxide solution to produce a neutral solution. The hair is covered with a plastic cap and placed under a hair dryer. Since the introduction of "acid perms," irritant and allergic reactions have been noted to occur on the hands of hairdressers and the face, neck, scalp, and hair line of their customers from use of these permanents . Patch testing can be carried out with 1.0 percent glyceryl thioglycolate (glyceryl monothioglycolate) in petrolatum or water (freshly prepared) [14]

Straighteners :

Straightening hair involves using a heated comb with petrolatum or a mixture of petrolatum, oils, and waxes. The petrolatum or "pressing oils" act as a heat modifying conductor, which reduces friction when the comb travels down the hair fibers. Mechanical and heat damage can cause hair breakage. Over the years, the heated oils can injure the hair follicles leading to scarring alopecia. Chemical straighteners containing sodium hydroxide, "lye," cleave the disul- fide bonds of keratin thoroughly and straighten hair permanently. Experience and caution in applying these straighteners are important to avoid hair breakage and chemical burns. Similar products that contain guanidine carbonate mixed with calcium hydroxide are reputed to be milder. It is necessary to straighten new growth every several months. Care is taken not to "double process" the distal hair, which is already straightened. Some manufacturers advise against using permanent hair colors that require peroxide on chemically straightened hair to avoid damage. Sulfite straighteners, chemically similar to sulfite permanents, are best suited to relaxing curly Caucasian hair. "Soft Curls" have become a fashionable way of styling black hair. Ammonium thioglycolate and a bromate or peroxide neutralizer are used to achieve restructuring of the hair. [15]

Shampoos :

Shampoo is a hair care product that is used to cleanse the scalp & hair by removing dirt,sebum,& residues of hair care products.When shampoos are used, they have generally a short contact of time with the scalp and are diluted to rinse off quickly. These factors reduce their sensitizing potential. Consumer's complaints are commonly directed at their eye stinging and irritating qualities . The importance of eye safety testing for these products became apparent 35 years ago when shampoos based on blends of cationic and nonionic detergents caused blindness in some users. Modern shampoos are detergent-based with a few containing small amounts of soap for conditioning. Fatty acid amides used in shampoos as thickeners and foam stabilizers have caused allergic contact dermatitis in other products . Formaldehyde or formaldehyde releasers may be used as a preservative in shampoos but formaldehyde rarely causes contact dermatitis in hairdressers or consumers related to use of shampoos [15].

Sunscreen :

Sunscreens are used to protect the skin from sunlight which can be classified into two major types: chemical and physical (Food and Drug Administration, 1978). Physical sunscreens such as titanium dioxide and zinc oxide reduce the amount of light penetrating the skin by creating a physical barrier that reflects, scatters, or physically blocks the ultraviolet light reaching the skin surface. Examples of chemical sunscreens include para-amino benzoic acid (PABA) and PABA

derivatives such as Padimate 0, cinnamates, benzophenones, salicylate derivatives, and dibenzoylmethane derivatives[16].

Salicylates :
Salicylates are the cosmetic produts which are used in the preparation of cosmetics.There are two cases of contact allergy and two reports of photocontact allergy to homomenthyl salicylate in the literature and no reports of sensitization to octyl salicylate, the major salicylate derivative in many sunscreens[16].

Cinnamates :
Cinnamate is an organic compound that is an unsaturated carboxylic acid.It is slightly soluble in water,but freely soluble in many organic solvents.Cinnamates are chemically related to or are found in balsam of Peru, balsam of Tolu, coca leaves, cinnamic acid, cinnamic aldehyde and cinnamon oil, ingredients used in perfumes, topical medications, cosmetics, and flavoring. Thune (1984) reported eight cases of sensitivity to cinnamates, two cases of photoallergy to 2-ethoxyethyl-p-cinnamate, and six subjects with contact allergy to other cinnamates such as amyl cinnamaldehyde, amyl cinnamic acid, and cinnamon oil. [17]

Excipients :
Excipients are inactive ingredients used in cosmetic products along side active ingredients. They also include surfactants, rheology modifiers, humectants, emollients,& preservatives. Surfactants lower surface tension & act as detergents, wetting agents,emulsifiers,& dispersants. Contact allergy can also be caused by excipients included in sunscreens. These chemicals include mineral oil, petrolatum, isopropyl esters, lanolin derivatives, aliphatic alcohols, triglycerides, fatty acids, waxes, propylene glycol, emulsifiers, thickeners, preservatives, and fragrances. An extensive list of vehicle constituents in cosmetics that can cause allergic responses has been published . Sunscreens available in the United States provide a complete list of ingredients including the excipients. The listing of all ingredients in sunscreens should be encouraged so that consumers, especially those with known sensitivities to chemicals, are fully informed about the composition of the formulation prior to the purchase and application of the product to the skin[17].

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