

The Perils of Cosmetics

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Abstract

Cosmetics have long been known to enhance the appearance or odour of the human body. In a society obsessed with beauty, people are lured to fake their appearance as a cure for their insecurities. Today, cosmetic industry is a 20 billion dollar global industry. As a consumer, we are constantly enticed to use an array of very promising beauty and personal care products. But these products, which are supposed to make us feel healthy and beautiful have a deep dark side. Toxic ingredients and hazardous chemicals are being used beyond acceptable limits. Carcinogens in bubble baths, lead in lipsticks, paraben in sunscreens, phthalates in perfumery and coal tar in shampoos are few of the ugly truths of cosmetics. Cosmetics have not only seeped into the fashion world but are also playing a prominent role in one's day-to-day life. Thus, it becomes a necessity to unveil the hidden truth of cosmetics and to make people aware of its ill-effects.

Key Words: cosmetics, parabens, allergies, carcinogens, sensitisation, dermatitis.

INTRODUCTION

Beauty is only skin deep, but the products we use to enhance it contain chemicals that may penetrate far deeper. Cosmetic products may be classified into various types such as [1]:

1. Decorative products eg: make-up
2. Nail care products eg: polish and removers
3. Skin care products eg: moisturizers
4. Soaps and bath additives eg : bubble bath
5. Oral hygiene products eg: toothpaste and mouthwash
6. Shaving products eg: foams, after shave
7. Sun protection eg: sunscreen creams and lotions
8. Hair care products eg: shampoo, dyes, regrowth treatment
9. Fragrances eg: perfumes and colognes
10. Deodorants and antiperspirants
11. Foot care products eg: antifungicides
12. Baby care products eg: baby salve, baby oil, baby powder

Cosmetic products that we use every day contain certain chemicals which are known to or are suspected to be toxic including endocrine disruptors, sensitizers, carcinogens and neurotoxins. We don't think of cosmetics such as make-up and shampoos as sources of exposure to toxins which may lead to an increased risk of breast cancer and other dreadful health problems. For instance, there are some ingredients in cosmetics which act like hormone estrogen in the human body, and most breast tumours depend on estrogen to grow. Generally, one-time use of a product containing toxic chemicals may not trigger any serious manifestation and pose a health risk. The problem may arise from a long-term low-dose exposure to toxic chemicals such as one product or a combination of products daily, year after year. Some toxic chemicals in cosmetic products can build up in our body over time with a risk of serious malignancies. There is an impressive array of cosmetic products in the market today with an even greater number of individual ingredients. The number of new products continues to increase and the rates of adverse cutaneous reactions are expected to rise. Therefore, given the widespread use of cosmetics, it is important to monitor their side-effects. It is estimated that an average woman uses 12 personal care products daily which comprise of 168 unique ingredients

and on an average, a man uses 6 personal care products with around 85 unique ingredients. According to a research, of the 10,500 chemical ingredients used in personal care products, only 11% have been safely assessed. In addition to allergens, cosmetics and toiletries contain several hazardous ingredients including 100 carcinogens and 15 endocrine disruptors particularly phthalates [2]. The skin is the largest organ of the body; over 70% of what is placed over the skin manages to seep into the body and the bloodstream. The various harmful allergens present in cosmetics may be grouped under phthalates, parabens, metals, chlorofluorocarbon propellants, dioxanes etc. Some of the harmful chemicals present in cosmetic products are coal tar colours (make-up and hair dye), diethanolamine (shampoo), formaldehyde and its releasers (eye shadow, mascara, nail polish, shampoo, blush etc), glycol ethers (deodorant, perfume), lead (hair dyes, lipsticks), mercury (skin-lightening cream), parabens (deodorant, shampoo, cream, baby product, shaving cream, make-up etc), phenylenediamine (hairdyes), phthalates (fragrance, nailpolish, hair products, cream, lotion etc). [3] [4]

