

Nutritive Cosmetics- A Review on Skin and Hair care Cosmeceuticals

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Abstract: Cosmeceuticals are being drastically used in recent years. They are commonly known as nutritive cosmetics or cosmeceuticals. Cosmeceuticals is the most widely used term for nutricosmetics. Cosmeceuticals/nutricosmetics present of the most promising, yet challenging treatment options available for physicians. Cosmeceutical is a term used to describe cosmetics with antiaging effects these days. They are the fastest growing segment in market. Even if such cosmetic products are expensive people like to spend on these to fulfil the human dream of looking younger. They are the junction where wellness meets beauty which can be indicated by its growing popularity. Cosmeceutical treatments are available for certain skin conditions such as photoaging, hyperpigmentation, and wrinkles. These are the cosmetic products which consists of biologically active substances which comprises of drug-like or medical benefits. Cosmeceuticals are known to nourish the skin as well as improve the appearance of the skin and are observed to be effective against various dermatological conditions.

Index Terms: Nutricosmetics, Anti-aging effect, Photo-aging, Hyperpigmentation.

I. INTRODUCTION

The importance of beautification to the mankind has been known since the pre historic time and the desire to look beautiful and healthy has been developing in the society. In recent times fitness, good health, looks, way of presenting oneself are being counted as one of qualities of personality, now these days people are also being judged on these factors. Hence today there is a necessity and desirable requirement to give more attention to the looks and beautification for social acceptance as well as professional success, which is also overemphasized by the media. Cosmeceuticals means combination of cosmetics and pharmaceuticals [1, 2]. Cosmeceuticals or Nutricosmetics are the cosmetic products which consists of biologically active ingredients and provide drug like or medical benefits. It is a product with medicinal properties that manifests beneficial topical actions and provides protection against degenerative skin conditions. It encompasses cosmetic actives with therapeutic, disease-fighting, or healing properties, there by serving as a bridge between personal care products and pharmaceuticals [3, 4].

The word "cosmeceuticals" was first introduced by Albert Kligman in 1984 to refer to that substances which persists both cosmetic and therapeutic effect. Cosmeceuticals are the fastest growing segment in the beauty segment. Cosmeceutical are topically applied, because they contain substances which are known to improve biological activity and function of the skin. They improve appearance by providing nutrients which are necessary for skin. They typically claim to improve skin tone, texture and radiance, and simultaneously reducing wrinkling [3]. The Food Drug and Cosmetic Act defines cosmetics according to their intention of use, as "article intended to be rubbed, poured, sprinkled, or sprayed on, or introduced into, or otherwise applied to human body for cleansing, beautifying, promoting attractiveness, or altering the appearance. Amongst the above, the product included in this definition are skin moisturizers, lipstick, finger nail polishes, eye and facial make up preparation, permanent waves, hair colors, shampoos, deodorants and toothpaste, and many other certain products which are intended to use as cosmetics [5, 6]. Cosmeceutically active ingredients are constantly being developed by big and small corporations engaged in pharmaceuticals, biotechnology, natural products, and cosmetics. Desirable features of cosmeceutical agents are efficacy, safety, formulation stability, novelty, and patent protection, metabolism within skin and inexpensive manufacture [5]. Given below is the activities made available by cosmetics, cosmeceuticals and drugs under Table No.1.

Table No.1: Activities made available by Cosmetics, Cosmeceuticals and Drugs [7]

Activities	Cosmetic	Cosmeceutical	Drug
Pharmaceutical activity	+	+	+
Intended effect in skin disease	-	+	+
Intended effect in mild skin disorder	-	+	+
Side effects	-	±	+

There are approximately 400 cosmeceutical manufacturers, including companies that supply the cosmeceutical and/or manufacture cosmeceutical to U.S market. The biggest companies in the industry for finished products are Procter and Gamble, Johnson and Johnson, L'Oréal Estee Lauder, Avon and Allergan which nearly represent half of the U.S market [1]. The efficacy of a cosmetic product not only depends on the active ingredients but also on delivery system to improve its efficiency. We have to remember that skin is more than an assembly of several layers of cells as corneocytes, keratinocytes, fibroblasts and complementing each other. Chemical products, pollution, stress, irradiation from infrared (IR) and ultraviolet (UV) sources, and abrasion are involved in skin

aging. The consequences can be visible or invisible: inflammation, burns, edema, long-term illness, actinic damage, and premature aging. Most of the cosmeceuticals have provided claims of providing antiwrinkle and firming, moisturizing and lifting, skin toning and whitening activity and the antiaging category of skin care products shows presently the highest growth rates [7].

