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Nano-Cosmeceuticals for Health Care

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ABSTRACT

Nanotechnology demonstrates the progress in research and development by enhancing the efficiency of the product by providing innovative solutions. To overcome certain disadvantages associated with traditional products, the application of nanotechnology in cosmeceuticals has escalated. Cosmeceuticals are considered to be the fastest-growing sector in the personal care industry, and over the years they have increased dramatically. Nano-cosmeceuticals are widely used in the treatment of skin, hair, nail, and lip, in conditions such as wrinkles, photography, hyperpigmentation, pimples and hair injuries. The use of conventional supply systems has been replaced by new nanocarriers such as liposomes, niosomes, nanoemulsions, microemulsions, solid lipid nanoparticles, lipid nanostructures, and nanospheres. These new nanocarriers have increased skin penetration, controlled and sustained drug release, increased stability, specific targeting at the site, and increased trapping efficiency. Nevertheless, nanotoxicological studies have shown concern about the effects of increased use of nanoparticles in cosmeceuticals, as nanoparticles may penetrate the skin and cause health risks. This review of nanotechnology used in cosmeceutical products highlights the various new transport companies that are used to supply cosmeceutical products, their positive and negative aspects, marketable formulations, nanocosmeceutical toxicity and regulations.

INTRODUCTION

Nanotechnology is considered to be the most imminent 21st century technology and is seen as a big boom in the cosmetic industry. The term Nanotechnology is the combination of two words: technology and Nano in Greek, meaning Dwarf. The science and technology used to develop or manipulate particles of 1 to 100 nm is thus considered to be nanotechnologies **[1,2].** Nanotechnology has developed in several fields, such as engineering, physics, chemistry, biology and science since 1959, and nanotechnology has intruded into cosmetics, health products and dermal preparations for almost 40 years. During the era of 4000BC, the Egyptians, Greeks and Romans recorded nanotechnology, using the concept of hair color preparation using nanotechnology. Nanotechnology contains 1-100 nm size particles with a specific surface area of more than 60 cm. Novel cosmetic carriers based on nanotechnology include nanoemulsions, nanocapsules, liposomes, niosomes, nanocrystals, solid lipid nanoparticles, carbon-nanotubes, wholeerenes and dendrimers. Nanoemulsions, the most advanced systems for cosmetic nanoparticles known as submicron emulsions (SME), are systems with uniform and minuscule droplets (20-500 nm). They are more advanced in cosmetics.

Nanomaterial cosmetics have certain unique benefits in comparison with microcosmetics. The use of nanomaterials by the cosmetic industry aims to achieve long-term effects and increase stability. The high surface area of nanomaterials makes it possible to carry the ingredient more effectively through the skin **[3].** One of the principal objectives of the use of nanomaterials in cosmetics could be the effectiveness of skin penetration for improved product ingredients, new colour elements (e.g. in lipsticks and onions), transparency (e.g. in sunscreens), and long-lasting effects (e.g. in makeup), for example. When using N.M.s, the ultimate aim of the cosmetics industry is to deliver the right amount of ingredients to the desired parts of the body to achieve long-term stability. Currently, N.M.s are the most commonly used in cosmetics, especially sunscreens to be UV. Filters. Filters.

1.1 Advantages and disadvantages of nanoparticles

1.1.1Advantages of nanoparticles

- Can be freeze-dried.
- The formulation of powder can be freezing-dried.

- Sterilization is possible by autoclaving and gamma radiation.
- Enhances the protection of skin with an organic compound It can be lyophilized.

1.1.2 Disadvantages of nanoparticles

- Inadequate capacity for drug loading.
- High dispersion water content.
- Low load capacity of hydrophilic medicines.

1.2 Cosmetics

Founding member of the United States Raymond Reed, the Society of Cosmetic Chemists, coined the word "cosmetics" in 1961. Cosmetics can be defined as products that enhance the appearance of the skin, intensify purification, and promote skin beauty **[4].** Cosmetics are defined as 'articles intended for cleansing, enhancing, promoting attractiveness or altering appearance' by the FDA, but not legally authorized to approve cosmetics before it is released onto the market. Cosmetics, however, must be safe for and properly labeled by consumers. By the 21st century, cosmetics are being enormously used, and with the development in technology, innovative cosmetic formulations are being developed by the incorporation of the latest technologies [**5, 6].**

1.3 Cosmeceuticals

The word "cosmeceutical" serves to identify a product that fits the niche between drugs and cosmetics **[3].** It is used in the skincare profession to describe a product with a measurable biological effect, like a drug, but regulated as a cosmetic because it claims to affect the **[4].** The FDA does not categorize cosmeceuticals, but skin scientists, physicians use this term, and skincare professionals, to encourage the consumer to continue buying cosmetic products, especially anti-aging and sunscreen products, marketed by many manufacturers with scientific claims and natural positioning as a way to emphasize that using these products is not only necessary but also natural.

