WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.084
Volume 8, Issue 12, 664-685. Review Article ISSN 2277– 7105

COSMECEUTICALS AN EMERGING TECHNOLOGY– A REVIEW

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Article Received on
16 Sept. 2019,
Revised on 07 Oct. 2019,
Accepted on 28 Oct. 2019
DOI: 10.20959/wjpr201912-16162

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ABSTRACT

Currently a new term in the cosmetic industry is Cosmeceuticals, which is the fastest growing segment of the natural personal care trade. Cosmeceuticals are cosmetic products with biologically active ingredients purporting to have medical or drug-like benefits. Cosmeceuticals are used to improve and nourish the skin appearance and to treat different dermatologic conditions. Cosmeceuticals are meant to improve appearance by delivering nutrients necessary for healthy skin. The efficacy of a cosmetic product depends not only on the active ingredients but also on the delivery system to improve its efficacy. Most of the cosmeceuticals have been developed with claims of antiwrinkle and firming, moisturizing and lifting, skin toning and whitening activity; the antiaging category of skin care products shows presently the highest growth rates. The cosmeceuticals product are most beneficial than cosmetics because it provides beauty as well as therapeutic effect. Careful preclinical or clinical evaluation of efficacy and safety is a prerequisite for the development of a specific cosmeceutical product. This article reviews some of the ingredients that are currently in use or might be potential candidates in cosmeceuticals of different categories.

KEYWORDS: Cosmeceuticals, sunscreen agents, moisturizing agent, Anti-aging, Hyperpigmentation, Nano cosmeceuticals.

INTRODUCTION

Cosmetics are products that are used to cleanse and beautify the skin. 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. As such, the use of cosmetics and personal care products can be traced back to ancient times where ingredients such as

milk, honey, lemon juice, clay, mud and even arsenic have been used in the name of beauty. The word cosmeceuticals was popularized by Albert M. Kligman in the later 1970's.[1] Cosmeceuticals improve appearance by delivering nutrients necessary for healthy skin. Cosmeceuticals is the fastest growing segment of the natural personal care industry.[2] Cosmeceuticals represent a hybrid between cosmetics and drugs and they stand for products that contain active ingredients capable of altering structure or function. Cosmeceticals are typically cosmetic-pharmaceutical hybrids intended to enhance the health and beauty of skin .some cosmeceuticals are naturally derived while others are synthetic, but all contain functional ingredients with either therapeutic, disease, fighting or healing properties.[3] Ideally, cosmeceuticals ingredients must be safe, efficacious, novel, stable, inexpensive to manufacture and can be metabolized with skin. There are three major trading blocks for cosmetics namely the USA, Europe and Japan.[4] Cosmeceuticals are cosmetic products with biologically active ingredients having a medical or drug like benefits.[5]

There are approximately 400 cosmeceutical manufactures, including companies that supply cosmeceuticals chemicals and/or manufacture in products in U.S market. The largest companies in industry for finished are Procter and Gamble, Johnson and Johnson, L'Oreal, Estee Lauder, Avon and Allergan, which together represent nearly one half of US market.[6] Consumers are always interested in maintaining a youthful appearance, and as the global population's median age increases, this market is increasingly expanding. The concept of beautifying is not restricted to women alone, even men have become aware of their look. Cosmetics and toiletries represent a highly diversified multidisciplinary field involved in many scientific sectors, such as material physics, chemistry, cell biology, bio ethics, regularity affairs, business administration and commercialization transition.

The products are generally formulated under the form of emulsion, ointment, gel, solution or powder containing different active ingredients.[7] Unfortunately, all the cosmetics are based on water and therefore prone to microbial contamination. They must be preserved by specific ingredients capable of killing bacteria and other micro-organisms. Microbial contamination may occur during the production, packaging and distribution processes. According to the United States food and drug administration (FDA), the food, drugs and cosmetics Act; a product can be drug, a cosmetic on a combination of both, but the term cosmeceuticals has no meaning under the law.[8] A drug is intended for use in the diagnosis, cure, mitigation,

treatment or prevention of diseases and intended to affect the structure or any function of the body.