II. CHARACTERISTICS OF COSMECEUTICALS

Cosmeceuticals could be characterized as follows:

1. The product has pharmaceutical activity and can be used on normal or near-normal skin.
2. The product should have a defined benefit for minor skin disorders (cosmetic indication).
3. As the skin disorder is mild the product should have a very low-risk profile [7].

III. SKIN COSMECEUTICALS

Skin Cosmeceuticals comprises of the daily used products which are part of everyday grooming. Our skin is the largest organ of our body which separates as well as protect the internal environment from the external environment such as air pollution, exposure to sunlight etc. It is essential to protect and preserve the skin for good health. UV radiations coming from the sunlight penetrate the skin and accelerate damage due to free radicals, which consist of wrinkling, inflammation and hyper pigmentation. The collagen and elastin fibers of the skin due to prolonged exposure to UV radiation are broken down by enzymes collagenase and elastase and thus the texture of skin deteriorates. Collagen and elastin are responsible for maintaining the elasticity and integrity of the skin. Numerous plant extracts and antioxidants that are obtained from natural sources are able to prevent the aging and also improving the appearance of the skin [4]. Given below are the diagrams of normal or healthy skin and a damaged skin in fig. 1.

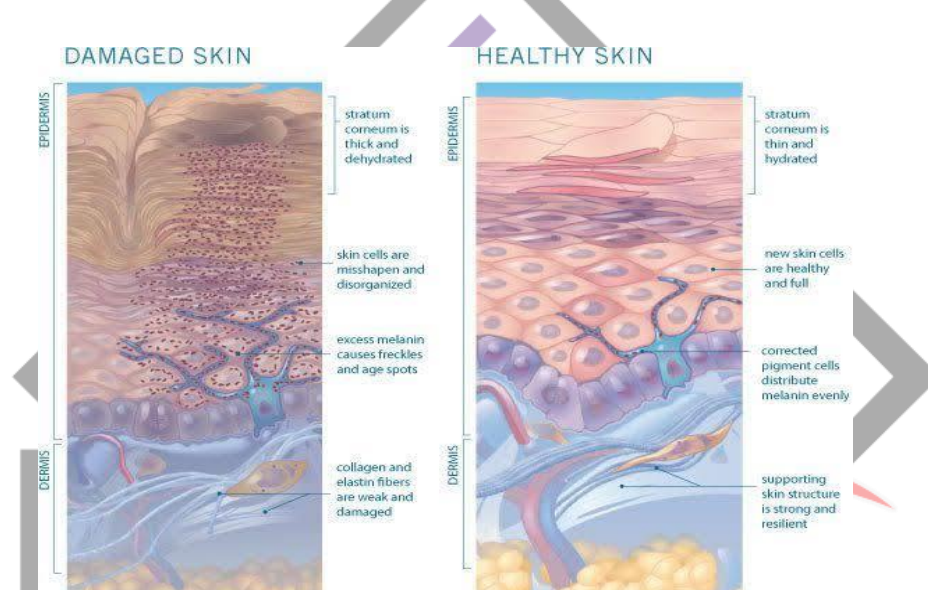


Figure.1: Damaged skin and Healthy skin [8]

IV. BOTANICALS APPLICABLE FOR COSMECEUTICALS FOR SKIN-

Few of the most important botanicals pertaining cosmeceutical use includes teas, soy, pomegranate, date, grape seed, pycnogenol, horse chestnut, German chamomile, curcumin, comfrey, allantoin, and aloe. All are documented to treat dermatologic conditions. Only green and black tea, soy, pomegranate, and date have published clinical trials for the treatment of parameters of extrinsic aging [9].

