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REVIEW ARTICLE

Constituents of Cosmeceuticals and Implication of Nanotechnology in Cosmetics

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ABSTRACT

Compounds that are used in reducing the wrinkles and fine lines for the beautification of skin, containing some biological activity are categorized under the term of "Cosmeceuticals". With the progression in age of individuals both the demand and need of makeup and beauty enhancer products increases. Peptides, preservatives, antioxidants, vitamins and polysaccharide are the major constituents of the cosmeceuticals. Marine organisms having extraordinary anti-aging property are widely used as a basic source of cosmeceutical. Herbal materials, being less potent and toxic, also used in many cosmeceutical products. There is a massive increase in use of nanotechnology in the field of cosmeceutical. It offers improved bioavailability at minimal dose due to its small size which aid in crossing the skin barrier more easily.

Keywords: Cosmeceuticals, marine source, antioxidants, nanotechnology, peptides and polysaccharides.

INTRODUCTION

The term Cosmeceuticals was first used by Dr. Albert Klingman a dermatologist [1]. US Food, Drug, and Cosmetic Act (FDCA) defines cosmeceutical as the products used for cleansing, moisturizing or improving the appearance and texture of skin by rubbing, applying or sprinkling. Cosmetics generally do not interfere with the normal physiology and biological functioning, while performing their own functions of cleansing and refining the skin [2]. Skin whitening treatment is a very common practice for hyper pigmented skin specially in Asians [3]. Hydroquinone acts as skin lightening agent. It inhibits the synthesis of melanin by effectively acting on melanocytes [4]. These products, comprised of different ingredients which play vital role in skin rejuvenation, effectively reduce discoloration or pigmentation, fine lines and wrinkles hence giving smooth skin [1]. In aesthetic field anti-aging care is attaining more importance as compare to makeup. With the age elasticity of skin decreased and skin become thin progressively [5]. Some cosmeceutical contain therapeutically active substances which give tremendous antiaging effect [6]. Antioxidants also play a vital role in improving the skin tone and fine lines. Herbal materials, being less potent and toxic, also used in many cosmeceutical products [7]. So, different skin related disorders can be treated by using cosmeceutical having wide range of active ingredients [4, 8]. Antioxidants neutralize the free radicals, produced during the radiation exposure, prevent the skin aging as result of oxidative stress. These antioxidants restore the normal biological functions when applied topically [9]. With the progression in age of individuals both the demand and need of makeup and beauty enhancer products increases. Through different mechanisms, like collagen strengthening, inhibition of melanin production and protein synthesis, rejuvenate and beautify the skin [10]. Safety, efficacy and compatibility of ingredients should be prioritized [11].

Types of Cosmeceuticals

Pharmaceuticals include different types of formulations like hair and skin care products used for both therapeutic and beautifying purpose [12]. Broadly we can divide cosmetics in two categories:

1. Skin care products
2. Make up

Routinely used products for only skin beautification purpose come under the class of makeup and products having some therapeutics effects for particular use and skin disorders are belong to the skin care range [1].

Beautifying Cosmeceuticals

The main purpose of the makeup is to augment the beauty and improvement and alteration of the skin appearance. Different products like lotions, lipsticks, creams and foundations come under the term f beautifying cosmetics or makeup. Each make up product is associated with a specific use. Lipsticks give different colors to lips and enhance the overall look [13]. Palm oil frequently use in cosmeceutical formulations, have stearic acid which is the main constituent of creams, lotions and eye makeup products. Glycerol monostearate and butyl stearate both are the derivatives of stearic acid and excessively used in above mentioned cosmetic products [14]. In market, different colors of mascara are available which give shades (brown, black, blue) and volume to eye lashes. Mascaras also include different ingredients like black iron oxide, kaolin and methyl parabens [15]. Stearic acid, lanolin, castor oil and bees wax are also the constituents of mascara that are used to color the eye lashes and makes it beautiful of the mascara [16]. For giving shine and volume to hairs different shampoos with variety of pharmaceutical ingredients are available. Lotions hydrate the skin and protect it from sun burns [17].

Medical Skin Care Cosmeceuticals

There is a class of cosmeceutical products with active medicinal ingredients showing therapeutic activity. Lipstick is commonly used cosmetic for coloring the lips but if it contains any medicinal agent it can be used for infectious diseases of lips [13].

There are number of cosmeceutical constituents which have various pharmacological efficiency.

