

COSMECEUTICALS – AN EVOLUTION

J. Padma Preetha*, K.Karthika¹

*Dept of Pharmaceutics, K.M.C.H College of pharmacy, Kovai Estate, Kalapatti Road, Coimbatore – 641 048. India.

¹Dept. of Pharmaceutics, KMCH College of pharmacy, Coimbatore-14, India.

*Corres.author: preetha_raghav@yahoo.co.in

*Mobile No: 99421-09828

ABSTRACT: Cosmeceuticals, which is the fastest growing segment of the natural personal care industry. These cosmeceuticals, serving as a bridge between personal care products and pharmaceuticals, have been developed specifically for their medicinal and cosmetic benefits. Cosmeceuticals (or alternatively, cosmaceuticals) are topical cosmetic pharmaceutical hybrids intended to enhance the beauty through ingredients that provide additional health-related function or benefit. The cosmeceutical concept is used by many skin-care companies; especially those endorsed by dermatologists, to give the impression that the products contain more effective or more biologically active ingredients than just ordinary cosmetics. Hence, anyone can slap the label with tall claims to promote these products saying the products are more beneficial than the existing conventional regulated cosmetic products.

Keywords: Cosmeceuticals, Skin, Anti aging, hyper pigmentation

INTRODUCTION

The Egyptians were the first to recognize the health properties of cosmetics. Up to the 19th century, there was no clear distinction between cosmetics and pharmaceuticals; the separation occurred when the first modern pharmaceutical industry was developed. Cosmeceuticals rapidly expanded in the 1980s due to hydroxy acids (natural fruit acids) used as exfoliants against wrinkles. Raymond Reed, founding member of the United States Society of Cosmetic Chemists, coined the term 'Cosmeceutical' in 1961. In 1971, Albert Klingman reactivated interest in cosmeceuticals by developing a formula to improve the appearance of UV damaged and wrinkled skin, using retinoic acid.

They are applied topically as cosmetics, but contain ingredients that influence the skin's biological function [1]. Cosmeceuticals improve appearance, but they do so by delivering nutrients necessary for healthy skin. Desirable features of cosmeceutical agents are efficacy, safety, formulation stability, novelty, and patent protection, metabolism within skin and inexpensive manufacture [2]. Even though some products claim to be unique botanical extracts or containing some rare ingredients with magic antiaging properties, most of the cosmeceutical formulations use fundamental ingredients

such as peptides, retinol, coenzyme Q- 10, ceramides, alpha lipoic acid, alpha hydroxy acids, beta hydroxy acids, aloe vera, panthenol, kinetin and vitamins A, C, E.[1]

SKIN CARE COSMECEUTICALS

Cosmetics and skin care products are the part of everyday grooming. Protecting and preserving the skin is essential to good health. Our skin, the largest organ in the body, separates, and protects the internal environment from the external one. UV radiations from sunlight penetrate the skin and accelerated damage due to free radicals, which includes inflammation, wrinkling and hyper pigmentation. Due to prolonged exposure to UV radiation the collagen and elastin fibres of the skin are broken down by enzymes collagenase and elastase and texture of skin deteriorates. Collagen and elastin are responsible for maintaining the elasticity and integrity of the skin. Several plant extracts and anti oxidants obtained from natural sources are able to prevent the aging and also improving the appearance of the skin.[3]

Cosmeceuticals being cosmetic products having medicinal or drug-like benefits are able to affect the biological functioning of skin owing to type of functional

ingredients they contain. There are skin-care products that go beyond coloring and adorning the skin. These products improve the functioning/texture of the skin by encouraging collagen growth by combating harmful effects of free radicals, thus maintaining keratin structure in good condition and making the skin healthier. [4-6]

The most important botanicals pertaining to dermatologic uses, such as cosmeceuticals, include teas, soy, pomegranate, date, grape seed, Pycnogenol, horse chestnut, German chamomile, curcumin, comfrey, allantoin, and aloe; only green and black tea, soy, pomegranate, and date have been studied to the extent that clinical trials for the treatment of parameters of extrinsic aging have been published.[7]. Potential cosmeceutical agents in this category include green tea, grape seed extract, vitamin E, and beta-carotene.