Cosmeceuticals have either drug like or some medicinal benefits. They are therefore able to affect the biological functioning of the skin by boosting collagen growth by combating the harmful effects of free radical, so as to maintain the keratin structure and making the skin healthier [10].

V. TYPES OF SKIN COSMECEUTICALS-

A) Based on their function cosmeceuticals are classified as follows-

- Skin-whitening and/or depigmenting cosmeceuticals
- Moisturizing cosmeceuticals
- Antiwrinkle cosmeceuticals
- Sunscreen cosmeceuticals
- Antiphotaging cosmeceuticals

B) Based on various products presently on the market, cosmeceuticals can be divided into the following broad categories:

- Antioxidants
- Growth factors

- Peptides
- Metals
- Anti-inflammatories/botanicals,
- Polysaccharides
- Pigment lightening agents [7].

VI. COSMECEUTICALS INGREDIENTS WITH THEIR SOURCES-

The cosmeceutical ingredients with their sources from which they are obtained are shown in Table No.2 given below.

Table No. 2: List of Cosmeceutical Ingredients with their Sources [11]

Ingredients	Action	Source
Vitamins	Antioxidants	Vitamin A, C and E
AHAs	Exfoliates and improves circulation	Fruit Acids (glycolic, lactic, citric acid etc.)
BHAs	Antibacterial	Salicylic acid
Essential fatty acids	Smoothens, moisturizes and protects	Linoleic and arachidonic acid
Coenzyme Q10(Ubiquinone)	Cellular antioxidant	Occurs naturally in skin
Allantoin	Soothes	Comfrey
Aloe Vera	Softens skin	Aloe Vera
Arnica	Astringent and soothes	A. montana
Calendula	Soothes, softens and promotes skin- cell formation	C.officinalis
B-Bisabolol	Anti-inflammatory, antibacterial, and calms irritated skin	Chamomile flower
Cucumber	Calms, refreshes, and tightens pores	Cucumber
Lupeol	Antioxidant and skin conditioning	C. nurvula
Ginkgo	Antioxidant that soothes, rejuvenates and promotes youthful appearance	G. biloba
Ivy	Stimulates circulation and helps other ingredients penetrate the skin	Hedera spp. (Ivy family)
Panthenol	Builds moisture and soothes irritation	Provitamin B5
Witch hazel	Tones	H. virginiana
Green tea extract	Antioxidant	Green teas
Neem oil limonoids	Antimicrobial	A. indica
Pycnogenol	Anti-ageing effect	Grape seed extract
α -Lipoic acids, Resveratrol, Polydatins	Potent free-radical scavengers and antioxidant	Fruits and vegetables
Furfuryladenine	Improves hydration and texture of the skin	Plant growth hormone
Kinetin	Free radical scavenger and antioxidant	Plants and yeasts
Sodium hyaluronate	Lubricant between skin tissues and maintains natural moisture	Natural protein
β -Carotene	Minimizes lipid peroxidation and cellular antioxidant	Carrots and tomatoes
Retinoic acid	Soothes skin and promotes skin renewal and improves circulation to the skin	Vitamin A
Tetrahydrocurcuminoides	Antioxidant and anti-ageing	C. longa
Boswellia	Anti-inflammatory and anti-ageing	B. serrate
Coriander seed oil	Anti-inflammatory and anti-irritant, skin lightening properties	C. sativa
Turmeric oil	Antibacterial and anti-inflammatory	C. longa
Coleus forskolii oil	Antibacterial, aromatherapy/ perfumer	C. forskolii
Arjunolic extract	Antioxidant and anti-inflammatory	T. arjuna
Ursolic acid	Anti-inflammatory, collagen build-up	R. officinalis
Oleanolic extract	Antioxidant, antifungal, improves texture and integrity of the skin	Olive leaf
Rosemary extract	Antioxidant, antimicrobial, and anti-inflammatory	R. officinalis
Dry extract from Yarrow	Treatment of oily hair	A. millefolium