Cosmetics are substances used to enhance the appearance or odour of the human body.[9] The food drug and cosmetic Act defines cosmetics by their intended use, as articles intended to be rubbed, poured, sprinkled or sprayed or introduced into or otherwise applied to the human body for cleansing, beautifying, promoting attractiveness or altering the appearance.[10] Nanotechnology is regarded as the most imminent technology of 21st century and is contemplated as a boon in the cosmetic industry.[11] Cosmetics can be defined as the products which amplify the appearance of the skin, intensify the cleansing and promote the beauty of the skin.[12] Nano cosmeceticals make the fragrances last longer. Nanomaterial are widely used in the preparation of anti-wrinkle creams, moisturizing creams, skin whitening creams, hairs repairing shampoos, conditioners and hair serums.[13]

Classification of Cosmeceuticals

Cosmeceuticals basically can be classified into following categories:

1) Skin cosmeceutical product- Anti-aging creams, Moisturizers, Facial products and Lotions.
2) Hair cosmeceutical product- Gel and creams, Hair colorants and Dyes, Shampoos, Growth Stimulators and Conditioners.
3) Others- Lipstick, Nail polish, Toothpaste and Powders

On the basis of

1. According to the part of body parts of cosmetics

A) Parts of cosmetics

a) Power compact: Ex- face powder, body powder, face pack

b) Creams: Ex- vanishing cream, cold cream, cleansing cream, moisturizing cream

c) Lotion: Ex- skin lotion, astringent lotion

d) Colorants: Ex-lipsticks, rouges

B) Cosmetics for hair

a) Hair remover: Ex-Depilatories, Epilatories, Shaving cream

b) Hair wave preparation: Ex- hairdressing, hair conditions

c) Shampoos: Ex- anti-dandruff shampoo, conditioner

d) Eyelash preparation: Ex- mascara,

C) Cosmetics for nails: Ex-lacquers, lacquers remover, nail polishes, nail remover.

D) Cosmetic for hygiene

a) Dental: Ex- toothpaste, paste dentifrices, lotion, mouthwashes.

b) Bath: Ex- soap, bath salts

2) According To Physical Characteristic

A) Emulsion: Ex- water in oil, oil in water, thin, thick emulsion

B) Suspension: Ex- water in oil, oil in water

C) Lotion: Ex- calamine lotion, nourishing lotion

D) Soaps: Ex- baby soap

3) According To Purpose

1) Protective – sunscreen lotion.

2) Nourishment- hair oil, lotion

3) Decorative – lipstick, mascara

4) Cleansing- cleansing milk

5) Curative- dentifrices, astringent.[14]

Preparation

The cosmetics preparation are broadly divided into following three categories Solids (Face powders, Talcum powders, Face packs, Masks, Compact powders etc.), Semi solids: (Creams, Ointments, Liniments, pastes etc.) and Liquids (Lotions, Moisturizers, Hair oil, Conditioners, Shampoos, Mouth washes, Deodorants, Sprays, etc.).The preparation of botanical cosmetics generally follows the same procedure as in the case of cosmetics. In preparation, suitable bioactive ingredients of their extracts are used along with requisite ingredients basically used for cosmetics. It requires selection of suitable emulsifying agent, and modified methodology to obtain desirable product of specified parameters. The herbal cosmetics formulation is a sophisticated and sensitive technological profile because it retains the bioactivity of the botanicals during excessive processing and ascertains their availability after application on skin. It is desirable that manufacturers should ensure the quality of products through systematic testing at their level. Other parameters like organoleptic characteristics, pH, viscosity, stability towards light and refrigeration should also be evaluated.

Needs for cosmeceuticals

Now a day it‘s not just the interest of people but certainly has become the need of the people to maintain a youthful & healthy appearance. Ultimately as the population in the world of the median age increases there is rise in the demand of the cosmeceuticals. Over 560 million people in India are in the age group of 18-35 years. As median age increases, the market is going to boom, especially growing number of women in the workforce feeling the hassle to maintain a youthful and vibrant appearance. This resulted into a rapid growth of cosmeceuticals in the natural personal care industry.[15]

As there is constant growth in global market, a lot of money is playing in hands of people at the same time, there is increase in the population with higher qualification and knowledge thus this class of population has become more beauty-conscious and thus is spending a high amount of their earning in maintaining a youthful appearance i.e. in cosmeceuticals. Thus cosmeceuticals market has become one of the fastest growing markets throughout the globe. Development in technology and invention of new ingredients has further contributed to the progress in the commercialization of cosmeceuticals products world-wide.