The following ingredients are most commonly used cosmeceuticals, some of them listed below,

Boswellic acids

It is obtained from *Boswellia serrata*. The main function is to inhibit the enzymes responsible for inflammation (5 - lipoxygenase) and damage of the skin.[3]

Tetrahydrocurcuminoids

It is obtained from white (colour free) curcuminoids of turmeric (*curcuma longa*) carnosic acid, cosmarinic acid, ursolic acid from rosemary extract *Rosemarinus officinalis* as anti oxidants are the other compounds which are used to facilitate the tissue damage and restoring the healthy status of skin. [3]

Retinoids

A great amount of research has concentrated on its use as an antiaging compound as well as its use for other cutaneous disorders. Vitamin A and its derivatives have 2 main functions: they act as antioxidants, and they activate specific genes and proteins. Structural changes underlying the cosmetic benefits include correction of epidermal atrophy, deposition of new collagen, generation of new vessels, and enhancement of mitogenesis. This enhanced mitogenesis promotes the shedding of melanin-laden keratinocytes, resulting in bleaching and subsequent depigmentation. The ability of topical tretinoin to improve the appearance of aged and photo-damaged skin by reducing wrinkles, decreasing laxity, bleaching hyperpigmented spots, and bringing about a smoother surface have been well studied and documented.

Hydroxy acids

Hydroxy acids are organic carboxylic acids classified into alpha hydroxy acids (AHAs) and beta hydroxy acids (BHAs) according to their molecular structure. Many are derived from natural sources and are often referred to as fruit acids. The different AHAs include the following: glycolic acid, lactic acid, citric

acid, mandelic acid, malic acid, and tartaric acid. AHAs have been shown to decrease the signs of aging. The skin appears smoother and more uniform.

BHAs are aromatic compounds. Salicylic acid is the reference BHA; it has dermolytic properties and helps in various xerotic and ichthyotic disorders. Other BHAs include 2-hydroxy-5-octanoyl benzoic acid, also known as beta-lipohydroxyacid (B-LHA), and tropic acid. Studies show that AHAs may increase sensitivity to UV radiation and that sunscreen application may be advisable when these products are used.

Antioxidants

In addition to these external insults like UV radiation, drugs, air pollutants, and heat and/or cold, the skin also has to cope with endogenous mitogens, most importantly reactive oxygen species (ROS) and other free radicals. These species are continuously produced during physiological cellular metabolism. To counteract the harmful effects of ROS, the skin is equipped with an antioxidant system to maintain equilibrium between the pro-oxidants, or damaging agents, and the antioxidants, or protective agents; these antioxidants intervene at different levels in the protective process.

Here some of the antioxidants are listed below,

Vitamin C

Vitamin C is necessary for the hydroxylation of procollagen, proline, and lysine. Vitamin C improves and normalizes the changes caused by photodamage. Vitamin C has been used effectively to stimulate collagen repair, thus diminishing some of the effects of photoaging on skin. However, vitamin C is easily degraded by heat and light, which along with its high acidity, presents certain challenges for use in a multipurpose skin care formulation. A recently introduced synthetic collagen fraction offers greater stability and compatibility, along with improved efficacy.

Vitamin E

Vitamin E (alpha-tocopherol) is the major lipophilic antioxidant in plasma, membranes, and tissues. The term vitamin E collectively refers to 8 naturally occurring molecules (4 tocopherols and 4 tocotrienols), all of which exhibit vitamin E activity. Its major role is generally considered to be the arrest of chain propagation in lipid peroxidation by scavenging lipid peroxy radicals, hence protecting the cell membrane from destruction. Vitamin E topically applied before UV irradiation has been shown to reduce erythema, edema, sunburn cells, immunosuppression caused by sunlight, and DNA adduct formation.

