Review Article

Cosmeceuticals

Dr Virendra Kushwaha, Dr Pooja Agrawal*, Dr Arka Das, Dr Pradeep Kumar Gupta, Dr Sarthak Goel
Department of Pharmacology, G.S.V.M Medical College Kanpur, India.
***Corresponding author's E-mail:** poojaagrawal378@yahoo.com

Received: 03-01-2025; **Revised:** 30-03-2025; **Accepted:** 11-04-2025; **Published online:** 20-04-2025.

ABSTRACT

The term 'Cosmeceutical' was coined by Raymond Reed in 1961 while in 1971 Dr. Albert Kligman, of the University of Pennsylvania who recognized that even water could alter the structure and function of skin popularized the term. In present times, it is still an emerging concept in the skincare marketplace. Cosmeceuticals are considered to enhance the health and beauty of the skin.

Classification of Cosmeceuticals: In General, Cosmeceuticals are divided into 3 types:

1) Skin cosmeceutical product. 2) Hair cosmeceutical product. 3) Other cosmeceutical products.

In India, cosmetics are regulated as per Drugs and Cosmetics Act 1940 and Rules 1945. Part-XIII (regulates import and registration of cosmetics), part-XIV (manufacture of cosmetic for sale or for distribution) and part-XV (regulates labelling, packing and standards of cosmetics). Rule 145 and 135 prohibits the use and import of arsenic and lead-containing compounds. Rules 135A and 145 D prohibits mercury for cosmetic uses. Rule 134 mentions that cosmetic products should contain colour, dye, or pigment as per specified by schedule Q and Bureau of Indian Standards.

Keywords: Cosmetovigillance, Skin, Drugs, Regulation.

INTRODUCTION

The word cosmeceuticals is a hybrid of 2 words Cosmetics and Pharmaceuticals which when combined, intend to enhance the health and beauty of the skin. In today's world, the most discussed topic in the cosmetic industry is Cosmeceuticals. The term 'Cosmeceutical' was coined by Raymond Reed in 1961 while in 1971 Dr. Albert Kligman, of the University of Pennsylvania who recognized that even water could alter the structure and function of skin popularized the term. In present times, it is still an emerging concept in the skincare marketplace. Cosmeceuticals are considered to enhance the health and beauty of the skin[1]. The personal care industry across the globe is taken over by Cosmeceuticals undoubtedly. Although the prevalent confusion about its definition and scope remains, it would not be an exaggeration to state that almost 30% to 40% of any dermatologist's prescription count across the world consists of a cosmeceutical[2]. Consumers no longer wish to purchase products that scent and adorn the skin momentarily until removed and they are willing to pay a high price for a cosmeceutical product that also delivers more skin benefits. The ability to charge a premium price has attracted the attention of manufacturers, dramatically increasing the cosmeceutical category offerings. The main advantage of cosmeceuticals is that they can be purchased by consumers without prescriptions[3].

Common Terminologies:

Cosmetics: Term cosmetics are defined as "articles intended to be rubbed, poured, sprinkled, or sprayed on, introduced into, or otherwise applied to the human body for cleansing, beautifying, promoting attractiveness, or altering the appearance"[4]. Traditional cosmetics are generally meant for beautifying the body and superficially improving the skin's external appearance.

Pharmaceuticals/Drugs: These are defined as "articles intended for use in the diagnosis, cure, mitigation, treatment, or prevention of disease and articles (other than food) intended to affect the structure or any function of the body of man or other animals."[4] or these are products or combination of substances which may be used in or administered to human beings either to restore, correct or modifying physiological functions by exerting a pharmacological, immunological or metabolic action, or to making a medical diagnosis[5].

Cosmeceuticals: Cosmeceuticals are cosmetic products with bioactive ingredients purported to have medical benefits. The name is a combination of "cosmetics" and "pharmaceuticals"[6]. Cosmeceuticals are scientifically validated, topical dermatological ingredients or preparations (creams, lotions, serums, etc) containing active ingredients that can impart visible changes to the skin by influencing biological functions of the skin[7].