COSMETICS AND CANCER

Children and adults are exposed to multiple carcinogens present in personal care products. According to the Environmental Working Group's skin deep database, one in five personal care products contain atleast one ingredient related to cancer. Studies show that higher estrogen exposures increases the risk of breast cancer in an individual's life. This raises the concern about repeated exposures to estrogen-mimicking chemicals and hormones in cosmetics. Several case studies link hormone containing cosmetics with early sexual development. The early and life-long use of such products especially by African-American women maybe a factor for the increased risks of breast cancer among them. A new study published in the Journal of Paediatrics revealed a large increase in the number of American girls who are entering puberty as early as 7 or 8 years of age. Studies link an early start to menstruation with elevated risk of breast cancer. Hair dyes are linked to high cancer rates due to the presence of coal tars and PPD. Thus salon workers show an increased risk of non-hodgkins lymphoma and bladder cancer. Skin

lighteners which contain hydroquinone and heavy metals are carcinogenic and hence they have been banned in many countries. Anti-bacterial soaps unlike regular soaps are linked to cancer like thyroid cancer and they contain triclosan. OSHA, NHI and WHO named 125 cosmetic chemicals that are suspected carcinogens and mutagens, out of which nine are absorbed to 43% of the applied dose according to a study in 1970. [5] Even small exposures of such chemicals can add up culminating in dreadful cancers. One-thirds of the cosmetic products containing chemicals are linked to cancer. [6]

ENDOCRINE DISRUPTING CHEMICALS IN COSMETICS

Personal care products are a major source of exposure to endocrine-disrupting chemicals. According to a recent study, an average of 13 hormone-disrupting cosmetic chemicals was traced in the urine of teenage girls, including parabens, triclosans and phthalates. These are common ingredients used in cosmetics. Oxybenzone which is found in sunscreens is a hormone disruptor in human beings. Phthalates are hormone-disrupting chemicals. Studies show that phthalates reduce female fertility and can cause premature breast development in young women. Phthalates in a mother's body can effect the fetal development of her child. Baby boys whose mothers were exposed to high levels of phthalates are more likely to have abnormal genital development and altered levels of testosterone. In males, phthalates lower the sperm count, reduce sperm motility, and damages it. Endocrine disrupting chemicals have been linked to obesity as well. Several animal studies show that exposing mice to endocrine disruptors, including phthalates, causes them to become more obese. [6]

ALLERGIES TO COSMETIC INGREDIENTS

Despite intensive efforts being taken to formulate hypoallergenic cosmetic products, skin irritations and allergic contact dermatitis occur in many people. In addition to eczema, there may be burning and itching sensations without visible lesions. Allergic responses are considered adverse health effects. Thus, skin sensitisation caused by cosmetic allergens are no different from toxicological hazards. Sensitisation of the skin is a critical event which evokes an acquired and irreversible immunological change, making the body more susceptible to these harmful chemicals.[7] 62% of women and 325 of men say that they have sensitive skin. Sensitisation gradually takes place when the skin is exposed to a product several number of times [8]. It may occur through direct or indirect contact, hand contact, air contact, vicarious contact or by exposure to sun. Of all the chemicals, methylisothiazolinone has been recently found to potentially pose a health risk to the consumers by causing allergies. [9]

HAZARDOUS CHEMICALS IN COSMETICS [10]

1. Antibacterials

Overuse of antibacterials affect their effectiveness in fighting disease-causing organisms such as E. coli and Salmonella enterica. Triclosan which is widely used in soaps, toothpastes and deodorants, has been detected in

breast milk, and one recent study found that it interferes with testosterone activity in cells.

2. Coal Tar

Coal tar, a known human carcinogen is used as an active ingredient in dandruff shampoos and anti-itch creams. Coal-tar-based dyes such as FD&C Blue 1, used in toothpastes, and FD&C Green 3, used in mouthwash, have been found to be carcinogenic in animal studies when injected under the skin.

3. Diethanolamine (DEA)

DEA is a hormone disruptor, with limited evidence of carcinogenic property and is known to deplete the body of choline needed for fetal brain development. DEA can also show up as a contaminant in products containing related chemicals, such as cocamide DEA.

4. 1,4-Dioxane

1,4-Dioxane is a human carcinogen that can appear as a contaminant in products containing sodium laureth sulfate and ingredients that include the terms "PEG," "-xynol," "cetareth," "oleth" and most other ethoxylated "eth" ingredients. The FDA monitors products for the contaminant but has not yet recommended an exposure limit. Manufacturers can remove dioxane through vacuum stripping. A 2007 survey by the Campaign for Safe Cosmetics found that most children's bath products contain 10 ppm or less, but an earlier 2001 survey by the FDA found levels in excess of 85 ppm.