Mechanism of Action

The uppermost layer of skin i.e. stratum corneum is an effective barrier to Trans epidermal water loss and for penetration of exogenous substances. . One need not progress to the stage of clinical trials to suspect that these active ingredient marketing claims have little basis in scientific reality. For example, topically applied hyaluronic acid is found in many cosmeceutical moisturizers. It has not been shown that hyaluronic acid penetrates through the stratum corneum. It increases cutaneous water-holding capacity; but does not have any other pharmacologic effects in human skin.[16]

Botanical Cosmeceuticals

Herbal extracts are primarily added to the cosmetic formulations due to several associated properties such as antioxidant, anti-inflammatory, antiseptic and antimicrobial properties.[17] Even today, people in rural and urban areas depend upon herbs for traditional cosmetics. Cosmetics alone are not sufficient to take care of skin and others body parts, it requires association of active ingredients to check the damage and ageing of the skin. Herbal cosmetics have gained much popularity among the population. Herbal cosmetics products claimed to have efficacy and intrinsic acceptability due to routine use in daily life and avoid the side effects which are commonly seen in synthetic products. Due to the awareness of the

environmental damage caused by industrialization, a trend has developed to use products with natural ingredients. Various adverse effects may occur in the form of acute toxicity, percutaneous absorption, skin irritation, eye irritation, skin sensitization and photosensitization, sub chronic toxicity, mutagenicity, and photo toxicity by the usage of synthetic products that's why today's generation prefers herbal cosmetics for hair, skin and dental care Some botanicals that may benefit the skin include green tea extract, ferulic acid, and grape seed extract. Ferulic acid, which is derived from plants, is considered to be a potent antioxidant, and has been shown to provide photo protection to skin. When ferulic acid is combined with vitamins C and E, the product has been shown to provide substantial UV protection for human skin. Grape Seed Extract has been established as a potent antioxidant and has been shown to speed wound contraction and closure. Topical application of grape seed extract has also been shown to enhance the sun protection factor in humans.[18]

S.No	Botanical name	Family	Uses
1.	Allium sativum	Liliaceace	Garlic oil is used to control sores, pimples and acne.[19]
2.	Aloe Vera	Liliaceace	Leaves juice, its pulp or extracted material is applied on the skin for smoothness, healing controlling skin burn and injury.[20]
3.	Azaairachta indica	Meliaceae	Bark, seeds, fruits and leaves contain diterpenes and highly oxidized tetramer warmer parts triterpeniods.[21]
4	Citrus lemon	Rutaceae	Potential source of vitamin c: oil is used in various preparations to reduce skin itching and skin nourishment.
5.	Carica papaya	Caricaceae	Milky juice of unriped fruits is a good ingredient for facial and face cream.[22]
6.	Cocos nucifera	Arecaceae	Oil is used for skin itching and rashes.[23]
7.	Cucusmis sativus	Cucurbitaceae	Water extract of fruits and seeds protect skin from sunburn.[24]
8.	Curcuma longa	Zingiberaceae	Rhizome powder possesses anti-inflammatory and anti-oxidant properties.[25]
9.	Jasminum grandiflorum	Oleaceae	Essential oil extracted from flowers is used in skin creams and lotions to control skin disease.
10.	Juniperus communis	Cupressaceae	Whole plant is useful in skin creams and lotion to control skin diseases
11.	Lavandula Vera	lamiaceae	Essential oil is used in skin anti-acne.[26]
12.	Mangifera indica	anacardiaceae	Plant extract possess anti-oxidant properties.[27]
13.	Mimosa pudica	mimosaceae	Herb extract applied in skin creams.[28]
14.	Momordica charantia	cucurbitaceae	Plant extract possess antioxidant properties.
15.	Ocimum sanctum	lamiaceae	Leaves extract is useful to control skin infection.[29]

Most of the time, active ingredients are not present in equal amounts in all parts of a plant and thus, usually only one part of the plant is used. Compared to the drug industry, in the cosmetic industry, total extracts are usually employed as active ingredients. Botanicals comprise the largest category of cosmeceutical additives found in the market place today. (Table.1).