1.4 Nanocosmecuticals

Nanoparticles are particles of submicron size in the 1-100 nm range **[7,8].** Nanoscience and nanotechnology explore the distinct characteristics of nanosized materials. These remarkable characteristics have reformed and transformed all areas of basic and applied sciences **[9].** In the past three decades, nanoparticle technology has provided new solutions to numerous acute and chronic illnesses **[10]** 's treatment challenges. Targeted delivery, painless remedies, customized therapies and simplified solutions over traditional treatments are available in the nanoparticulate systems **[11].** Various forms of new, sub-micronized drug delivery systems used for cosmeceutical preparations include liposomes, nanostructured lipid carriers, solid nanoparticles, niosomes, transferosomes, ethosomes, nanocapsules, nanoparticles of gold, completeness, dendrimers, and cubosomes (figure). These new forms have been developed and marketed successfully**[12,13]**. In the personal care sector the use of nanotechnology is now steadily increasing with improved trapping, dispersion, performance, quality, protection, penetration and compliance.

2.Benefits of Nanocosmeceuticals [14]

- Better entrapment
- Improved dispersibility and spreadability
- Enhanced performance
- Improved textural quality
- Protection of sensitive and volatile actives
- Better skin penetration
- Sustained action
- Diminished direct contact of irritant molecules
- Increased color and finish quality

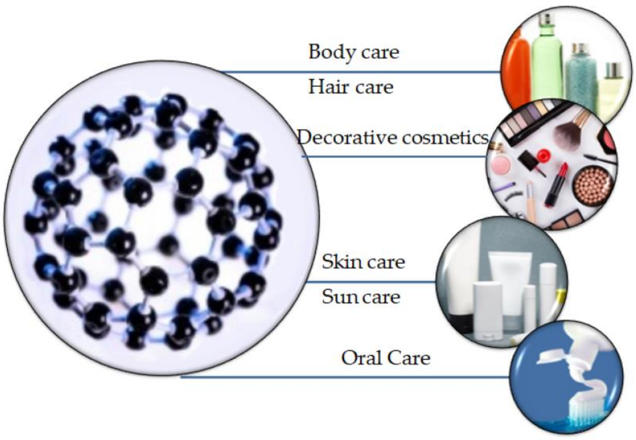

Figure No. 1: Nanomaterials in various cosmetic applications. [15]

3. Nanomaterials in cosmeceuticals

Carrier technology is used to deliver nanocosmeceuticals, which provides an intelligent approach to active ingredients. Various novel cosmeceuticals delivery nanocarriers are depicted in Fig 2.