Licorice extract	Skin whitening properties, antioxidant, antimicrobial, and anti-inflammatory	G. glabra
Horse chestnut extract	Supports blood circulation, wound healing effect, and anti-inflammatory	A. hippocastanum
Lycopene	Smooths skin, promotes cell renewal and improves circulation to the skin	S. lycopersicum (Tomato)
Epigallocatechin gallate	Antioxidant	C. sinensis (Green tea)
Quercetin, Epicatechin	Anti-bacterial, Astringent	M. domestica (Apple)
Ascorbic acid	Potent Antioxidant	C. limon (Lemon)
Stearic and oleic acids	Potent free-radical scavengers	B. parkii
2-methyl butanoic acid ester	Anti-inflammatory, antibacterial, and calms irritated skin	A. nobilis (Roman Camomile)
Hydroquinone mono-glucoside, Myricetin, Quercetin	Smoothens moisturizes and protects	A. uva-ursi (Bearberry)
Vitamin E	Potent Antioxidant	H. annuus (Sun Flower)
Vitamin B5, Potassium, polyphenols and Vitamin C	Builds moisture and soothes irritation	P. granatum (Pomegranate)
Vitamin A, Sitosterol, Laserine, Epilaserine	Minimizes lipid peroxidation and cellular antioxidant	D. carota (Carrot)
Vitamin C, Indole-3-carbinol	Antioxidant and anticancer	B. oleracea (Cabbage)
Curcumin, Zingiberine	Antibacterial and anti-inflammatory	C. longa (Turmeric)
Liriodenine, Moupinamide, Pinene	Potent antioxidant	A. squamosal (Sugar-apple)
Vitamin B, Vitamin C, etc.	Skin conditioning agent, increases collagen production, improves texture and integrity of the skin, and reduces the appearance of stretch marks	C. nucifera (Coconut)
Homocysteine, allicin (diallyl thiosulfinate or diallyl disulfide)	Antioxidant and skin conditioning agent	A. sativum (Garlic)
Glycyrrhetic acid, Stearyl glycyrrhetinate	Skin whitening properties, antioxidant, antimicrobial, and anti-inflammatory	G. glabra (Licorice)
Ginkgolides and Bilobalide	Antioxidant that smooths, rejuvenates and promotes youthful appearance	G. biloba (Maidenhair tree)

VII. HAIR COSMECEUTICALS-

Hair has played a significant role in people's lives throughout history, not only impacting their outward appearance but also on their inner self. Both men and women regard an abundance of hair as ideal, and providing them with positive self-image attributes such as beauty, strength, virility, youthfulness and confidence. Conversely, the lack of hair is associated with negative attributes and people have gone extremes to conceal their baldness.

In early times Egyptians used "artificial braids" to hide their baldness and outlandish hair concoctions (e.g. –snake oil) were prolific. In more recent history, minoxidil topical solution became the first clinically approved safe and effective hair-growth stimulant. 2% concentration of minoxidil topical solution became available in 1986 for men and in 1991 for women, a higher more effective concentration (5%) is now available [12]. A hair cosmeceutical product includes - conditioning agents, special care ingredients, and hair growth stimulants. Conditioning agents are intended to impart softness and gloss, to reduce flyaway and to enhance disentangling facility. A number of ingredients may be used, mostly fatty ingredients, hydrolysed proteins, quaternized cationic derivatives, cationic polymers, and silicones [5]. The structure of hair is given in the Fig. 2 below.