Delivery of Botanicals Using Nanoparticles

Various novel drug delivery systems such as liposomes, niosomes, microspheres and phytosomes have been reported for the delivery of herbal drugs. Incorporation of herbal drugs in the delivery system also aids to increase in solubility, enhanced stability, protection from toxicity, enhanced pharmacological activity, improved tissue macrophage distribution, sustained delivery and protection from physical and chemical degradation. The phytosomal carriers have been studied for effective delivery of herbal extracts of ginseng, ginkgo biloba etc. Direct binding of phosphatidyl choline to herbal extract components led to better absorption characteristics as compared to conventional delivery of herbal extracts. Other vesicular assemblies like microspheres, nano emulsions, polymeric nanoparticles etc. have been proved beneficial to carry herbal components.

Nanoparticles are the submicron size particles having size range 10 to 1000 nm. The main advantages of the nanoparticles are their stability and long term storage. The particle size and surface characteristics of nanoparticles can be easily modified for controlled and targeted drug delivery. Nano sizing led to increased solubility of components, reduction in the dose via improved absorption of active ingredient. Nanoparticles are efficient delivery systems for the delivery of both hydrophilic and hydrophobic drug.[30]

Skin Cosmeceuticals

Cosmetics and skin care products have become the part of everyday grooming of the people. Such 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. Collagen and elastin are responsible for maintain the elasticity and integrity of the skin.[31] 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.[32] The efficacy of a cosmetic product depends not only on the active ingredients but also on the delivery system to improve its efficacy. We have to remember that skin is more than an assembly of several layers of cells as corneocytes,

keratinocytes, fibroblasts and complementing each other.[33] The treatment of aging skin with a cream containing a hormone such as oestrogens results in a fresh appearance with a rejuvenating effect.

Sunscreen Agents

Use of sunscreen agents and limiting the exposure to sun prevent early wrinkling and skin cancer. Sunscreen agents are used to prevent sunburns. Regular use of an effective sunscreen is the single most important step to maintain healthy, youthful-looking skin. Mainly, it is the effect of ultraviolet (UV) light from the sun that causes most of the visible effects of aging of skin.

Types of sun screen agents: There are two kinds of sunscreen agents

- Chemical sunscreen agent
- Physical sunscreen agent

Chemical sunscreen agents

Chemical sunscreen agents protect the skin from the sun by absorbing the ultraviolet (UV) and visible sun rays, while physical sunscreen agents reflect, scatter, absorb, or block the rays. Chemical sunscreens are mainly based on para-amino benzoic acid, its derivatives, cinnamates, various salicylates and benzo phenones, dibenzoyl methanes, anthraline derivatives, octocrylene and homosalate are frequently employed as sun blocking agents.[34]

Physical sunscreen agents

Direct physical blockers include metal containing compounds such as iron, zinc, titanium, and bismuth. Zinc oxide and titanium dioxide are highly reflective white powders, but submicron zinc oxide or titanium dioxide powder particles transmit visible light while retaining their UV blocking properties, thus rendering the sun block invisible on the skin. Eg: Benzophenone-8, neoheliopan MA and BB, Parsol MCX and HS, Escalol 557, 587 and 597.[35]

Moisturizers

Moisturizers incorporated with emollients help smoothen age lines, brighten and tone skin surface by filling space between non-living outer layer of the skin and lubricating while promoting the retention of moisture in these layers.[36] Ingredients such as black cohosh, soy extract and vitamin A, and E found in healthy remedies balancing lotion for menopausal

women help in diminishing the appearance of fine lines and wrinkles while uplifting the neck area and promoting moisture retention.[37] Stratum corneum is the primary barrier of the skin whose main purpose is to keep inside in and outside out. This barrier is rich in cholesterol, free fatty acids, and cetramides. Many oily preparations have been used to maintain the fluidity of the skin (Mineral oil, Lanolin, cyclomethicone, etc.). Water from the stratum corneum gets evaporated very quickly leading to dehydration. This dehydration of skin can be averted by using moisturizers which provide flexibility to the skin. When moisturizers are applied to the skin, a thin film of humectants is formed which retains moisture and imparts better appearance to the skin. Cetramide containing moisturizers are very popular as these contain the same balance of lipids as our skin.[38-44] Fluocinolide containing cetramides formulation has been found to reduce eczema.[45] Moisturizers restore water content to the epidermis, and provide a soothing protective film. They improve the appearance and tackle properties of dry and aging skin, restore the normal barrier function of the skin, and reduce the release of inflammatory cytokines. Moisturizers comprise an important therapeutic component in the management of various skin conditions (e.g. eczema, psoriasis, pruritus, and aged skin).[46]