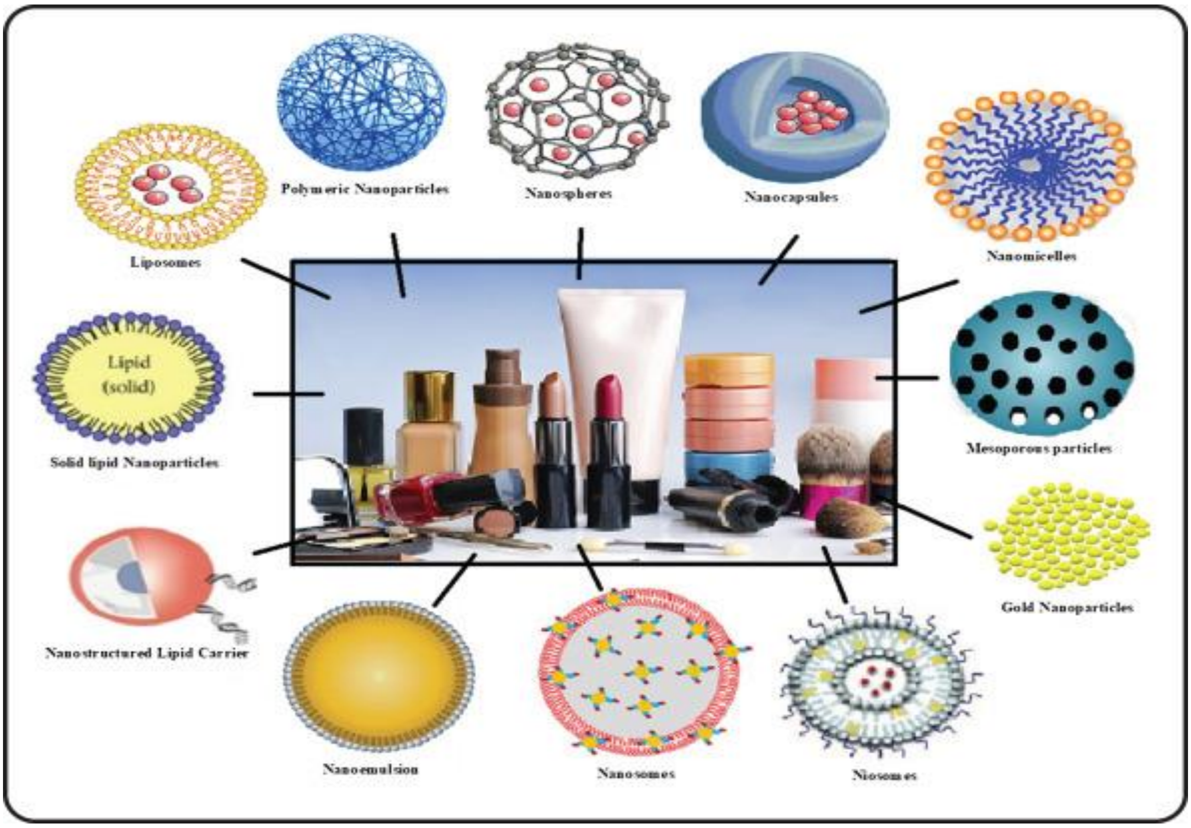

Figure No. 2: Types of Nanomaterial in Cosmetics [15]

3.1 Vesicular Delivery Systems

This category is comprised of liposomes, proniosomes, niosomes, phytosomes, transfers, ethosomes etc. Liposomes are structures with an aqueous core surrounded by a bilayer of hydrophobic lipid created by the extrusion of phospholipids. Phospholipids are GRAS ingredients that can be used to make safer formulations (generally recognized as safe). Liposome lipid bilayers can merge with other bilayers such as the cell membrane and help carry the core therapeutic material. This makes it an advantageous delivery system for various dermatologically useful active substances. Liposomes may range in size between 15 nm and several micrometers and can have either a single layer (unilamellar), or a multilayered structure (multilamellar). Nanoliposomes are known as liposomes with vesicles in the range of nanometers.

A new type of liposome has been developed known as transferosomes that are more elastic than liposomes and have improved efficiency. Transferosomes of 200-300 nm in sizes can penetrate the skin more effectively than liposomes. Self-conducted, elastic bilayered lipid droplets can spontaneously penetrate the stratum cornea via intracellular or transcellular routes and can be used as cosmetic and topical drug delivery systems. Niosomes are also nanometer-based vesicular systems made with nonionic surfactants **[16].** Besides stability reasons, niosomes can also be preformulated as proniosomes. Proniosomes are water-soluble portable particles that are covered with surfactant and can be hydrated immediately before use to form a niosomal dispersion. Proniosomal gels can be used because of their unique characteristics as an effective delivery system for cosmetics and cosmeceuticals. Phytosome is a naturally active component complex and a phospholipid – lecithin in general and is established to increase herbal extract absorption and topically isolated active ingredients.

3.2 Nanoemulsions

Biphasic distribution of two immiscible fluids, either in oil (W / O) water or in water (O / W) droplets, stabilized by an amphiphilic surfactant is nanoemulsion. These occur like ultrafine dispersions, which can provide a variety of functionalities with differential drug loading, viscoelastic and visual properties. Since they are transparent dispersions that have droplets within a liquid, they have unique tactile and textural features. These emulsions are meta-stable systems whose structures can be handled based on preparation for various products, for instance, water-like fluids or gels. The potential vehicles for the controlled supply of herbal cosmetics and optimal dispersion of active ingredients, in particular layers of the skins, are nanoemulsions recently increasingly important. One relatively recent but fast-growing field of application for nanoemulsions is 'nanogel' systems and 'emulsion wet wipes,' which are very popular in the treatment of infants and in the removal of makeup.**[17]**

3.3 Solid Lipid Nanoparticles

They are nanometer-sized particles with a solid lipid matrix, which are commonly known as SLNs. They are oily droplets of lipids that are solid and stabilized by surfactants at body temperature. The encapsulated ingredients can be protected against degradation. Polymers such as coenzyme Q10 **[19]** and retinol **[18]** may remain stable for a long time in SLNs.

SLNs, which consist of biodegradable and physiologically biodegradable and physiologic lipids with very low toxicity, are popular in cosmeceutical and pharmaceutical applications

[20]. Their small size ensures that the stratum corneum is in close contact, thereby increasing the penetration by skin of active ingredients**[21]**. SLN 's got U.V. Resistant properties and acting as individual physical sunscreens can be achieved by combining the photoprotection and decreasing side effects with the molecular sunscreen **[22]**. As a carrier of 3, 4,5 trimethoxybenzoylchitin and vitamin E sunscreen, solid lipid nanoparticles are developed to improve U.V. protection **[23]**. protection. Occlusive properties of SLNs are likely to increase hydration of the skin, i.e. the skin water contents **[24].** Perfumes also contain SLNs which delay the release of perfume over a longer period and are ideal for use in day creams **[25, 26].** They have greater coalescence of stability than liposomes because they are reliable, and mobility of the active molecules is reduced, which prevents leakage from the carrier. The advantages and disadvantages of SLNs are shown.