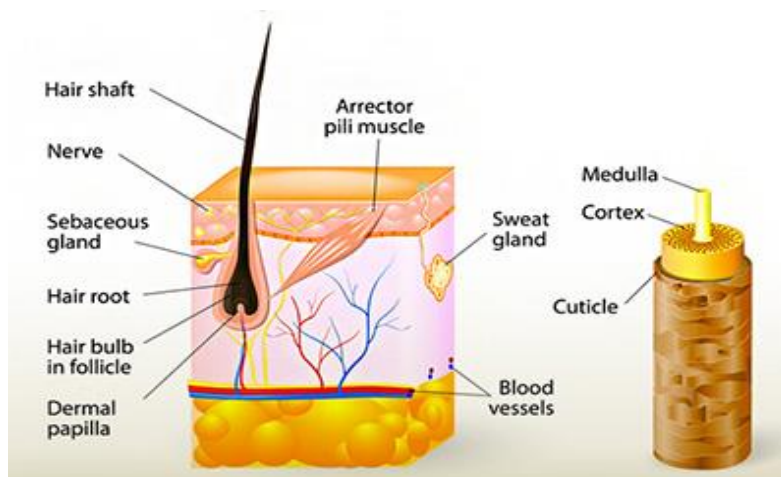


Fig.2: Structure of Hair [13]

Shampooing is the most common form of cosmetic hair treatment. The diversity of qualities expected from a shampoo by today's consumer surpass the primary function of cleansing. Current shampoo formulations are adapted to the variations associated with hair quality, hair care habit and specific problems related to the superficial condition of the scalp. Hand in hand, test methods are developed to evaluate the efficacy of hair care products so that consumers are offered products that perform as claimed. Through the development of cosmetics with pharmaceutically active compounds, products are evolving that are becoming more similar to topical therapeutic agents (cosmeceuticals). The efficacy of cosmeceuticals that claim to act as hair growth stimulants should be measured by the standards set by the drugs minoxidil and, more recently, oral finasteride [14]. A liquid shampoo which contains biologically obtained protein detergent has been patented by Jack J. Mausner, which provides unusual mildness to the hair and scalp and also possesses hair conditioning properties [15].

A hair care cosmetic composition for treatment of hair, in particular oily hair has been obtained which is based on an extract of Yarrow (*Achillea Millefolium* L). This composition includes an appropriate carrier and a non-allergenic dry extract of Yarrow, obtained by oxidation of flower tops of Yarrow. The extract contains less than 0.5% by weight of polyphenolic derivatives [16]. A method for treatment of androgenic alopecia is patented by Buck, where Liquor Carbonis Detergens IS topically administered [17].

VIII. OTHER COSMECEUTICALS-

The skin underneath the eye lacks in subcutaneous fat and also oil glands, hence the products to be formulated needs to be particularly for this area and should be gentle. This delicate skin should be provided protection and plenty of moisture to replenish and repair, which helps to reduce the early signs of premature aging. There are numerous cosmeceutical eye creams available in the market with natural emollients and beneficial nutrients. For instance, Zia Natural Skincare offers two different eye creams. The Ultimate Eye Crème contains antioxidants vitamins A, C and E, green tea and tiare flower in a non-greasy base. Jensen said "The Essential Creme is for allergic and puffy eyes, and is great for recovery after sad movies,". The functional ingredients include butcher's broom, chamomile and vitamin E [18]. The other functional ingredients include butcher's broom, chamomile, and vitamin E, antioxidants - vitamins A, C and E, green tea and tiare flower, *Ginkgo biloba* and also cucumber, calendula and a-bisabolol, an active constituent of chamomile, to calm irritated skin. A key ingredient in the eye lifting moisture cream - that treats puffiness, irritation, and also protects against future skin damage is yeast which helps to plump up the wrinkles. The eye wrinkle cream helps forestall the signs of aging and generally contains wheat germ and corn oil, squalene and carrot extract. Eye firming fluid has aloe, an algae extract from seaweed that helps the skin to maintain elasticity [5].

IX. NANOTECHNOLOGY IN COSMECEUTICALS-

Nanotechnology is regarded as the most imminent technology of 21st century and is contemplated as a big boon in the cosmetic industry [19]. The term nanotechnology is derived from the combination of two words: the Greek word 'Nano' which means billionth and the word technology. Nanotechnology or Nano-scaled technology generally refers to be at size below or 100nm (10^{-9} m) [20]. Cosmeceuticals are known as the fastest growing fragment of the personal care industry. Although knowing the enormous benefits of nanoparticles, there's only little information of the long term and short-term effect on the environment and the organism. Safety concerns have been raised due to the reported toxicity and possible dangers of the nanomaterials [21].