Skin Lightening Agents

Skin-lightening agents added to product formulations have become increasingly popular and such products are in demand. Hydroquinone has been the popular agent of choice for skin lightening. The US FDA has proposed concentrations between 1.5% and 2% in skin lighteners. Hyperpigmentation is the changing of colour intensity of the skin to darker, which is due to an increased amount of melanin in the epidermis, the dermis, or both. Skin lightening agents work best when melanosis or melanocytosis is confined to the epidermis. Standard dermatologic agent for skin lightening is hydroquinone but its safety is questionable, leading to the use of alternative agents such as retinoid, mequinol, azelaic acid, arbutin, kojic acid, aleosin, liquorice extract, ascorbic acid, soy proteins, and N -acetyl glucosamine.

BLEACHING AGENTS

Bleaching agents provide sun protection, that is block the formation of skin pigment called melanin apart from bleaching/fading various marks such as brown marks, liver spots, melisma, etc. One of the most commonly used agents is hydroquinone, kojic acid, and extract from mushroom, which may be compounded with tretinoin or topical steroids. α, β hydroxyl

acids, is slightly less effective as an agent compared with hydroquinone. Hydroquinone as an agent maintaining a pH between 4 and 7 and includes a compressed mixture of a synthetic anionic detergent, hydroquinone and its stabilizer, water, a buffer which maintains the pH between 3.5 and 7.5 thus, the skin bleaching preparation is characterized by an extended shelf life due to the presence of stabilizer and the maintenance of low PH.

Common Ingredients Used In Skin Care Cosmetics

HydroxyAcid: Hydroxy acid also referred to as fruit acids are a common ingredient found in many cosmeceutical products. Examples include citric acid, malic acid, and lactic acid. It improves the skin texture and reduces the signs of aging by promoting cell seeding in the outer layers of the epidermis and by restoring hydration.

Ferulic acid: This compound, which is derived from plants, is considered to be a potent antioxidant and has been shown to provide photo protection to skin.

Depigmenting Agent: Skin-lightening agents. Common Depigmenting ingredients include hydroquinone, ascorbic acid (vitamin C), kojic acid, and licorice extract (glabridin).

Hydroquinone: Hydroquinone is the skin lighting agent, conc. between 1.5% and 2%. The study based on animal model utilizing long- term exposure at high dosages at carcinogenic.

Exfoliates: Exfoliates promote skin turnover by removing adherent cells in the stratum corneum. Common exfoliants found in cosmeceutical preparations include salicylic acid (SA), lactic acid, and glycolic acid. There are concerns that repeated use of SA could cause the dermis and epidermis to be more vulnerable to penetration by UV radiation.[47]

Topical Peptides: Topical peptides are regarded as cellular messengers that are formed from amino acids and are designed to mimic peptide fragments with endogenous biologic activity. These penta peptides are comprised of a sub fragment of type I collagen propeptide, and play a role in signalling fibroblasts to produce collagen in the skin, which can improve the appearance of wrinkles.[48]

Retinoid: Retinoid are among the most common ingredients found in cosmeceuticals. In fact, they are the most studied and have the most data behind them. They consist of natural and synthetic derivatives of vitamin A that reduce hyperpigmentation and inhibit enzymes from breaking down collagen.

Antioxidants: Antioxidants reduce free-radical damage, thereby preventing impairment at the cellular level. They inhibit inflammation, which leads to collagen depletion, and they offer protection against photo damage and skin cancer. Common antioxidants include alpha-lipoic acid (ALA), Lascorbic acid (vitamin C), niacinamide (vitamin B3), N-acetyl-glucosamine (NAG), α tocopherol, and ubiquinone.

Vitamin C: Vitamin C is necessary for the hydroxylation of procollagen, proline, and lysine. Vitamin C improves and normalizes the changes caused by photo damage. Vitamin C has been used effectively to stimulate collagen repair, thus diminishing some of the effects of photo aging 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 30 naturally occurring molecules, 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 peroxyl radicals, hence protecting the cell membrane from destruction. Vitamin E topically applied before UV irradiation has been shown to reduce erythema, edema, sunburn cells, immune suppression caused by sunlight, and DNA adducts formation.