Every component has its own therapeutic effect against various skin disorders. Addition of allantoin in lipstick make the particular product therapeutically efficient in lip infection [13]. Similarly, clindamycin and 1% pimecrolimus in form of gel and cream used for treatment of acne and dermatitis respectively [18, 22]. Likewise, ketoconazole has antimycotic activity when added in hair shampoo, it treats multiple fungal disorders [21]. Skin lotions are used to attain both cosmetic purposes and therapeutic functions. They hydrate and glorify the skin tone. Meanwhile, if pharmaceutical active ingredient like erythromycin is added in their composition, it converts the products into pharmacological active form to heal skin related problems like acne [20], (Table **1**).

Table 1. Cosmeceuticals with their pharmacological effect.

Active ingredient	Dosage form	Pharmacological effect	References
Pimecrolimus	Cream	Dermatitis	[18]
Clindamycin	Gel	Anti-acne	[19]
4% Erythromycin	Skin lotion	Anti-acne	[20]
Ketoconazole	Hair shampoo	Fungal infection	[21]
Allantoin	Lipstick	Lip infection	[13]

Cosmeceuticals Ingredients

Antioxidants

Skin aging is the repercussion of oxidative stress that damage the skin protein and its DNA. Oxidative stress produces free radicals that are the causative agent of skin maturation and destruction. Thereby, antioxidants are utilized to nullify the free radicals and provide skin protection [1]. The main antioxidants which provide anti-aging affect include are alpha lipoic acid, vitamin A, B, C and coenzyme Q10 [23].

Vitamins are the basic organic components, required on daily basis, as human body cannot produce them internally due to their slow-going synthetic pathway. So, a balanced routine diet should contain their appropriate quantity [24]. They are essential for skin to curb the antiaging affect and to maintain its absolute functioning. The past studies showed, most of the externally used products of cosmeceuticals' possess different types of vitamins which play a vital role in skin rejuvenation [9].

One of the component is retinol, belongs to retinoid family, commonly known as vitamin A has a prominent antioxidant affect. It hydrates the skin, improves the collagen synthesis and promotes epidermal hyperplasia. Basically, it inhibits the matrix metalloproteinase that cause the matrix degradation. It shields the skin by reducing the fine lines and wrinkles [25].

Another antioxidant vitamin is ascorbic acid also known as vitamin C. It is active form is L-ascorbic acid which reduces the oxidative stress, provides collagen synthesis to minimize the furrow and thin lines on face and secures the skin from ultraviolet radiations [26]. Improper intake of vitamin C promote skin aging, thereby, body requires its accurate quantity on daily basis [27].

It also improves the healing mechanism of lesion via collagen synthesis as well as glorify and lighten the skin tone by reducing the melanin formation by inhibiting the tyrosinase enzyme [28].

A widely used antioxidant, is vitamin E, a fat soluble vitamin, protects the skin from UV light. It is available as over the counter product, with quantity 0.5-1% in market [29]. A human cell contains mitochondria which further possess alpha-lipoic acid, a naturally occurring antioxidant. It provides skin protection against UV light and reduces cell damage. It further maintains the vitamin C and E concentration within a body. It acts as exfoliate and anti-inflammatory [32]. It applies externally twice a day for 12 weeks to minimize the crease and fine lines on face. Its mechanism of action involves penetration within a skin cell to nullify the free radicals. On contrary, it moves to cytosol within a cell and impede the pro inflammatory elements to avoid inflammation [34].

Another antioxidant which is present in mitochondria is coenzyme –Q 10 (fat soluble, quinone).

It also known as ubidecarenone or ubiquinones. It controls the cell peroxidation property and removes the lines and wrinkles on face [31]. One of the prominent synthetic element of this class is idebenone, which shows prominent antioxidant effect. It cures the immunosuppression after UV subjection. It repairs the mitochondria's DNA, remove the furrow, xeroderma, erythema and thin lines of skin [35].

Table 2. Antioxidant with their main source and prime function.

Antioxidant	Source	Prime function	References
Vitamin A	Carrots, sweet potatoes, green vegetables	Improve vision, reduced acne, shield from radiation, diabetes mellitus	[25]
Vitamin E	Vitamin E adjunct, sunflower seeds	Protect from UV radiation	[29]
Vitamin C	Multifarious citrus fruits like berries, etc.	Improve collagen biosynthesis, provide UV protection	[30]
Coenzyme Q10	CoQ-10 adjunct	Remove fine lines and crinkle, shows anti-inflammatory action	[31]
Alpha-lipoic acid	Alpha-lipoic acid adjunct	Anti-inflammatory, protection against the UV radiation	[32]
Polyphenol	Tea, coffee, grapes	Anti-inflammatory	[33]
Flavonoids	Extricates of grape fruit and green tea	Vision, protect from sunburn	[23]

Some chemicals like polyphenols have both antioxidant and anti-inflammatory properties. They act by minimizing the signaling pathway in melanogenesis. Moreover, these elements provide skin protection against UV radiation that harm the skin in form of sunburn. The most common ingredient of this class, which is used in cosmeceuticals, is flavonoids [33].