Panthenol

Panthenol, the alcohol analog of vitamin B-5, is a water-soluble humectant commonly found in various commercial skin creams, lipsticks, lotions, and hair preparations. It is stable in the presence of oxygen and light but unstable in the presence of acids, bases, and

high temperatures. Panthenol is converted in the skin to pantothenic acid, which is an important component on coenzyme A essential for normal cellular metabolism.

Lipoic acid

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

Niacinamide

Niacinamide is stable in the presence of oxygen, acid, and high temperatures, and it is inexpensive to formulate.[8] Most of its known effects are the result of increased epidermal turnover and exfoliation.[9] Topical kinetin and niacinamide have been found to exert a synergistic antiaging cutaneous effect in people in the Republic of China.[10]

Dimethylaminoethanol[8]

Topical preparations containing dimethylaminoethanol (DMAE) have been touted for their ability to improve skin firmness and to lift sagging skin. DMAE is able to diminish the cross-linking of proteins that occurs during aging, probably acting as a free-radical scavenger.

Spin traps

Free radical spin traps are species that react with reactive free radicals to produce fairly stable, unreactive free radicals, thus blocking the free radicals from damaging cellular components.

- DMPO (5,5-dimethyl-1-pyrroline-*N*-oxide)
- DEPMPO (5-diethoxyphosphoryl-5-methyl-1-pyrroline-*N*-oxide)
- TEMPONE-H (1-hydroxy-2,2,6,6-tetramethyl-4-oxo-piperidine)

Melatonin

Melatonin, a hormone secreted by the pineal gland. This beneficial action of melatonin has been explained in terms of its ability to scavenge free radicals and to augment the activities of antioxidant enzymes. It has been shown to suppress UV radiation-induced erythema.

Catalase

Catalase, an enzyme present in almost all cells of the human body, catalyzes the decomposition of hydrogen peroxide to water and oxygen. High amounts of this enzyme in the skin can impart antioxidative activity.

Glutathione

Glutathione is a tripeptide of glutamic acid, cysteine, and glycine. It is found in all active animal tissue. It is fundamental as an antioxidant, and significantly decreased amounts of glutathione are found after UV exposures.

Superoxide dismutase

Superoxide dismutase (SOD) is an enzyme that destroys superoxide (a highly ROS). SOD is a large molecule and has difficulty penetrating deep into the skin. In theory, once in the lower epidermis and dermis, SOD should decrease UV erythema and damage and act as an excellent antioxidant.

Glucopyranosides

Resveratrol and polydatins are glucopyranosides found in many fruits and vegetables, the highest concentrations being found in grape skins, which synthesize these compounds in response to exposure to UV-A and UV-B and fungal pathogens.

Polyphenols

Polyphenolic compounds (eg, catechins, flavonols, thioflavins, thearubigins), also known as epicatechins, are antioxidant in nature. These compounds, tested against human keratinocyte cells stressed by UV-B irradiation, showed high antioxidative properties.

Cysteine

Several recent studies have shown that cysteine derivatives can protect against the negative effects of UV exposure. In particular, *N*-acetylcysteine (NAC) is shown to be an effective protector against UV-B-induced immunosuppression.

Allantoin

Allantoin promotes cell proliferation, aiding in the healing process. Allantoin has long been known to enhance the effectiveness and desirability of cosmetic creams and lotions by its action as a skin protectant. Allantoin has been incorporated into shampoos, lipsticks, shaving creams, suntanning products, bath foams, hair gels, baby powders, and various aerosol preparations. Allantoin has been called a cell proliferant, an epithelization stimulant, and a chemical debrider. It is said to clean away necrotic tissue, hastening the growth of new healthy tissue.

Furfuryladenine

Furfuryladenine (Kinerase) is a natural plant growth factor that retards the aging process in plants. Cut leaves dipped in a solution that contains furfuryladenine remain green, while untreated leaves turn brown. It is marketed as the natural evolution of antiaging treatment with similar effects in vitro on human skin cells as that in plants, helping to slow and reverse alterations that naturally occur in the cell-aging process.

Uric acid

In the past, uric acid was generally looked upon as merely an end product of purine metabolism. More recently, uric acid has become increasingly recognized as an important biological antioxidant.