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 dihydrofolic acid, which is also an antioxidant. Alpha lipoic acid also recycles other key antioxidants, such as vitamin C.[49]

Niacinamide: Niacinamide is stable in the presence of oxygen, acid, and high temperatures, and it is inexpensive to formulate.[50] Most of its known effects are the result of increased epidermal turnover and exfoliation.[51]

Dimethylaminoethanol: Topical preparations containing dimethylamino ethanol (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.

Cysteine: Several recent studies have shown that cysteine derivatives can protect against the negative effects of UV exposure. In particular, N- acetyl cysteine (NAC) is shown to be an effective protector against UV-B– induced immuno suppression.

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.

Allantoin: Allantoin promotes cell proliferation, aiding in the healing process. Allantoin has long been known to enhance the effectiveness and desirability.

Polyphenols: Polyphenolic compounds (e. g, catechins, flavonols, thioflavins, the arubigins), also known as Epicatechins are antioxidant in nature. These compounds, tested against human keratinocyte cells stressed by UVB irradiation, showed high antioxidative properties.[52]

Hair Cosmeceuticals

Humans have about 100,000 hairs on their heads. Each hair shaft has three layers with the cuticle, outer layer, protecting the two inner layers. In healthy hair, the layers of the cuticle lie flat, overlap tightly and reflect light. The inner layers are then well protected from heat, sun, chlorine and other environmental stress. When hair is damaged, the cuticles can be separated and hair may be dry. As the cuticles don't protect the two inner layers, hair can break and look dull. Humans have direct control on their hair in terms of length, colour and style. Hair plays a significant role in people's physical appearance and self-perception .Problems with hair include oily hair, dandruff and hair loss (alopecia). Hair care includes caring for hair quality and scalp care.

Hair cosmetics can be categorized into two,

- ✓ Exocuticle (shampoo, conditioners, serums, hair sprays, waxes)
- ✓ Cortex (hair colour, bleaching agent, straightening agent and perming agent)

Shampooing is the most frequent from hair treatment. Current shampoo formulations contain ingredients that can treat specific problems. The extract of yarrow has been used to treat oily hair. Extract contains less than 0.5% by weight of polyphenolic derivative. Spironolactone is an aldosterone antagonist that works by stopping binding of natural androgens to receptors.

Topical treatment on animal model showed penetration into skin is a hair growth –including agent. Minoxidil shampoo has been widely used in the treatment of alopecia.

New method or technology has been developed for improving the texture and softness of the hair. The use of glycyl glycine, silicon oil in micro emulsion preparation and use of silicon oil-in-water nano emulsion has been used to improve the texture, stability and strength of individual hair shaft. New hair cosmetic products have been developed to cleansing hair of detritus.[53] Among the earliest forms of hair, cosmetic procedures in ancient Egypt was hair setting using mud and hair colouring with henna.[54]

Adverse effects of synthetic cosmetics

Skin caring agents remain on the body for a very short period of time and rarely cause significant adverse reactions, however, perfume and others constituents may cause skin irritation and allergic reactions. Moisturizers increase the hygroscopic properties of the skin; however, high concentration of these substances may cause irritation and exfoliation. Skin lightening/Depigmenting agents, such as hydroquinone (HQ), are one of the most widely prescribed agents. Ochronosis is an uncommon adverse effect of HQ, characterized by progressive darkening of the area to which the cream containing high concentrations of HQ is applied for many years.[55] P-Phenylenediamine (PPD), in the form of commercial hair dye mixed into the henna paste, which is very harmful. Addition of this artificial dye stains the skin for, an hour or less adverse reactions of PPD can include stinging sensations, with an erythematous rash, swelling, blisters, and surface oozing. Adverse effects to sun-screening agents may result in irritant, allergic, phototoxic, or photo allergic reactions, caused not only by the active constituents but also by the additives such as fragrances and stabilizers. Benzophenones are probably the most common sensitizers, while dibenzoylmethanes, para-aminobenzoic acid (PABA), and cinnamates may cause photo allergic dermatitis.[56]