The main sources of flavonoids are soy isoflavones and natural extricates of grape fruit and green tea. The grape seed extricate function for keratinocyte and improves the lesion healing by inducing the growth factors. While, the extract of green tea is suitable against sun burn and UV light exposure [23].

Along with natural biological active ingredients, there is also a synthetic hormone known as kinetin or N6-furfuryladenine, used in cosmeceuticals and shows antioxidant quality. It neutralizes the oxidative stress and provide sun light protection against harmful rays. Approximately, 1% kinetin if applies externally, beautify the skin as well as minimize the crinkles and thin lines [36]. Moreover, it is a member of cytokinin class that acts as a growth hormone within plants by promoting the cell growth and differentiation process [37].

A human cell contains mitochondria which further possess alpha-lipoic acid, a naturally occurring antioxidant. It provides skin protection against UV light and reduces cell damage. It further maintains the vitamin C and E concentration within a body. It acts as exfoliate and anti-inflammatory [32]. It applies externally twice a day for 12 weeks to minimize the crease and fine lines on face. Its mechanism of action involves penetration within a skin cell to nullify the free radicals. On contrary, it moves to cytosol within a cell and impedes the pro inflammatory elements to avoid inflammation [34], (Table **2**).

Peptides

By definition peptides are short chains of amino acids including essential and non-essential amino acids. Essential amino acids are obtained by food. This type is capable of carrying out different biological activities like reproduction, immunity and growth in the human body [38]. Biologically active peptides interact with receptors in the body those in return express the beneficial or harmful effects. Peptides are also involved in regulation of various biological processes by imparting their vital role in normal functioning of body. Dairy, meat and beans are chief sources of proteins (peptides) possessing both antioxidant and antimicrobial characteristics [39].

Peptides are frequently employed as cosmetic ingredients due to their outstanding biological activity of skin miniaturization. Small sized peptides are utilized in cosmetics because of this feature peptides can cross the stratum corneum with no difficulty and thus, exhibit their biological functions. l-amino acids being non-immunogenic in nature, and they disrupt into individual amino acids after application on skin are normally used in skin care formulations [40]. Modified amino acid chains are present in the topical peptides preparations that stimulates the physiological activities of the skin including stability and cell receptor interaction and skin permeability [41]. Clinically topical peptides are being utilized as anti-aging agents, in treatment of wrinkles, reducing hyperpigmentation, in melisma, used to boost collagen synthesis and for strengthening of skin [42], (Table **3**).

Table 3. Basic functions of various peptides in cosmeceuticals.

Peptides	Basic function	Reference
Glutathione	Its primary function is the neutralization of free radicals and it also carry out antioxidant function.	[43]
Palmitoyl pentapeptide-3	synthesis of collagen	[44]
Acetyl-hexapeptide-8	Basically it serves as a guard for skin against dehydration, and also involved in synthesis of collagen.	[45]
Palmitoyl tetrapeptide-7s	It functions as anti-inflammatory agent.	[40]
Gly-his-lys	This type of peptide is involved in synthesis of collagen and in healing of wounds.	[43]

Polysaccharides

Polysaccharides being natural compounds have various types including alpha hydroxy acids (AHAs), beta hydroxyl acids (BHAs) and poly-hydroxy acids (PHAs). These types of polysaccharides are further divided into sub types. For example, alpha hydroxy acids (AHAs) have its sub types including, lactic acid, citric acid, glycolic acid and malic acid. These are obtained from different kinds of food products like dairy, citrus fruits, grapes and apples. Alpha hydroxy acids serve to improve functioning of stratum corneum and also work as humectant [46].

Beta hydroxy acids comprise of tropic acid and salicylic acid that is extensively utilized for the treatment of acne and for oily skin. Previously salicylic acid was thought to be beta hydroxy acid but in fact, it is a phenol aromatic. Beta hydroxy acids along with salicylic acid is used for the exfoliation purpose of skin. It is also extensively utilized for acne treatment and to control black heads. These product should have their pH in range of 3-4 [47].