Carnosine

Carnosine (beta-alanyl-L-histidine) is a physiological dipeptide that can rejuvenate senescent cultured human fibroblasts. Carnosine has been shown to contain antioxidant, free radical- and metal ion-scavenging activities.

Depigmenting Agent[8]

Hyperpigmentation is the result of an increased amount of melanin in the epidermis, the dermis, or both. This pigmentary change can be divided into 2 pathophysiologic processes: melanocytosis (increased number of melanocytes) and melanosis (increased amount of melanin). Depigmenting agents work best when melanosis or melanocytosis is restricted to the epidermis. Depigmenting agents can be divided into several groups:

Phenolic compounds include the following:

- Hydroquinone
- Monobenzylether of hydroquinone
- 4-Methoxyphenol
- 4-Isopropylcatechol
- 4-Hydroxyanisol
- *N*-acetyl-4-*S*-cysteaminyphenol

Nonphenolic compounds include the following:

- Corticosteroids
- Tretinoin
- Azelaic acid
- *N*-acetylcystein
- L-ascorbyl-2-phosphate
- Kojic acid

Combination formulas include the following:

- Kligman's formula
- Pathak's formula
- Westerhof's formula

Cosmeceutical agents	Source	Applications
<i>N</i> -acetyl-4- <i>S</i> -cysteaminyphenol	-	Treatment of solar lentigines and related hyperpigmented lesions
Vitamin C and its derivatives	-	Reducing agents on melanin intermediates
Kojic acid	-	A fungal metabolic product, has been increasingly used as a skin-depigmenting agent in skin care products marketed in Japan since 1988.
Arbutin	-	Inhibit melanogenesis by affecting the activity of tyrosinase rather than by killing melanocytes and decreasing the synthesis of melanin.
Azelaic acid (AZA)	<i>Plasmodium ovale</i>	Depigmenting agent, AZA is believed to selectively inhibit tyrosinase in hyperactive melanocytes
Paper-mulberry compound	Paper-mulberry root bark	Scavenge free radicals, and to depigment UV-induced hyperpigmentation in guinea pigs. Studies in humans show no irritation or sensitization
Chemical peeling agents E.g: glycolic acid, resorcinol, and salicylic acid	-	Treating cutaneous hyperpigmentation.
Ginkgo biloba extract	-	Catalase enzyme activity in the epidermis after topical application
Aloe vera	-	To protect and soothe the skin
Enzymes 1. Papain	Papaya fruit	Treatment of hypertrophic scars, and it can be used to exfoliate keratotic skin

2. Deoxyribonucleic acid (DNA) repair enzymes	-	When the bacterial DNA repair enzyme T4 endonuclease V is intracellularly delivered, it increases the rate of repair of sunlight-induced DNA damage in human cells.
Growth factors 1. Epidermal growth factor 2. Transforming growth factor	Found in plasma, sweat, urine, saliva, and semen. ----	It stimulates epidermal growth and differentiation. It has been used in the treatment of burns and excision wounds, where it accelerates re-epithelization. Normal skin growth and cellular growth and repair.
Hormones Hormonal creams claim to be the most effective means to stop or slow the aging process by reversing the loss in tone and elasticity of the skin Estrogens Progesterone Botulinum A exotoxin	- - - A exotoxin is a neurotoxin produced by the bacterium <i>Clostridium botulinum</i>	One investigation found that after 6 months of applying 0.01% estradiol and 0.3% estriol compounds, the elasticity, firmness, wrinkle depth, and pore sizes of the skin were markedly improved. However, better studies are needed before these agents are routinely used for their antiaging effects. Progesterone cream heals skin conditions, such as acne, psoriasis, rosacea, seborrhea, and keratoses. This toxin is now being used by cosmetically oriented specialists for the treatment of a large variety of movement-associated wrinkles on the face and neck
Peptides • Copper peptides	-	Production of both collagen and elastin is reduced in aging skin and in skin exposed to ultraviolet light, copper peptides may be able to help produce new collagen and hence repair aged skin.