5. Formaldehyde

Formaldehyde has adverse effects on health, which includes immune-system toxicity, respiratory irritation and cancer in humans. Yet it still turns up in baby bath soap, nail polish, eyelash adhesive and hair dyes as a contaminant or break-down product of diazolidinyl urea, imidazolidinyl urea and quaternium compounds.

6. Fragrance

The term "fragrance" may imply phthalates, which act as endocrine disruptors and may cause Obesity, reproductive and developmental harm. Phthalates should be avoided by selecting essential-oil fragrances.

7. Lead and Mercury

Neurotoxic lead may be present in certain cosmetic products as a naturally occurring contaminant of hydrated silica, one of the ingredients in toothpaste, and lead acetate is found in some brands of men's hair dye. The mercury found in the preservative thimerosal, is used in some mascaras and is known to cause damage to the brain.

8. Nanoparticles

Tiny nanoparticles, which may penetrate the skin and damage brain cells, are appearing in an increasing number of cosmetics and sunscreens. Most problematic are zinc oxide and titanium dioxide nanoparticles, used in sunscreens to make them transparent. Look for sunscreens containing particles of these ingredients larger than 100 nm. These days, a few manufacturers have started advertising their lack of nanoparticle-sized ingredients on labels.

9. Parabens

(methyl-, ethyl-, propyl-, butyl-, isobutyl-) Parabens, which have weak estrogenic effects, are common preservatives that appear in a wide array of toiletries. According to a

study, butyl paraben damaged sperm formation in the testes of mice, and sodium methylparaben, is banned in cosmetics by the E.U. Parabens break down in the body into p-hydroxybenzoic acid, which has estrogenic activity in human breast-cancer cell cultures.

10. Petroleum Distillates

Petroleum distillates which are possible human carcinogens are prohibited or restricted for use in cosmetics in the E.U. but are found in several U.S. brands of mascara, foot-odour powder and other products.

11. p-Phenylenediamine

It is commonly found in hair dyes and can bring damage to the nervous system, causing lung irritation and severe allergic manifestations. It's also listed as 1,4-Benzenediamine; p-Phenyldiamine and 4-Phenylenediamine.

12. Hydroquinone

Found in skin lighteners and facial moisturizers, hydroquinone is neurotoxic and allergenic, and there's limited evidence that it may cause cancer in lab animals. It may also appear as an impurity not listed on ingredients labels.

COSMETIC ALLERGENS

Cosmetic allergens responsible for ACD are classified into several categories: fragrances, preservatives, antioxidants, botanicals, UV absorbers, acrylates, hair dyes, nail varnish ingredients, and others.

Fragrances: Fragrances is the most common cause of contact allergy. They can be naturally derived from plants or synthesized in the laboratory. Although there are more than 5000 different fragrance chemicals, 95% of the fragrance allergic patients can be identified by testing the following 11 substances; cinnamic aldehyde, cinnamic alcohol, geraniol, eugenol, isoeugenol, oak moss absolute, alpha-amyl cinnamic alcohol, sandalwood oil, hydroxycitronellal, narcissus absolute, and ylang-ylang oil. [11] [12]

Preservatives: Preservatives are classified as the most common cosmetic contact allergens. They may be antimicrobials, antioxidants and UV absorbers. Formaldehyde preservatives, formaldehyde releasers, and non-formaldehyde releasing preservatives are the antimicrobial agents. [13]

Balsam of Peru: Balsam of Peru is an aromatic fluid which comes from the bark of a native tree in central America. It is a complex mixture of many ingredients including benzoyl cinnamate, benzoyl benzoate, vanillin and nerodilol. Besides being used as a fragrant, it is used as an antifungal, antibacterial and antiscabetic compound. [11] [13]

In sunscreens: Paraaminobenzoic acid and benzophenone-3 are the most common sunscreen sensitizer. Avobenzene and derivatives of PABA such as benzophenones, cinnamates, and dibenzoyl methanes may cause photo-allergic dermatitis. [11]

Allergens in hair care products: Paraphenylenediamine (PPD), a common hair colouring chemical causes allergy in almost 5% of the women. Glycerol thioglycolate can cause

allergy in 2% of the test patients. Ammonium thioglycolate may also cause dermatitis. [11]

ALLERGIC CONTACT DERMATITIS

Allergic contact dermatitis (ACD) is an immunologic reaction in the skin. This allergic response occurs only when an individual's immune system is sensitized to the allergen. [14] ACD is usually accompanied by intense itching. Allergic dermatitis due to cosmetics can be present in different forms [5] :

Pruritus: Itching in the area of application of cosmetic product.