3.4 Nanostructured Lipid Carriers

These are the second generation of lipid particles that are mixed with solid lipids. They are popular as NLCs and are structurally distorted. This imperfection leads to the creation of rooms for active compounds. The NLCs provide high loading capacity and long-term stability which make them in many cosmetic applications superior to SLNs. **[27]** They also have a high level of occlusion and a high degree of skin adherence.

Due to the lower risk of systemic side effects, NLC is receiving increased scientific and commercial attention in the last few years. NLC shows a higher drug capacity for loading the captured bioactive compound in comparison with SLN due to the distorted structure, which helps to create more room. The formulation of NLC eliminates other SLN limitations, such as reducing the concentration of particulate matter and drug discharge during storage. They are formulated with highly toxic biodegradable and physiological lipids. NLC has a modulated drug administering profile, a biphasic pattern of drug release; the drug is initially released at a continuous release rate, followed by a burst. They have numerous beneficial features, such as increased skin hydration due to occlusion, and a small size ensures close contact with the cornea stratum, resulting in increased penetration into the skin of a medication. The incorporation of drugs during storage is stable and UV is enhanced. Reduced side effects protection system with the stratum corneum leading to the increased amount of drug penetration into the skin.

3.5 Nanocrystals

It consists of several hundred to tens of thousands of atoms that are combined into a cluster. They are between 10 and 400 nm in size and have the intermediate physical and chemical properties of bulk solids and molecules. Additional properties such as bond gap, the conductivity of the load, crystalline structure and temperature melting can be modified by controlling the size and surface area. These nanocrystals can easily be converted into a topical formulation by dispersing in water, like a nanosuspension. They have superior light dispersing characteristics and are used in mineral cosmetics. Pyo et al. prepared nanocrystals of the flavonoid Rutin and found that its saturating solubility was improved and that this antioxidant was increasingly diffused into the skin. **[28]**

3.6 Nanopigments

Silver and gold are two essential metals with a wide variety of activities incorporated into the nano-colloidal range. The gold and silver nano pigments are ready to give new lipstick coloured pigments and are safe, harmless and dispersed. For example, if it has a spherical shape of several hundred nanometers of gold, it starts to display different shades of red. In silver, likewise, nanoparticles show the colour yellow and not the colour grey silver. As gold and silver, unlike conventional pigments, do not have any toxicity and they have strong disinfectants and great stability, they have a great future in cosmetics and personal care. The two metal oxides that are invariably used in the sunscreen as physical solar blocking pigments are titanium and zinc oxide**.[29]** Reduced particle size within the nano range improves scanning capabilities and ensures product transparency.

3.7 Dendrimers

For use in the cosmetic industry, dendrimers and hyperbranched polymers were also considered. Dendrimers are mono-molecular, micellar nanostructures approximately 20 nm in size, with a well defined, well-defined symmetrical structure and a high density of functional endgroups. Thin films, such as nail enamel, mascara, such as hyperbranched polymers or dendrimers, can be used appropriately. **[30]**

3.8 Cubosomes

These are discreet, nanostructured, submicron particles from the bicontinuous crystalline liquid phase. It consists of the self-assembly of liquid crystalline particles of specific tensile materials mixed in a certain ratio with water and microstructure. Cubosomes consist of honeycombed structures that split two internal aqueous channels and a wide interfacial area, offering a wide surface area, low viscosity and can occur at almost any dilution level. High heat stability, hydrophilic and hydrophobial molecules are available. **[31]**

3.9 Nanogold and Nanosilver

Gold and silver nanoparticles have been studied as valuable materials for their strong antibacterial and antifungal properties in the cosmeceutical industry. These particles are commonly used in cosmeceutical products, such as deodorant, facial packaging and anti-aging creams. A silver nanoparticle ointment was claimed to be antibacterial and can be used for skin inflammation and disinfection with skin injuries **[32].** A study by French scientist Dr. Philippe Walter and his team, published in ACS Nano, describes the synthesis of fluorescent gold nanoparticles inside human hair. It included soaking white hair in a gold solution.