X. MAJOR CLASSES OF NANCOSMECEUTICALS-

1] **MOISTURISERS**- When moisturizers are applied to the skin, a thin film of humectant is formed which retains moisture and gives better appearance to the skin. Liposomes, Nano emulsions, SLNs are widely used moisturizing formulations because of their prolonged effects. These are considered to be the most useful product for the management of various skin conditions (e.g., atopic dermatitis, psoriasis, and pruritus).

2] **SUNSCREENS**- Sunscreens are widely used to protect the skin from the harmful radiation from the sun on exposure [21]. Sunscreens are used to provide protection against adverse effects of ultraviolet UVB (290–320 nm) and UVA (320–400 nm)

radiation. According to the United States Food and Drug Administration, the protection factor against UVA should be at least one-third of the overall sun protection factor. Titanium dioxide (TiO₂) and zinc oxide (ZnO) minerals are frequently employed in sunscreens as inorganic physical sun blockers. As TiO₂ is more effective in UVB and ZnO in the UVA range, the combination of these particles assures a broad-band UV protection [22].

3] **ANTIAGING PRODUCTS**- Chemical products, pollution, stress, irradiation from infrared (IR) and ultraviolet (UV) sources, and abrasion are involved in skin aging. Collagen plays an important role in skin rejuvenation and wrinkle reversal effect. The quantity of collagen in the skin decreases along with age. The aging of the skin manifests itself in many ways: drying out, loss of elasticity and texture, thinning, damaged barrier function, appearance of spots, modification of surface line isotropy and finally, wrinkles. Most of the cosmeceuticals have been developed with claims of antiwrinkle and firming, moisturizing and lifting, and skin toning and whitening activity. Antiaging products are the main cosmeceuticals in the market currently being made using nanotechnology. L'Oréal has employed nanotechnology in products such as Revitalift antiwrinkle cream which contains nanosomes of Pro-Retinol A, and claims that it instantly retautens the skin and reduces the appearance of wrinkles. Application of retinol can increase epidermal water content, epidermal hyperplasia, and cell renewal while enhancing collagen synthesis. Retinol also interferes with melanogenesis and inhibits matrix metalloproteinases, which are involved in collagen breakdown [21].

4] **HAIRCARE**- Hair care is another promising field for nanotechnology. Companies are using nanotechnology in hair care products and research is ongoing to discover the ways of how nanoparticles can be used to prevent hair loss and to maintain shine, silkiness, and health of hairs. Unlike ordinary hair straightening products Nano emulsion in hair cosmetics does not destroy the outer structure of the hair fibers, called cuticles, to penetrate into the hair strands [21]. Sericin nanoparticles are used in many cosmeceuticals and are observed to be an agent which imparts gloss and softness and promotes maintenance of coloration in dyed hair [23].

5] **SKIN CLEANSER**- The art of cleansing has made a progress and improved over thousands of years by simply scraping the skin to an exercise in relaxation and improving skin's health appearance. Soaps were the basic cleansing agents but also have undergone a series of changes [24]. Skin cleansers may be an important adjunct to the regimen of those who use cosmetics, have sensitive or compromised skin, or utilize topical therapies. Cleansers emulsify dirt, oil and microorganisms on the skin surface so that they can be easily removed [25]. Silver nanoparticles are used as skin disinfectant and decontamination. Nano Cyclic Inc. has produced Nano Cyclic cleanser pink soap which is a scientifically balanced blend of Nano silver and natural ingredients which claims that it kills harmful bacteria and fungi, fights acne, and diminishes age spots and sun damaged skin. It also consists of sericin and collagen [26].

XI. OTHER COSMECEUTICALS COMMON MYTHS AND MISCONCEPTIONS-

Cosmeceuticals are opened and subjected to many misconceptions. Many consumers believe that cosmeceuticals are regulated and are tested as drugs. They also believe that the ingredients and final products have been tested for safety and that the claims made in advertisements are valid. Cosmeceuticals and pharmaceutical ingredients have never been closer together, and also their regulatory environments are vastly different due to the distinct Congressional mandates given the Food and Drug Administration. Physicians are in a good position to help patients and potential cosmeceutical users understand the benefits and realistic limitations of these products [27].