Erythema: It is a redness without any alteration in the depth or surface of the skin which disappears when pressed with the finger.

Eczematids: Pink plaques covered by fine scales although not very itchy.

Acute eczema: An allergen which triggers immunological rejection response in the host which results in itching, redness, oedema, vesicles and oozing on continuous application. The skin becomes covered with a scab which sheds off exposing a healthy, pink and fragile skin.

Chronic eczema: It is dry, cracked and chabbed causing severe itching. It does not ooze out unlike acute eczema. Scratching leads to thickening of skin called lichenification.

Urticaria: Red lesions which are projecting and oedematous in different sized plaques and extremely itchy.

Pigmentation: Alteration in the skin colour.

Difference between allergic and irritant dermatitis [5] :

It becomes necessary to know the difference between irritant and allergic dermatitis because the prognosis and the treatment plan are completely different for the two.

Irritant dermatitis	Allergic dermatitis
Immediate or after several applications	After several successive contacts or when use of a cosmetic product is resumed
Limited to area of contact with the product	Often spreads beyond the area of contact with the product
Can happen to anybody	Problem of individual sensitization
Tingling, tightness, redness, cracks, vesicles; little or no itching	Redness, oedema, vesicles, cracks; intense itching
Variable, according to concentration, time and number of applications of product	Reaction possible even with a low dose of a cosmetic product applied for a short time
Generally fast and easy recovery	<ul style="list-style-type: none"> • Slow recovery • May require general treatment • Frequent recurrence if continued presence of allergen
Incorrect choice of product, unsuitable for skin type	Reaction to a molecule which has become an 'allergen'
Soaps, shampoos, deodorants, shaving products, perfumes, toilet waters and products that are too greasy, 'antiageing' products with AHA and/or vitamin A acid	Perfumes, toilet waters and scented products +++, preservatives ++, excipient components (lanolin), hair dyes, nail varnishes and other nail products, sun screens, etc.
Eyelids +++, hands (back and palms) ++, armpits ++, genital organs +, neck +, lips +	Eyelids +++, rest of the face ++, neck ++, lips ++, scalp ++, hands (back) and finger pulps +

METALS IN COSMETICS

Mercury or mercuric salts are used as an active ingredient in skin lighteners as it removes blotchy spots and lightens the skin complexion. It interferes with melanin formation thus giving the skin a lighter tone. Mercury absorbed through the skin from prolonged exposure can damage the brain, nervous system and kidneys. It may also cause rashes and skin irritation. Pregnant women who use mercury containing cosmetics may not experience symptoms of mercury poisoning but the fetus is poisoned [15]. Lead, a proven neurotoxin, is a heavy metal which is harmful to the developing brain. 61% of the tested brand-name lipsticks contain about .03 to.65 ppm of lead. Lead also causes learning, language and behavioural problems. Lead easily crosses through the placenta and enters the brain of the fetus thus interfering with normal development. [16] The average use of some lipsticks and lip glosses would result in excessive exposure to chromium, a carcinogen linked to stomach tumors. High use of these makeup products could result in potential overexposure to aluminum, cadmium and manganese as well. Over time, exposure to high concentrations of manganese has been linked to toxicity in the nervous system. [17]

HAZARDS IN BABY PRODUCTS

Childrens' bath products are often labelled as gentle and soft. But on the contrary, they are pose a dangerous risk. Recent research studies show the presence of formaldehyde and 1,4 dioxanes in baby products. These substances are carcinogens and they may trigger contact dermatitis and other such conditions. [18] Formaldehyde procedures have been associated with leukemia and it is also a skin, eye and respiratory irritant. It is released from quaternium-15 which is an ingredient in products like baby shampoos. [19] The 2007 EWG study [20] determined that :

- 82 percent of children are exposed every week to one or more ingredients with the potential to harm the brain and nervous system.
- 69 percent of children are exposed every week to one or more ingredients that may disrupt the hormone system.
- 3.6 percent of children are exposed to ingredients with strong data linking them to cancer, including chemicals classified as known or probable human carcinogens.
- 80 percent of children's products marked as gentle and non-irritating contain ingredients linked to allergies and skin or eye irritation according to government and industry sources.