Poly-hydroxy acids provide the skin protecting and hydrating functions. Gluconolactone comes under the category of poly-hydroxy acids that shields the skin against ultra violet radiations. It is beneficial for sensitive skin due to its low penetration property into the deep skin layers, because of its large size thus causing low irritation to the skin [48], (Table **4**).

Commonly used antimicrobial agents in cosmeceutical are neem oil, turmeric oil, beta hydroxyl acids, benzoic acid and rosemary extract. These antimicrobial agents are mostly obtained from natural sources i.e. neem oil is obtained from *Azadiracta indica* [53], turmeric oil from *Curcuma longa*, beta hydroxyl acids from *Salix alba* [54], benzoic acid from oak bark [55] and rosemary is obtained from *Rosemarinus officinalis* [56].

Preservative are obtained either by natural or synthetic sources, these are added into the cosmeceuticals maintain the stability, to inhibit the microbial growth and to avoid degradation of other constituents of cosmeceuticals. These preservative should not have any reaction with other excipients or should ensure their stability at huge range of pH and temperature [57]. Examples of preservatives are isothiazolinones, parabens, and formaldehyde. The minimum effective concentration of preservative must be ensure during their addition into cosmeceuticals because they induce various kind of allergies. For instance, triclosan and formaldehyde releasers may become the reason of various toxic effects and allergy. To avoid the various toxicities and side effects due to above mentioned synthetic preservatives, preservative boosters are utilized [58].

Basically, preservative boosters are synthetic compounds possessing antimicrobial activity and also minimize the concentration of preservatives to be added and their noxious effects. Thus, these are utilized to sustain the microbial clarity of cosmeceutical [59].

Table 4. Basic functions of various polysaccharides in cosmeceuticals.

Polysaccharides	Basic function	Reference
Gluconolactone	Shields the skin against ultra violet radiations.	[49]
Agar	Employed as binding agent.	[50]
Tropic acid	Used as anti-acne agent.	[47]
Methylcellulose	Employed as thickening and binding agent in various cosmeceuticals including gels and pastes.	[51]
CM-glucan	Provide shielding to skin against ultra violet radiations.	[49]

Antimicrobials and Preservatives

Quality of cosmeceutical is affected by different impurities that got entry via manufacturing procedures where raw material or water may be contaminated or afterwards by external inappropriate environmental conditions. Thus, the finished product may hold microbial agents [52].

Marine Source of Cosmeceuticals

There are different types of chemicals extracted from marine organisms that are vastly used in variety of

cosmetic products. Among terrestrial plants, seaweed essentially has various constituents that are used in cosmeceuticals. A variety of constituents like vitamins, peptides and other polysaccharides are extensively used in the development of cosmeceuticals. Bioactive sesquiterpenes are commonly used ingredients in cosmetics , extracted from red algae, show anti-fungal activity [60]. Marine organisms include algae are the major source of bioactive compounds responsible for the development of variety of cosmetic products. Essential oils which are isolated from different types of algae have anti-inflammatory activity. Vitamins and proteins, majorly extracted from the microalgae, are used in cosmeceuticals due to their antioxidant activity [61]. As antioxidant activity has shown by the extract of microalgae, so it is used in variety of cosmetic products including anti-aging creams and other skin care products. Different types of chemicals are extracted from the marine organisms include seaweed that are used in skin care products and enhance the beauty by reducing the wrinkles and aging effects from the skin [62]. Seaweed has wide range of biologically active compounds that are used in different cosmeceutical products as potential agent. Marine organisms consisting of brown algae are rich source of micosporine-like amino acids which are secondary metabolite used in cosmetics to protect the skin from UV exposure by absorbing these radiations. Fucoidans are obtained from the brown seaweed involved in wound healing [63].

A extensively used absorbent in cosmetics are aluminium silicate obtain from variety of marine organisms including seaweed and various types of algae. Chitin is extensively used in skin care and anti-aging creams due to their remarkable antioxidant activity and it is obtained from the crustacean shells. Shark is a major source of squalene and used in cosmeceuticals for skin lubrication purpose [64]. Marine organisms are major source of cosmeceutical ingredients and that's why these are picked up by industry on a large scale. A variety of constituents extracted from the marine organisms and show the remarkable effect on skin by their antioxidant activity. The action of these constituents include UV protection, hydration of the skin and prevent the oxidation stress [65].

Table 5. Cosmeceutical ingredients from marine source.