Nutricosmetics: They are type dietary supplements or food or beverage products with additives that are marketed as having medical benefits that affect appearance[6]. It refers to products and ingredients that act as nutritional supplements but carry the purpose of treating the skin. Nutricosmetics are more commonly known as Beauty Supplements and these supplements come in the forms of drops, pills, powders, shakes, and gummies[8].

Dermo-cosmetics: This product is specially formulated to restore skin health. They protect against the many stresses of contemporary life and natural skin aging. The products

consist of fine molecules that penetrate the dermis, the middle layer. At this depth, creams have an optimal impact in correcting problems, protecting skin tissue, and preventing unwanted marks such as wrinkles[9].

Classification of Cosmeceuticals:

In General, Cosmeceuticals are divided into 3 types:

1) Skin cosmeceutical product.

2) Hair cosmeceutical product.

3) Other cosmeceutical products.

1) Skin cosmeceutical product

Skincare cosmeceutical products enhance the skin's appearance, texture, or functioning.

a. **Nonbleaching agents –**

- Currently, there is a universal trend of favoring natural treatments. Among them, currently available topical agents include tyrosinase inhibitors, retinoids, hydroquinones, and agents toxic to melanocytes. Physical sunscreen agents and Chemical sunscreen agents are the two types of sunscreens. Physical sunscreen agents are those that block, reflect, or scatter the rays. Chemical sunscreen agents are those which protect the skin from the sun by absorbing ultraviolet (UV) and visible sun rays. The outermost layer of the epidermis is the Stratum corneum, This layer is rich in cholesterol, free fatty acids, and ceramides. Various oily preparations like Mineral oil, Lanolin, and Cyclomethicone, are used to reduce fine lines and smoothen and hydrate the skin. Some components like Glycyrrhetinic acid, Telmesteine, and ceramide-dominant barrier repair lipids have anti-inflammatory properties.

b. Protease-activated receptor 2 pathway-

- They play a regulatory role in pigmentation when keratinocyte-melanocyte contact is established. The regulation occurs through phagocytosis of melanosomes by the keratinocytes[10]. Serine protease is one such inhibitor found in soybean-derived soy seed and soy milk. Other nonbleaching agents such as vitamins C and E and polyphenol ellagic acid have been reported to decrease tyrosinase activity. A standardized extract from Pinus pinaster bark called as Pycnogenol has been reported to decrease UV-induced pigmentation[11].

c. Antioxidants-

- Methods of protecting skin from photodamage, photoaging, and cancer are highly desirable. Although skin naturally uses antioxidants to protect itself from photodamage, the system can be overloaded by excessive exposure to various prooxidants[12]. There is increasing demand for various natural antioxidants to boost the physiology of skin[13].

S.No	Name of Anti-oxidant	Source
1.	Vitamin C	Diet
2.	Vitamin E	Diet
3.	Glutathione	Synthesized in Cytoplasm
4.	Ubiquinol/ubiquinone	Synthesized in Mitochondria