The hazardous ingredients present in baby products and their dangerous effects are:

- 2 bromo, 2 nitropropane, and 3-DIOL: Can cause allergies and skin irritations. In certain products these ingredients can also break down to form other cancer causing agents
- Sodium borate, found in Desitin diaper cream, can accumulate in your child's brain and liver, causing detrimental health effects
- Oxybenzone, a common ingredient in sunscreen, can trigger allergies, and may disrupt a child's delicate hormone system. [19]

CONCLUSION

In today's world, exposure to man-made chemicals has become unavoidable. We breathe polluted air, we drink polluted water, because we don't have a choice. However, we do have a choice when it comes to our personal care products. We can limit our exposure by avoiding products that contain harmful chemicals. Alternatively, one can buy products that are natural and safe. There is something disturbing about sacrificing our health and that of our planet and calling the result beauty. Such a sacrifice is unnecessary, as conventional standards of beauty can be achieved cheaply, safely, and greenly. We don't need to limit ourselves to the cosmetic industry's definition of beauty. True beauty transcends the limits of what any cosmetic can do. If cosmetics are to be used, natural cosmetic products and make-up are safer, healthier alternatives because they are composed of all natural ingredients. Caution is required when products claim to be natural. For instance, they may contain small amounts of plant extracts, but the bulk of the product is petroleum based and loaded with fragrances [21]. Instead, consider switching to completely natural products, which perform to the same standard as their non-natural counterparts. Switching to all-natural cosmetic products and make-up can help you to avoid feeding your skin harmful chemicals. Many skin problems, such as acne, contact dermatitis, irritations and allergies may disappear once petroleum or synthetic ingredients are removed from your skin care regimen. Using fully natural products can contribute to healthy skin and a healthy body in the long term.

REFERENCES

- [1] http://ec.europa.eu/health/scientific_committees/consumer_safety/docs/scs_o_102.pdf
- [2] Cette brochure est disponible en francais ISBN 0-7717-0645-6
- [3] AccuStandard Europe – Dr. Vogel GmbH www.vogel-gmbh.ch
- [4] <http://www.allergyclinic.co.nz/guides/59.html>
- [5] www.agilent.com/chem
- [6] 10 Things To Know About Cosmetics And Cancer by Stacy Malkan
- [7] Sensitisation caused by exposure to cosmetic products ISBN 978-82-8082-298-7
- [8] Sensitive Skin and Cosmetics by Werner Voss, M.D., Ilisabe Bunge, M.D. Ph.D., Gerrit Schlippe, M.D., Dermatest GmbH, Muenster, Germany
- [9] BfR opinion Nr. 020/2013, 22 january 2013
- [10] <http://www.thegreenguide.com/doc/122/dirtydozen>
- [11] Marks JG, et al, American J Contact Dermat 2003;14:59 Ortiz KJ, et al. Dermatologic Therapy 2004;17:264
- [12] www.safecosmetics.org
- [13] Skin Therapy Letter, Volume16 number4, april 2011 Indexed by the National US library of medicine and PubMed
- [14] <http://http://www.revespcardiol.org>
- [15] Public Health and Environment. World Health Organisation. Mercury in skin lightening products (2011) RAPEX (2011) FDA Advisory 2011-012 and FDA Circular 2012-009 FDA Laboratory test results
- [16] Lead in lipstick by Dr.Landrigan
- [17] Poison lips by Sarah Yang, may 2, 2013.
- [18] <http://www.epa.state.il.us/land/fluorescent-lamps/>
- [19] <http://www.ewg.org/release/children-exposed-daily-personal-care-products-chemicals-not-found-safe-kids>
- [20] <http://www.theucbinstituteofallergy.com>
- [21] The True Story of cosmetics by Dana Joel Gattuso