HAIR COSMECEUTICALS [1]

The appearance of the hair is a feature of the body over which humans, unlike all other land mammals, has direct control. Hair care, color, and style play an important role in people's physical appearance and self-perception. Among the earliest forms of hair cosmetic procedures in ancient Egypt were hair setting by the use of mud and hair coloring with henna. In ancient Greece and Rome, countless ointments and tonics were

recommended for the beautification of the hair, as well as remedies for the treatment of scalp diseases.

While shampoos have primarily been products aimed at cleaning the hair and scalp, current formulations are adapted to the variations associated with hair quality, hair care habit, and specific problems such as treatment of oily hairs,[11] dandruff[12] and for androgenic alopecia[13] related to the superficial condition of the scalp. Cosmetics for the treatment of hair are applied topically to the scalp and hair. While they can never be

used for therapeutic purposes, they must be harmless to the skin and scalp, to the hair, and to the mucous membranes and should not have any toxic effect, general or local, in normal conditions of their use. A haircare cosmetic compositions comprising iodopropynyl butylcarbamate and/or a solution of zinc pyrithione in N-acyl ethylenediamine triacetate has been patented, which includes an appropriate carrier and a nonallergenic dry extract of yarrow (*Achillea millefolium* L.), obtained by oxidation of a water– alcohol solution extract of flower tops of yarrow. The extract contains less than 0.5% by weight of polyphenolic derivatives, is used for the treatment of hair, in particular oily hair, based on extract of yarrow.[14]

Buck[15] has patented a method for treatment for androgenic alopecia wherein Liquor Carbonic Detergents are topically administered. It is generally accepted that genetic hair loss arises from the activation of an inherited predisposition to circulating androgenic hormones. 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, hydrolyzed proteins, quaternized cationic derivatives, cationic polymers, and silicones.[16]. Accordingly, current antidandruff ingredients are virtually all-effective antifungal agents – zinc pyrithione, octopirox, and ketoconazole.[17] Hair growth stimulants cannot be expected to have any impact on hair growth due to shortcontact time and water dilution. A minoxidil-related compound (2,4-diamino-pyrimidine-3-oxide) is a cosmetic agent with claim of acting as a topical hair growth stimulant.[18] Its target of action has been proposed to be the prevention of inflammation and perifollicular fibrosis.[19] Some degree of efficacy of 2,4-diamino-pyrimidine-3-oxide has been claimed in the prevention of seasonal alopecia.[20] Recent approval in the United States of two new products, Propecia and Rogaine Extra Strength (Minoxidil) 5%, indicated in men to promote scalp hair growth, have added a new dimension to treatment options offered by physicians in treating androgenetic alopecia.[21]

OTHER COSMECEUTICALS [1]

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The skin beneath the eye lacks subcutaneous fat and has virtually no oil glands. This delicate skin needs protection and plenty of moisture to replenish and repair, which helps to reduce the signs of premature aging. As the skin ages, it becomes thinner, drier, and rougher. Over-exposure to the elements and to environmental pollution aggravates this condition. Many topical skin-soothing products intervene in this process, but products for this area need to be particularly gentle and specially formulated with ingredients that work from the inside out by interacting with the cells under the skin's surface – without irritating the eyes. There are numerous cosmeceutical eye creams that nourish the skin with natural emollients and beneficial nutrients. 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 α -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.

Lawlor had developed dental care compositions, which are useful for providing a substantive composition on the surfaces of oral cavity, which can provide prophylactic, therapeutic, and cosmetic benefits.[22]

FUTURE PROSPECTS

By the addition of small amount of cosmeceutical agents to the cosmetic formulations which do not require medical regulations and it would improve the production of cosmeceuticals that could help to improve the skin, nail, and body mass growth. New challenges will also be presented to government regulatory agencies as more chemicals with true biological activity are invented and tested. In conclusion, cosmeceuticals are not only the external beautification but also it improves the internal beauty through the health related function. The health group professionals will show the importance to cosmeceutical products and develop the awareness about these products.

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