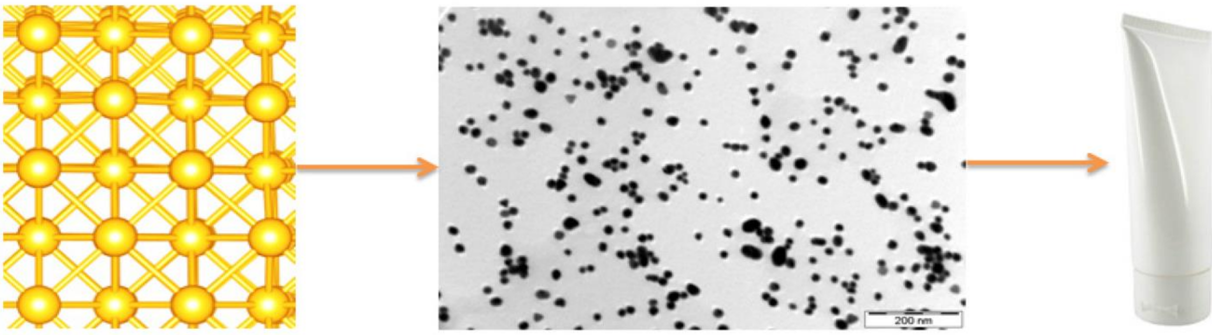

Figure No. 3: Gold nanoparticles use in cosmetic products.[33]

3.10 Nanosponges and microsponges

These are highly cross-connected, polymeric, porous, free-flowing, uncontrolled systems. These properties have been used in cosmetics and dermatological applications for drug delivery systems release of a drug in a diffusion-controlled manner with high effectiveness of trap **[33].** Size and trapping efficiency depend on different factors such as polymer nature, drug solubility, plasticizer type and concentration and the emulsifying process' speed and temperature. Nano-sponged sunscreens provide improved protection against sunburn with minimal irritation and sensitivity **[34].** For example, benzoyl peroxide microsponges are more effective, less sensitive and less skin irritation. Microsponges also offer considerable benefits over other formulations relating to mutagenic and irritating medicines and have a great potential for developing new formulations for topical diseases.

3.11 Fullerenes

Carbon fullerenes have powerful scavenging capabilities against radical oxygen species and are used in cosmeceuticals formulations for their skin rejuvenation properties. Due to their hydrophobic nature, they are not soluble in aqueous solutions, limiting their applications, but a modification of surface and surfactants enhance the capacity of fullyerenes in the water and are thus used in pharmaceuticals [35]. Chirico et al. examined carboxy compleerenes' ability to prevent normal human keratinocytes from UVB-induced apoptosis and results show that carboxy fullerenes penetrate human keratinocytes and act by free radicals and by using confocal laser microscopy and microscopic transmitting electrons to protect cells from apoptosis **[36**]. They are used as anti-aging products with antioxidant properties. For instance, fullerene C60 (Lipo Fullerene) is an active ingredient because of the effectiveness of anti-wrinkle. antioxidative properties. For example, fullerene-C60 (Lipo Fullerene) is an active ingredient due to its antiwrinkle efficacy.

3. 12 Niosomes

Niosomes are nonionic and bilayer vesicles, which are developed by self-assembling nonionic surfactants, with or without lipophilic compounds and have a high degree of entanglement effectiveness, suitable for hydrophobic and hydrophilic drugs, good chemical stability, greater penetration and cost-effectiveness in the production of large-scale products[37]. The diameter of the vesicles ranges from 100 nm to 2 µm and may be polylamellar or unilamellar vesicles in an aqueous solution contained within a membrane arranged as a bilayer. Niosomes are advantageous for dermal application as they increase the API's residence time, reduce corneal stratum's horny layer barrier resistance, and reduce systemic absorption.

4. Major Classes of Nanocosmeceuticals

The fastest-growing segment of the personal care industry is cosmeceuticals. A large number of nanocosmeceuticals are assimilated into nails, hair, lips and skincare. The figure shows significant classes in Nanocosmeceuticals.

4.1 Skin Care (Nanotechnology & Dermatology)

The skin is the largest organ in the human body, with a total area of about 2m. Due to its interaction at the subatomic level of the skin tissue, nanotechnologies promise to transform the diagnosis and treatment of dermatological conditions. The skin is a magnificent vehicle for testing these nanomaterials for drug delivery, both for the delivery and efficacy of active ingredients.

It is more susceptible to radiation and ultraviolet rays, being the most exposed part to the external environment. **[38]** Any skin-related pathology is of cosmetic concern. Since systemic treatment for dermatological problems has its potential adverse effects, higher patient compliance and satisfaction give rise to the topical application.

The skin forms a barrier in the external environment and is impermeable to medicines because of the cohesion of the epidermal cells and lipids of the cornea. Efficient drug delivery systems are required across this barrier. In addition to ensuring direct contact with stratum corneum and skin appendages **[39]** and protecting the medicine from chemical or fitness instability, nanotechnology can modify the drug permeation/penetration by controlling releasing and increasing the period of the durability of active substances on skin **[40].** Furthermore, the delivery of therapeutic agents without the need for chemical enhancers desires the normal function of the skin barrier. Chemical treatments such as surfactants and organic solvents may decrease the barrier function, skin irritation and skin damage treatment with chemical enhancers. **[41]**