Ingredient	Source	Activity	References
Alginate	Brown algae	Emulsion homogenizer	[66]
Fucoidans	Brown seaweed	Protect from skin infection	[67]
Phlorotannin	Brown algae	Prevent oxidation	[68]
Fucoxanthin	Brown algae	UV radiation absorber	[69]
Carrageenan	Red seaweed	Suspension homogenizer	[70]
MAAs	Red algae	Prevent oxidation	[68]
Ulvans	Green algae	Removal of active species from skin	[71]
Glycogen	Mussel	Protect from UV radiation	[72]
Alluminium silicate	Sea mud	Absorbent	[63]
Squalene	Shark fish	Hydrate the skin	[73]
Chitin	Crustacean shells	Protect the skin from aging effects	[63]
Chitosan	Crustacean shells	Prevent oxidation	[63]
Proteins	Microalgae	Lubricate the skin	[74]
Carotenoids	*Dunaliella salina*	Protection against UV radiations	[75]
Fucosterol	*Ecklonia stolonifera*	Prevent oxidation	[76]
Tocopherol	*Euglena gracilis*	Prevent oxidation and remove wrinkles	[77]

Cosmeceutical industry use marine organisms on a large scale because a variety of ingredients obtained from these organisms and have a unique and desired effect on the skin [60]. The quantity of these chemicals that are obtained from these organisms should be in a specific range for safe and effective use. These constituents showed biological action when they are applied topically. These actions include protection from various harmful radiations, skin hydration and prevent oxidation [74]. Marine organisms produce proteins and other amino acids that are commonly used in the cosmetics especially in sun-block creams. Microalgae produce variety of proteins that are extensively used in skin care products to remove the dryness of skin. *Dunaliella salina* produces carotenoids that act as radiation absorber and used in the variety of cosmeceutical preparations. *Ecklonia stolonifera* produces fucosterol that has antioxidant activity. *Euglena gracilis* produces tocopherol and it prevents oxidation [61]. Most of the fishes produce peptides that are extensively used by the cosmeceutical industry because of their remarkable antioxidant activity and also act as radiation absorber. They are also used to remove the aging effects and prevent oxidation [78]. Most of the marine constituents are obtained from algae. A variety of extracts obtained from marine source include microalgae which are used in skin care products for both therapeutic and beautifying purposes. Sporopollenin, a chemical obtain from algae are used in the cosmetic products to protect the skin from sunburn and radiations [64]. MMPs are actively participated in aging mechanism, so their ability or activity is inhibited by marine constituents including flavonoids and polyphenols to remove the wrinkles and improve the appearance of the skin [79], (Table **5**).

Nanotechnology

In 2001, nanotechnology initiative was established for the first time. Nanotechnology involves research and development of variety of materials at a molecular or atomic level with a size ranging 1-100nm and also include different devices that can manipulate the materials at atomic scale [80]. The research in nanotechnology has been increased in last 15 years. In this research, different compounds are studied at atomic level and it gives a unique and rare property of a particular material. Nanomaterials are extensively used in nanotechnology to deliver the active ingredients to the site of action with better bioavailability [81].

Firstly, biomedical operations of nanomaterials were studied in the literary texts and now these are extensively used in research, as more focused on drug delivery. The main purpose of these nanoparticles is to deliver the drug to the target site with improved bioavailability. The advantage of Nano medicines is their better bioavailability, less toxicity due to their unique multifunctional structures. These structures keep their solubility and colloidal properties when these nanoparticles are used in the complex medium like blood and tissue fluids [82]. This nano medicines can be used for both diagnostic as well as therapeutic purposes [83]. This Nano medicines can be used to treat different diseases including cancer, infectious diseases and other skin infections as well [80]. These nanoparticles are mainly used to deliver the active to the target site and deeper into cells and tissues for proper and effective action [84]. Nano medicines are greatly used by the pharmaceutical industry as it involves in the development of pharmaceutical preparations with better stability and higher bioavailability and delivered the active to the target site in a controlled release action. As due to their small size they easily cross the stratum corneum and penetrate into the skin and show their effect [85]. As following parameters involve in nanotechnology; drug delivery, diagnosis, treatment and detection of variety of proteins [86]. Range of remarkable properties possessed by nanotechnology utilized in all fields including medical sciences, computer sciences and the health care systems. Diagnosis and treatment of various diseases have been improved by the use of nanoparticles [87]. Nanotechnology is continuously used in the development of these Nano medicines to improve drug delivery mechanism. For achieving this development, the active constituent or drug is encapsulated in the Nano sphere or microsphere and drug release is usually controlled by rubbing the formulation on the skin surface. Nano capsules are also formulated and used in various diseases for both diagnosis as well as therapeutic purposes [88]. The application of this research include, drug delivered to deeper into the cells easily, nano medicines are accumulated at higher concentration in the target site and showed therapeutic action. In nano systems, due to their small size it easily crosses the blood brain barrier and delivered the drug to the brain and shows the therapeutic effect [89]. So nanotechnology is used in the screening, treatment as well as diagnosis of the

various diseases [83]. In nanotechnology the active drug is encapsulated in the microsphere that are handled at atomic level and exploit the novel structure and function of particular material [89].