- Green tea extract, a catechin-based polyphenolic flavonoid acts as an anti-inflammatory and pathway modulator in cell proliferation. Green tea contains epigallocatechin 3-gallate, which stimulates the proliferation of epidermal keratinocytes, increases epidermal thickness, inhibits UV-induced apoptosis of keratinocytes, and may inhibit cancer cell formation. Pycnogenol, a pine bark extract, is used as an antioxidant, anti-inflammatory, and anticarcinogenic. It is rich in pro-anthocyanidins that include polyphenolic bioflavonoids. These compounds may stabilize collagen and elastin as it binds to elastic fibres, decreasing the rate of degeneration of the fibres by elastases. Further, it blocks the release of inflammatory factors[11]. Other botanically derived antioxidants are carotenoids are lycopene, an acyclic hydrocarbon carotenoid that is also anti-inflammatory and anticarcinogenic. The oxidation of cell membrane lipids is decreased by Idebenone, another compound that is believed to have a role in photoprotection by inhibition of post-UVB nuclear thymidine[14]. Tetrahydro curcuminoids, carnosic acid, coumaric acid, and ursolic acid obtained from turmeric (Curcuma longa) and rosemary extract from Rosemarimus officinalis also act as antioxidants compounds that are used to promote tissue repair and for restoring the healthy status of skin[15,16].Boswellic acids: It is acquired from Boswellia serrata. It inhibits the enzyme 5 – lipoxygenase which is responsible for inflammation and damage to the skin[15,16].

d. Peptides-

- New peptides have been recently identified as potential cosmeceutical agents. The peptide palmitoyl pentapeptide-3 (Matrixyl) which contains pal pentapeptide of the sequence Lys-Thr-Thr-Lys-Se, is helpful in wound healing. It is the minimum sequence for collagen synthesis, a fragment of procollagen. Matrixyl stimulates the synthesis of collagen I and II in addition to the formation of fibronectin by fibroblasts[17].

e. Growth factors-

- Growth hormones when used as external supplements can compensate to decrease the normal cell aging process. Growth hormones upgrade cellular processes of healing and regeneration. Topical growth hormones may stimulate new collagen formation and

help to thicken the epidermis, resulting in smoother skin and wrinkle reduction[18].

f. Hormones-

- Hormonal creams claim to be the most effective means to stop or slow the aging process by reversing the loss in tone and reviving skin elasticity. Eg: Progesterone cream claims to heal skin conditions like acne, psoriasis, rosacea, seborrhoea, and keratosis.

g. Exfoliants-

- Exfoliants stimulate skin turnover by removing dead cells in the stratum corneum. Exfoliants that are commonly in cosmeceutical preparations are mainly salicylic acid (SA), lactic acid, and glycolic acid. SAs are safe to use when formulated and avoids skin irritation.

h. Retinoid-

- Vitamin A and its derivatives have 2 main functions: they act as antioxidants, and they activate specific genes and proteins. Topical tretinoin improves the appearance of aged and photo-damaged skin by reducing wrinkles, decreasing laxity, bleaching hyperpigmented spots, and bringing about a smoother surface. They reduce epidermal atrophy, promote the deposition of new collagen, help in the generation of new vessels, and enhancement of mitogenesis. This enhanced mitogenesis promotes the shedding of melanin-filled keratinocytes, thereby resulting in bleaching and subsequent depigmentation.

i. Lipoic acid-

- Lipoic acid is a unique free radical protector as it is both fat and water-soluble. Once lipoic acid crosses the cell membrane, it is broken down into di-hydrofolic acid, which is also an antioxidant. Alpha lipoic acid also recycles other key antioxidants, such as vitamin C, vitamin E, and glutathione.

j. Panthenol-

- Panthenol, is an analog of vitamin B-5, is a water-soluble humectant found in various commercial skin creams, lotions, hair preparations and lipsticks. It is stable in the presence of oxygen and light but becomes unstable in the presence of acids, bases, and high temperatures. In Skin, Panthenol is converted to pantothenic acid, which is an important component of coenzyme A essential for normal cellular metabolism.

k. Niacinamide-

- Niacinamide is stable in the presence of oxygen, acid, and high temperatures. Most of its known effects are the result of increased epidermal turnover and exfoliation.

l. Allantoin-

- Allantoin stimulates cell proliferation, assisting the healing process, and also acts as a skin protectant[19]. Allantoin has been named as a cell proliferator, an epithelization stimulant, and also as a chemical debrider. It is said to clean necrotic tissue, thereby helping the growth of new healthy tissues[16].