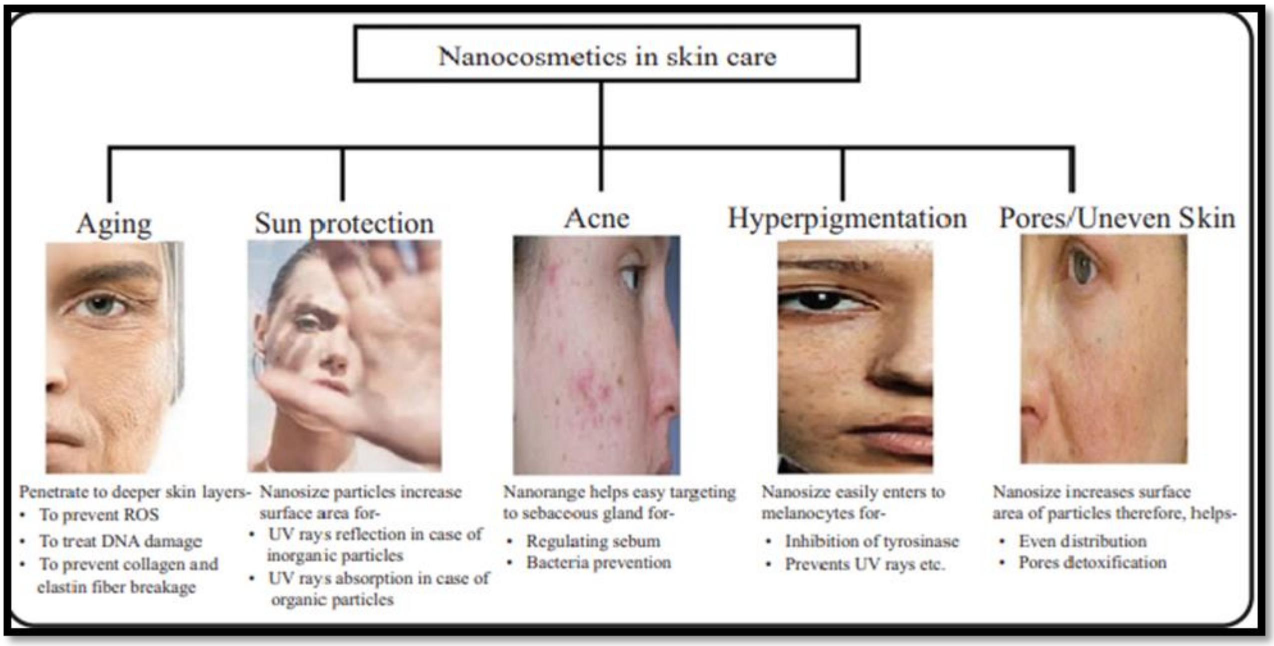

Figure No. 4: Various benefits of nanocosmetics in skincare.

4.2 Aging

Aging is the critical factor in causing skin collagen to lose its physical appearance in many ways, including reduced oil production, dry skin, loss of texture, age, and loose skin. Aging leads to skin thinning and wrinkles formation**[42,43**] This is not limited to the aged population. It may also affect younger people exposed to different harsh conditions such as infrared and ultraviolet rays, chemical pollution and other physical stress. Various synthetic and natural nanosize anti-aging creams with enhanced skin protection for hydration, lifting and white skin are available on the market. Lohani has recently reviewed nanoproducts for enhanced beauty produced by few companies, such as Hydra Zen Cream, Revitalift and Skin Caviar ampoules, which contain phytocompounds and utilize several nanotechnology products.

4.2.1 Anti-aging products

The anti-aging creams usually have an anti-aging component such as hydroxy acids, retinol, tea extract, Q10 coenzyme, grapes, vitamin C, or a combination of fine lines and pores**[44].** They also lift and tighten the skin when you get older. Protein and silica products are used to fill the mesoporous structure, lifting and tightening the skin. Nana Renovator Microdermoblazing and NanoEmulsion of the VitActive Activator are complementary products for anti-aging: one works through a mechanical exfoliation process containing Xylitol and vitamin C microcrystals and the second is a nanoemulsion of the VitActive Activator that imparts the moisture of the skin.