XII. THE TOXICITY OF COSMECEUTICALS-

"Natural" is the term which is most frequently used for cosmeceuticals and willingly or unwillingly connotes safety. Vitamin E has shown to cause an increase in contact dermatitis, while the antioxidant P-hydroxyanisole increases skin pigmentation. Some peptide components have also shown to be carcinogenic. Perhaps the deliberate adulteration and the incorporation of harmful products like steroids and retinoid are supposedly the greatest danger. Microbial contamination has been reported with unfavorable consequences [28].

XIII. REGULATORY ASPECTS OF COSMECEUTICALS-

Regulatory agencies have not yet formally recognized cosmeceuticals and although there is no legal class called cosmeceuticals, this term has got application and recognition to designate the products at the borderline between cosmetics and pharmaceuticals. Cosmeceuticals are not subject to review by FDA or any other equivalent agency. The regulation of cosmeceuticals has not been harmonized between the USA, European, Asian and other countries. Hence there is a necessity for implementing increased regulation of cosmeceuticals that would require proof of safety, which is not mandatory for cosmetics [29].

Table No. 3: Comparison of Drugs and Cosmeceuticals in case of regulatory aspects [11]

SERIAL NO.	DRUG PRODUCTS	COSMECEUTICAL PRODUCTS
1	Pre-approval is necessary	No pre-approval is necessary
2	Pre-determined end point according to class of drugs	No pre-determined end point according to active ingredients
3	Safety studies of drugs are important such as animal, toxicology, pharmacokinetic, pharmacodynamics, and drug-drug interactions, etc	No definition of safety
4	Complex label requirements (chemical structure of active ingredients, formula, strength, additives, indication of use, contra-indications, precautions, warnings, adverse effects, etc.)	Well defined but far less complex
5	Strict control on manufacturing practice and inspections followed	Should follow GMP but not strict
6	Active ingredient and additives must be approved by FDA	Change in formula is a matter of course Not reviewed by FDA
7	Claims are monitored strictly	Claims are seldom monitored No approval for claims
8	Time of drug development is 7-15 years	Development of cosmetic using break-through technology is 3-5 years
9	Cost of new drug development is \$ 800 m	Cost of cosmetic development is \$ 2-\$ 3 m only
10	Pre-market application is must with safety and efficacy studies	Not necessary to do pre-market application

XIV.CONCLUSION-

From the literature survey it has been concluded that, Cosmeceuticals are not drugs, but they claim to have a drug like effect. The term cosmeceutical has no meaning under the law. They are not reviewed by Food and Drug Administration (FDA) but the cosmeceuticals are topical pharmaceutical-cosmetic hybrids which contain biological actives intended to enhance the beauty and health of the skin.


It has been further noted that, the great demand of skin cosmeceuticals has led to development of products to counteract the signs of aging skin, to decrease erythema, and to even out tone and pigmentation. These cosmeceuticals can help to protect the skin from photo damage and in some ways repair it through stimulation of new collagen production.

Further it has been noted from the literature that, hair cosmeceuticals usually consist of actives which are hair growth stimulant, or to improve hair aesthetic properties such as texture, shine, manageability, etc.

Apart from skin and hair cosmeceutical, actives are also reported to improve the condition of the applied area and are added in various cosmetics such as under eyes, lips, nail products. Nanotechnology is a technology, if applied, it will help the targeted drug delivery

Nanotechnology represents the main and important technologies of the twenty-first century which offers excellent opportunities for both research and business. The rapid spread and commercialization of nanotechnology in cosmeceuticals have given rise to great technical and economic aspirations but also question about the emerging risks to health and safety of consumers. Thus, finally it is concluded that cosmeceutical products based on nanotechnology should be designed and sold in a way that fully respects the health of consumers and the environment.

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