Application of Nanotechnology in Cosmeceuticals

The primary application of nanoparticles is to improve the product stability by encapsulating the cosmeceutical active ingredients within Nano spheres and to prevent the skin from the UV radiation. As their application include drug delivery to the desired site and release of the drug in controlled release manner [90]. Niosomes are one of the most used excipient in Nano medicines to deliver the drug topically. ZnO and TiO2 are commonly used in variety of skin care products as they are less toxic. Skin disinfectants involve silver nanoparticles that are extensively used in the cosmeceutical products. Due to their small size it easily crosses the skin barrier and protect it from further harm [91]. Liposomes are also used in nano cosmeceuticals, as liposomes are biocompatible and a variety of active ingredients can be encapsulated. In Nano cosmeceuticals, nanoparticles involve in drug delivery, gene therapy and prevention from various infectious diseases [92]. Salicylic acid is usually encapsulated by double layer encapsulation mechanism. Firstly, salicylic acid is encapsulated within the hydrophobic microsphere and then it is further encapsulated within the nanosphere. In this case, the drug release is controlled by rubbing the formulation on the skin surface. Due to its small size it easily penetrates into the skin and show the biological activity. Nano cosmeceuticals ensure the better and improved bioavailability at much lesser dose [93]. The small size ensure the better penetration of drug into the tissue and easily reached to the target site and show their activity [94]. By the use of nanoparticles the active drug from the formulation is released in a controlled release manner to the site of action with better therapeutic effect [95]. Different types of nanomaterials are used in the cosmeceuticals include ZnO, arbutin metals with antioxidant activity when applied topically. Proteins and amino acids include polymer amino acids that protect the skin from UV radiations [96]. Tio2 are majorly used in the sunscreen that protect the skin from sunburn, UV radiation and also improve the texture and appearance of the skin [97]. The UV radiations enhance the aging process, to overcome this problem the nano medicine based cosmeceutical preparations are extensively used and it removes the wrinkles and aging effects as well. The active drug that is used in the Nano cosmeceutical products for removing the anti-aging effects include silver and ZnO. These nanoparticles can easily crosses the skin barrier and shows the photo-protective activity and prevent the skin from the further harmful environment and improve the appearance of the skin as well [98].

Table 6. Classification of nanomaterials and their applications.

Class	Nanomaterial	Application	Reference
Metal and their oxides	ZnO Ag Au Arbutin	Radiation absorber Protect from microbes Microfiber Skin whitening agent	[96]
SLN (solid lipid nanoparticle)	Solid lipid	Delivery of the active drug	[99]
Polymers	Polyaminiacid	Protect the skin from radiation	[100]
Synthetic polymers	Nano capsules	Delivery of the active drug	[101]
Native polymer	Polyaminoacids	Protect the skin from UV radiation	[101]
Carbon	Fullerenes	Prevent oxidation	[102]

The main purpose of nanotechnology is to develop the formulation of smallest droplets with larger surface area which ensure and facilitate the effective transport of the drug to the target site [96, 98]. Nano pigments, which also comes under the class of nano cosmeceuticals (Table **6**).

Nano pigments are also used in nano cosmeceuticals that protect the skin from UV radiation. When applied topically, improve the texture and appearance of the skin [103]. Nanomaterials used in the cosmeceuticals can be of different nature like inorganic includes TiO2 and ZnO that are commonly used in the nano cosmeceuticals as UV filters [104].

CONCLUSION

Cosmeceuticals are the special skin care and make up products that are essential for all group of ages providing protection from UV exposure, harmful environment and same time also improve the structure of skin and prevent the aging effects by incorporation of range of pharmaceutically active or inactive ingredients. Free radicals, which are harmful for the skin, are easily neutralized by the addition of antioxidants. Constituents derived from algae species play an important role in skin rejuvenation process. Revolution has been started with the use of nano technology in cosmetic field. Due to its small size and better efficacy it gained much importance.

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