5. Skin Dehyradation

Moisturizers that support the beauty of skin and increase skin flexibility by maintaining moisture can prevent skin dehydration. The stratum corneum that maintains the moisture of the skin is a moisture-preventing barrier. Dehydration causes abundant loss of skin water. Moisturizer creates a thin film on the outer surface of the skin that maintains hydration and can be effectively achieved through various nanotechnological systems. **[45]**

5.1 Nanomoistures

Nanosemulsions, nanoliposomes and solid lipid nanocarrients are currently effectively used in moisturizer formulations with the active International Journal of Nanomedicine 1989 Phyto-based nanocosmeceuticals for therapeutic skin phytoingredients, enhancing the skin's beauty 79,80. Safranol has been used among them to produce solid lipid nanoparticles with enhanced hydrating effects and U.V. Activity protection. Protection activities. The minimum diameter for nanoparticles was 100 nm.80 In a similar way, rice bran oil nanoemulsions were also developed to improve different skin diseases, including atopic dermatitis and psoriasis, with increased hydrating effects. Nanoemulsions from Opuntia Ficus-Indica (L.) extract mill with varying particle size from 92 nm to 233 nm have been developed with enhanced moisturization effects. Currently, different vegetable oil nanoemulsions have been studied as a moisturizer product for their potential use. Vegetable oils will become an excellent alternative to enhanced moisturizing effects in dry skin conditions in the future. **[46]**

6 Sunburn

Sunburn is a red, painful, touch-hot skin. It usually appears from sunshine or artificial sources, such as sunlamps, in just a few hours after too much exposure to UV. The risk of other conditions such as wrinkles, dark spots, and skin cancer is increased through repeated exposure. Symptoms include red, painful, hot-to-touch itchy skin. The skin can blister as well. Treatment includes pain relievers and itching creams.

6.1 Nanosunscreens

Sunscreens protect the skin from exposure to harmful sun rays. Commercially available sunscreens include creams and lotions containing synthetic compounds that act as a barrier when harmful rays touch the skin. Deep U.V. prevents sunscreens. Ray penetration and irritation and other consequences are inhibited. Synthetic sunscreens, however, have disadvantages, including chalky layer formation, grassiness, smell, decreased appeal and toxicity.90 Some of the disadvantages mentioned above are overcome with the use of natural active phyto-based components. Nanostructured lipid carriers were built from rice bran oil and raspberry oil, and increased sunscreen activities were performed with increased antioxidants and UV. Protective Activities.95 In another study, 90-100 nm particle-sized nanoparticles of Phytoflavanoid encapsulated with sunscreen activity and increased antioxidant activity were constructed. In another study, a pomegranate seed oil nanoemulsion was constructed in various sizes, with enhanced antioxidant activity to protect the skin against photodamage. The same research group studied the effect of nanoemulsions of the pomegranate seed oil on the human erythrocytes and found that lipid skin membranes are more photo safe. From previous research, the development of new nanosized phytocompounds can improve sunscreen products with fewer toxic effects. **[47]**

6.1.1 Targeting inflammatory skin disorders

Topical steroids are a major treatment option for different inflammatory skin conditions such as eczema, psoriasis, dermatitis atopic, etc. However, the continuous use of topical steroids involves a basket of side effects such as atrophy of the skin, telangiectasia, striae and etc. Corticosteroids were also used as nanoparticles. Liposomal formulations with topical steroids minimize certain side effects, such as skin atrophy. SLN podophyllotoxin encapsulating was introduced in the treatment of genital warts. Liposomal cyclosporine and tacrolimus showed successful results. The results were encouraging for methotrexates (Liposomal methotrexate hydrogel), for psoralens (lipid nanoparticles), diithranol (liposomal formulations), clotrimazole and other antifungal drugs. Nanoparticles have proved safer and have good therapeutic results as well as better patient tolerance.

7. Nanocarriers and nanoparticles for skin care and dermatological treatments

Nanocarriers

Nanostructured carriers are an upcoming drug delivery option because of their benefits compared to conventional formulations. These colloid particulate systems of 10 nm to 1000 nm provide a targeted drug supply, continued release, degradation-resistant labile groups, low toxicity and adhesive drug adhesion to the skin. Nanocarriers to pharmaceuticals, such as liposomes, micelles, polymer and solid lipid nanoparticles and inorganic nanoparticles and submicrometric emulsions are now available. Zinc oxide particles, generally opaque and greasy, disappear and feel elegant when broken down into nanoparticles, for example. Emulsions divided into nanometers are less oily, are better textured and, when incorporated into emollients and hair conditioners, penetrate the skin and hair more deeply. The physical-chemical features of nanocarriers such as rigidity, hydrophobicity, size and load are crucial to the mechanism of skin permeation. The use of nanoscaled drug carriers is expected to increase the specificity of drugs and thus decrease the dose of administered drugs by reducing the adverse effects. **[48]**

Skincare products Cosmeceuticals improve the texture and function of skin by stimulating collagen growth by combating the harmful effects of free radicals. They improve the health of the skin by maintaining a good keratin structure. Zinc oxide and titanium dioxide nanoparticles in sunscreen products are the most efficient minerals to protect the skin by penetrating the deep skin and making the product less grey, smell-less and traceable.