m. Furfuryl-adenine-

- Is a natural plant growth factor, that slows down the aging process in plants. It is marketed as a natural antiaging treatment with effects in vitro on human skin cells similar to that in plants, helping to slow and reverse alterations that naturally occur in the cell-aging process.

n. Carnosine-

- Carnosine (beta-alanyl-L-histidine) is a physiological dipeptide that have proven to regenerate the growth of cultured human fibroblasts. Carnosine has been shown to contain antioxidant and free radical-scavenging activities.

o. Dimethylaminoethanol-

- Topical preparations containing dimethyl aminoethanol (DMAE) have been used for their ability to improve skin firmness and lift sagging skin. DMAE can reduces the cross-linking of proteins which occurs during aging, thereby acting as a free-radical scavenger.

p. Catalase-

- Is an enzyme present in cells of the human body, that catalyze decomposition of hydrogen peroxide to oxygen and water. In the skin, it can help in antioxidative activity when present in high amounts.

q. Cysteine-

- Cysteine derivatives protect against the negative effects of UV exposure. Mainly, N- acetylcysteine (NAC) is shown to be an effective protector against UV-B– induced immunosuppression.

r. Glucopyranosides-

- Glucopyranosides like Resveratrol and Polydatins are found in fruits and vegetables, the highest concentrations is found in grape skins. They are secreted on to exposure of UV-A and UV-B and fungal pathogens.

s. Melatonin-

- The hormone Melatonin is secreted by the pineal gland. It suppresses UV radiation–induced erythema. Action of melatonin has been explained in terms of its ability to scavenge free radicals and augment the activities of antioxidant enzymes.

t. Botulinum A exotoxin-

- It is a neurotoxin synthesized by the Clostridium botulinum bacterium. It is used by cosmetically oriented specialists for the treatment of a huge variety

of movement-associated wrinkles on the face and neck.

u. Kinetin:

- Kinetin improves skin damaged by light thereby making it smoother and more even in colour, it noticeably reduces the appearance of fine lines and wrinkles. Kinetin also improves the skin barrier function, thus helping the skin to retain more moisture, thereby making the skin softer and smoother.

2) Hair Care Cosmeceuticals Products[20]

- From the medieval ages, various ointments, tonics, and herbal combinations were recommended for beautifying hair, and also for the treatment of scalp diseases[16]. The earliest forms of hair cosmetic procedures in ancient Egypt were setting hair with mud and colouring with henna. Hair care, colour, and style play an important role in an individual's physical appearance. Cosmetics used for the treatment of hair are applied topically, mainly on the scalp and hair.Products used must be harmless to the skin, scalp, and mucous membranes and should not have any toxic effect under normally usable condition[15].
- A hair cosmeceutical product contains – special care ingredients, conditioning agents, and hair growth stimulants.
- Several ingredients are fatty ingredients, quaternized cationic derivatives, and silicons, hydrolyzed proteins, and cationic polymers. Eg of hair care cosmeceuticals include antifungal agents like octopirox, zinc pyrithione, and ketoconazole.
- A minoxidil-related compound (2, 4-diamino-pyrimidine-3-oxide) is a cosmetic agent acting as a topical hair growth stimulant used to prevent inflammation and perifollicular fibrosis[21].

3) Other Cosmeceutical Products[20]

- For the reduction of the signs of premature aging, it is needed to protection and plenty of moisture to replenish and repair the delicate skin. The skin particularly around the eyes becomes thinner, drier, and rougher after aging. Cosmeceutical eye creams nourish the skin along with natural emollients and beneficial nutrients.Yeast is the chief ingredient and also protects against future skin damage and also helps to sleek up wrinkles.
- The other ingredients include chamomile, vitamin E, Ginkgo biloba and also cucumber, calendula. An active constituent of chamomile(α-bisabolol), calm irritated skin around eyes.
- The eye wrinkle cream reduces signs of aging and generally contains wheat germ and corn oil, squalene, and carrot extract.
- Eye firming fluid increases elasticity around eyes and has aosain, which is an algae extract from seaweed.