The allergic complications associated with deodorants and fragrances are usually caused by fragrance or other ingredients. Fragrance can enter the body through lungs, airways, skin, ingestion, and via pathways from the nose directly to the brain and can cause headaches, irritation to eyes, nose, and throat, dizziness, fatigue, forgetfulness, and other symptoms.[57] .Shampoos and conditioners have only a brief contact with the skin and are not a common cause of cutaneous irritant or allergic contact dermatitis. However, eye irritation can be a problem. Possible sensitizers in shampoos include formalin, parabens, hexachlorophene, triclosan, and fragrances. Matting of scalp hair is most commonly a sudden, usually

irreversible, and tangling of scalp hair resulting from shampooing. Hair straightening (relaxing) with pressing oils and heated metal combs or round tongs may be associated with hair-shaft breakage and scarring alopecia. Hair removal techniques may partially account for allergic and photo allergic reactions.[58]

The adverse effects of shaving include skin irritation, cuts in the skin, ingrown hair (pseudo folliculitis), etc. The active ingredients in hair bleaches are hydrogen peroxide solutions that oxidize melanin to a lighter color. They may be supplemented with persulfate boosters. The disadvantages of bleaching include skin irritation, temporary skin discoloration, pruritus, and the prominence of bleached hair against tanned or naturally dark skin. Ammonium persulfate may cause types I and IV allergic contact reactions.

Efficacy

The term 'cosmeceutical' has been heavily criticized because it connotes that rigorous efficacy studies have been done as it would be for pharmaceuticals. Various studies on cosmeceutical peptides have not demonstrated clinically significant difference from placebo. Botanical cosmeceuticals are probably at similar level of development with oral herbal remedies. Extensive studies in animals have demonstrated effects like anti-inflammatory, anti-tumorigenic, anti-microbial, anti-peroxidation and free radical scavenging activities in wide range of models using mouse, rats and guinea pigs.[59] Most have neither undergone phase 2 or 3 clinical trials nor randomized studies and their efficacy remain unproven. Though, high concentrations of Vitamins C and E do indeed protect against acute ultraviolet skin damage, the low concentrations in most cosmeceuticals have not been shown to be effective.[60] Furthermore, the stability of these vitamins is compromised as soon as the product is exposed to light and air.[61]

Toxicity

The term 'natural' is frequently used for most components of cosmeceuticals and willingly or unwillingly connotes safety. Carboxyl, the only constituent of veterinary cosmeceuticals with documented toxicity profile, has an oral LD50 of 100 mg/kg in mice and 250 mg kg in rat. Though, it is rapidly metabolized by human and animals and does not accumulate, low doses have been known to cause dermal and eye irritation in rabbits despite that the dermal LD50 in rabbits is quoted as greater than 2000 mg/kg. Vitamin E has been shown to cause a significant increase in contact dermatitis.[62] While the anti-oxidant P-hydroxyanisole increases skin pigmentation.[63] Some component peptides have also been shown to be

carcinogenic. Perhaps the greatest danger is from deliberate adulterations and incorporation of harmful products like steroids and retinoid. These can lead to devastating skin and systemic changes. Microbial contaminants have been reported with unfavourable consequences. The broad categories of cosmeceuticals are antioxidants, growth factors, peptides, anti-inflammatories/botanicals, polysaccharides, and pigment lightening agents.[64]

New Carrier for advanced Cosmeceuticals

An innovative category of cosmeceuticals of biodegradable nonwoven tissues are made by chitin Nano fibrils and Nano lignin. They can be produced and distributed at the dry state. These tissue-carriers produced as facial mask sheets (Figure 1) consist of natural fibers able to strictly bind and release the entrapped active ingredients at different doses and time. Thanks to the carrier and ingredient functionality, these innovative products can be used, for example, as antibacterial, anti-inflammatory, sun-protective, whitening, or anti-aging cosmeceuticals, depending on the effectiveness of the selected ingredient(s).[65,66] Differently from the usual cosmetics, they do not contain preservatives, emulsifiers, colors, and other chemicals, therefore being more skin-friendly and respectful of nature.

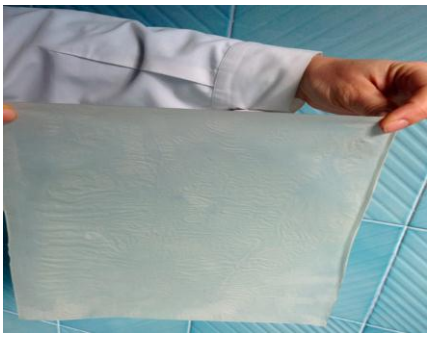

Fig. 1: Example of Chitin Nano Fibrils Tissue Obtained By Electro Spinning Technology.