Regulatory Aspect of Cosmeceuticals:

- Although there is no legal class called cosmeceuticals, this term has found application and recognition at the borderline between cosmetics and pharmaceuticals. Cosmeceuticals are not subject to FDA review and the Federal Food, Drug, and Cosmetic Act do not recognize the term itself. Some countries have classes of products that fall between the two categories of cosmetics and drugs: for example, Japan has 'Quasi-drugs'; Thailand has 'controlled cosmetics' and Hong Kong has 'cosmetic-type drugs.

Cosmeto-vigilance and its importance in India:

- Cosmeto-vigilance is a public health surveillance on cosmetic products with a public health objective[22]. In India, cosmetics are regulated as per Drugs and Cosmetics Act 1940 and Rules 1945. Part-XIII (regulates import and registration of cosmetics), part-XIV (manufacture of cosmetic for sale or for distribution) and part-XV (regulates labelling, packing and standards of cosmetics). Rule 145 and 135 prohibits the use and import of arsenic and lead-containing compounds. Rules 135A and 145 D prohibits mercury for cosmetic uses. Rule 134 mentions that cosmetic products should contain colour, dye, or pigment as per specified by schedule Q and Bureau of Indian Standards[23]. Contact dermatitis and other dermatosis are common in India and cosmetics are implicated in the same. Import of cosmetics tested on animals is prohibited in India as per section 135 B of the Drugs and Cosmetics Act. Hair dye is reported as one of the most common causes of contact dermatitis in India, while Kumkum dermatitis was highly prevalent in the southern part of India. Sticker bindi use is also found to be an important risk factor for the occurrence of contact dermatitis[24,25]. Disorders related to cosmetics also lead to pharmacoeconomic loss. So, proper regulation of these agents, and a proper vigilance system are also required to protect the health of the Indian population. Proper use of cosmetovigilance can help to control or rule out hazardous ingredients in cosmetics and thus improve our confidence in use of these agents[22].

CONCLUSION

Cosmeceuticals include a range of products to increase the beauty of the patients associated with dermal problems. Cosmeceuticals like vitamins, sunscreens, hydroxyl acids & many more have proved their worth in treating skin diseases, which helps to enhance the skin texture.

Clinical trials of cosmeceuticals are an important factor to know about the relationship between skin and cosmeceuticals. The most influential angle over the coming 5 years will be the links between internal health, beauty,

and anti-aging. The next big beauty trend will include skin gestibles that will promote beauty from the inside out, borrowing of pharmaceutical terms for cosmetic applications, amino peptides to make the skin more elastic, neuro mediators which are chemicals to tell the brain to be happy, and the blurring of boundaries between surgery and cosmetics.

In conclusion, cosmeceuticals are not only external beautification but also improve internal beauty through health-related functions. The health group professionals will show the importance of cosmeceutical products and develop awareness about these products.

Source of Support: The author(s) received no financial support for the research, authorship, and/or publication of this article

Conflict of Interest: The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

REFERENCES

1. Choi CM, Berson DS. Cosmeceuticals. Semin Cutan Med Surg 2006; 25:163-8.
2. Pandey A, Jatana GK, Sonthalia S. Cosmeceuticals. In: *StatPearls*. Treasure Island (FL): StatPearls Publishing; August 8, 2022.
3. Wilkinson JB, Moore RJ. Astringents and skin toners. In: Harry's cosmeticology. 7th edition. New York: Chemical Publishing; 1982. p. 74–81.
4. https://www.fda.gov/cosmetics/cosmetics-laws-regulations/cosmetics-us-law
5. https://en.wikipedia.org/wiki/Medication#Definition
6. https://en.wikipedia.org/wiki/rCosmeceutical
7. https://www.sabinsacosmetics.com/beautyboutique/skincareredifnes/cosmeceuticals.
8. https://cosmeticcomposition.com/2018/04/17/what-are-nutricosmetics/
9. https://www.brunet.ca/en/beauty/beauty-tips/what-is-dermocosmetics
10. Seiberg M, Paine C, Sharlow E, et al. The protease-activated receptor 2 regulates pigmentation via keratinocyte-melanocyte interactions. Exp Cell Res 2000;254:25-32
11. Paine C, Sharlow E, Liebel F, et al. An alternative approach to depigmentation by soybean extract via inhibition of the PAR-2 pathway. J Invest Dermatol 2000;116:587-95.
12. Rabe JH, Mamelak AJ, McElgunn PJ, et al. Photoaging: mechanism and repair. J Am Acad Dermatol 2006;55:1-19.
13. Zhang L, Lerner S, Rustrum WV, Hofmann GA. Electroporation-mediated topical delivery of vitamin C for cosmetic applications. Bioelectrochem Bioenerg 1999;48:453-61.
14. Pelle E, Muizzuddin N, Mammone T, et al. Protection against endogenous and UVB-induced oxidative damage in stratum corneum lipids by an antioxidant-containing cosmetic formulation. Photodermatol Photoimmunol Photomed 1999;15:115
15. Kadam Vaishali S, Chintale Ashwini G, Deshmukh Kshitija P and Nalwad Digambar N; cosmeceuticals an emerging concept: a comprehensive review; ISSN: 2231-2781.
16. Padma PJ, Karthika: Cosmeceuticals-an evolution; International Journal of ChemTech Research CODEN(USA): IJCRGG; ISSN : 0974-4290. Vol.1, No.4, pp1217-1223; 2009; 1(4): Dept. of Pharmaceutics, K.M.C.H College of pharmacy, Coimbatore–641 048 India.
17. Lee JH, Cho KH, Youn HJ. Use of artificial skin in assessment of effect and safety of cosmetics. J Am Acad Dermatol 2005;52(S3):P33-8.
18. Fitzpatrick RE. Endogenous growth factors as cosmeceuticals. Dermatol Surg 2005;31:827-31 [discussion 831].
19. Basavaraj K. Nanjwade, Kishor A. Bellad, Meghana S. Kamble, Teerapol Srichana, Nagi F. Idris. Development of cosmeceuticals.; world journal of pharmacy and pharmaceutical sciences; Volume 6, Issue 4, 643-691.
20. Sanket Rathod, Sneha Mali, Namdeo Shinde, Nagesh Aloorkar. Cosmeceuticals and Beauty Care Products: Current trends with future prospects. Research J. Topical and Cosmetic Sci. 2020; 11(1):45-51. doi: 10.5958/2321-5844.2020.00008.4
21. AnkitVerma, Surya Prakash Gautam, Reeta Devi, Narinder Singh, Harjaskaran, Lovepreet Singh; cosmeceuticals: acclaiming its most fascinating position in personal care industry; Indian Research Journal of Pharmacy and Science; A Verma et.al.
22. Vigan M, Castelain F. Cosmetovigilance: Definition, regulation and use "in practice" *Eur J Dermatol.* 2014;24:643–9. [PubMed] [Google Scholar]
23. *Guidelines on Registration of Import of Cosmetics.* [Last accessed on 2018 Jan 06]. Availablefrom: http://www.cdsco.nic.in/writereaddata/Guidelines%20on%20Registration%20of%20Import%20of%20Cosmetics.pdf.
24. Pasricha JS. *Contact Dermatitis in India.* 2nd ed. New Delhi: The Offsetters; 1988. pp. 67–85. [Google Scholar]
25. Nath AK, Thappa DM. Clinical spectrum of dermatoses caused by cosmetics in South India: High prevalence of kumkum dermatitis. *Indian J Dermatol Venereol Leprol.* 2007;73:195–6. [PubMed] [Google Scholar]