These dry facial masks, applied on wet skin (where they get wet and remain in contact for about 30 minutes), are able to slowly release the active ingredients entrapped into the fibers, depending to the designed tissue-architectures. It is interesting to underline that these tissues not only act as carriers (thus loading and releasing the active ingredients at the different skin layers) but also possess a proper own effectiveness. They are made by chitin and lignin that are polymers characterized by an antibacterial, antioxidant, anti-inflammatory, regenerative, and protective activity. Thus, they protect the skin against environmental attack and pollution, such as UV and air micro and Nano particulate (NP).[67-71] Therefore, they can be

considered new active carriers for innovative cosmeceuticals, as they are useful for the consumer to ameliorate skin wellness both for men and for women and for the industry to increase its business.

Common Myths and Misconceptions

- Cosmeceuticals and cosmetics are regulated as drugs.
- Cosmeceuticals claims in labeling and advertising are substantiated and approved before market.
- Cosmetic ingredients undergo premarket testing and review by the FDA for safety.
- Cosmetic ingredients undergo premarket testing and review by the FDA for efficacy.

Approval Requirements

For cosmetic products or ingredients, FDA does not have a premarket approval system with the important exception of colour additives. However, Drugs are subject to FDA approval. Generally, drugs must either receive premarket approval by FDA or conform to final regulations specifying conditions whereby they are generally recognized as safe and effective, and not misbranded. Currently, certain-but not all over-the-counter (OTC) drugs (that is, non-prescription drugs) that were promoted before the beginning of the OTC Drug may be advertised without specific approval pending publication of final regulations under the on-going OTC drug review. Once a regulation covering a specific class of OTC drugs is final, those drugs must either.

- Be the subject of an approved New Drug Application (NDA) [FD&C Act, sec. 505(a) and (b)], or Comply with the appropriate monograph, or rule, for an OTC drug.
- Regulations specifically prohibit or restrict the use of the following ingredients in cosmetics. For complete details, refer to the relevant regulations (21 CFR, Parts 250.250 and 700.11 through 700.23).

These products must meet the standards for both cosmetics (colour additives) and drugs, to refer to products that have drug-like benefits. Some cosmetic makers use the term cosmeceuticals, but FDA does not recognize this term. While drugs are reviewed and approved by FDA, FDA does not approve cosmetics for the product‘s acting like a drug, FDA must approve it as a drug.

Future Propects

By the addition of small amount of cosmeceuticals agents to the cosmetic formulations 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. Cosmeceuticals are not drugs but are claimed to have drug-like effects. In future, more effective formulations containing herbal component may come in trend. The addition of herbal extracts for therapeutic use requires better understanding of the herbal potential. The present trend towards herbal cosmetics with effective therapeutic property will continue and may be some newer herbs will also be placed in cosmetics world. In coming future, the regulatory authorities will need to frame some laws concerned with safety, efficacy and quality assessment of these newer herbal cosmeceuticals.[72] The great demand of cosmeceuticals has led to development of products to counteract the signs of aging skin, to decrease erythema, and even tone out and pigmentation.[73] These cosmeceuticals can help protect the skin from photo damage and in some ways repair it through stimulation of new collagen production. The further research in wound healing and biotechnology will serve to expand this field. In conclusion, Cosmeceuticals are not only the external beautification but also it improves the internal beauty through the health related function.

CONCLUSION

Natural products are not synonymous with safety, and indeed, being the opposite of synthetically produced products, they may have a greater variability in content. Pure chemical compounding can significantly minimize contamination, whereas making products from natural sources can never totally have batch-to-batch consistency, and biologic additives can cause problems for the patient. The future promises increasingly sophisticated formulations for cosmetics and skin-care products. Cosmetic companies are finding ways to deliver small-dose ingredients that do not require medical regulations and to introduce steroids and hormones into lip balms, which would result in production of cosmeceuticals that could help to improve body mass, nail, and hair growth. New challenges will also be presented to government regulatory agencies as more chemicals with true biological activity are invented and tested. Biotechnology will also compete directly with the pharmaceuticals and cosmetic business. One can easily conclude that cosmeceuticals will continue to evolve in parallel with advances in our understanding of skin biology, along with improved methods of measuring the benefits that may be provided by well-engineered skin care products. But we have to consider the changes in the science and technology, so clinicians, scientists and

dermatologists have to update their knowledge in this field to produce high quality products with safety.

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