Skincare products Cosmeceuticals improve the texture and function of the skin by stimulating collagen growth by combating the harmful effects of free radicals. They improve the health of the skin by maintaining a good keratin structure. Zinc oxide and titanium dioxide nanoparticles are the most effective minerals in sunscreen products, which protect the skin by penetrating deeper skin layers and reducing the grease, smelling and transparency of the product**[49]**. SLNs, nanoemulsions, liposomes and niosomes are widely used in hydrogenated formulations since they form a thin humectant film and maintain a long time's moisture content. Marketed nanocosmeceutical anti-aging products, including nanocapsules, liposomes, nanosomes and nanospheres, show beneficial effects such as collagen renewal, skin rejuvenation, and skin firmness and skin lifting.

7.1 Hair Care

Hair can be an indicator of individual health and have a significant impact on the cosmetic look, although it is not a vital organ. Various conditions, including androgenic alopecia, hirsutism and hair colour loss can have a significant impact on a patient's quality of life; this can cause cosmetic concerns and loss of self-esteem, sense of social inefficiency and feelings of helplessness. For example, brittle hair may be an indicator for thyroid disease and/or nutritional deficiency; the perception of 'dry scalp' may range from psoriasis to tinea capitis as a basic skin disease. Dilution of the hair can mean hormonal imbalances. Because of the effect of hair on quality of life, it is not surprising that for a variety of aesthetic reasons consumers try to change their hair. For instance, a blend of lead minerals and loosened lime has been used since Greco – Roman times to colour grey-black hair. However, because of the low penetration and low stability of the bioactive species, hair dye is limited. Moreover, there has been increasing concern throughout the 20th century about the adverse effects of such dyes, including genetic and carcinogenic reactions to human cell lines. The cosmetics and biomedicine industries have therefore turned to emerge delivery platforms. **[50]**

7.2 Anti dandruff

The study, approved by the appropriate ethics committee and organized as a randomized 60-day clinical trial of placebo-market-products-untreated, was conducted to examine two anti-dandruff shampoos (anti-dandruff and non-fat hair) and two conditioning emulsions as well as their efficacy to reduce hair luminosity and glare. It was controlled in double-blind by 70 voluntary subjects (between 2022) and 20 (15 men and 15 women), of whom the oily hair (group 1) was affected, 20 (eight men, twelve women) were affected by dandruff on the scalp (group 2) and 20 (10 men and 10 women) were treated in a commercial product, while 10 (five men and five women) were treated as untreated. A bottle of shampoo and a bottle of creamy packaging were received for the randomized test subjects, both classified as A, B, C or D. All subjects were instructed three times a week to use cosmetic products. Before the treatment started, all subjects were controlled by an expert dermatologist who measured the sebum content of the body at controlled temperature humidity (RH = 50 percent, T = 22 ° C) at the scalp and cellular aggregates (Dandruff) in one room.

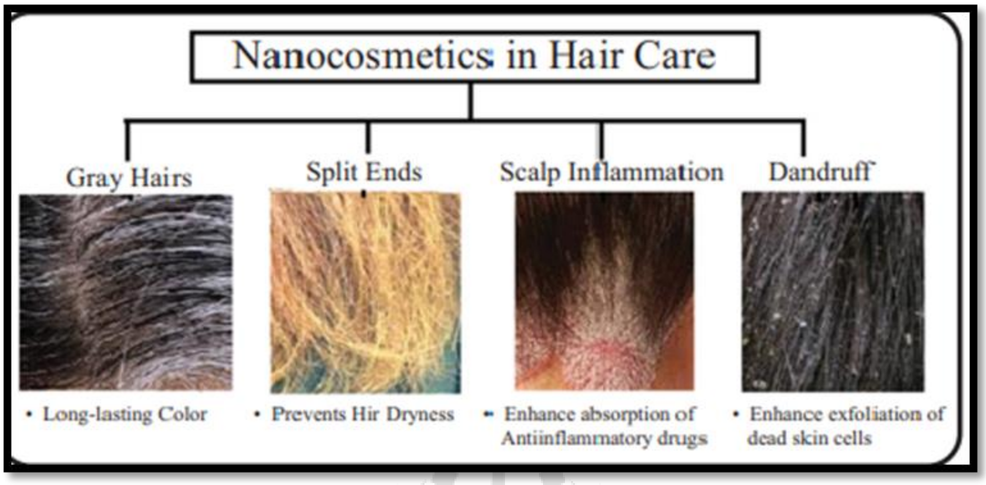

Figure No. 5: Various benefits of Nanocosmetics in Haircare [51]

7.3 Follicular Targeting with Nanoparticles

Topical drug therapy enables significant amounts of drug to be delivered at sites of disease, although low and erratic pharmaceutical absorption and stability of active ingredients frequently confuse delivery. Recent advances in nanotechnology enable carriers with enhanced skin penetration and permeation to develop. The stratum Corneum, the epidermis' lipid-rich, tightly bonded outermost layer, is a natural barrier to penetration of the ingredients, preventing the epidermis from moving into the dermis. Although cosmetic products are not intended for systemic absorption, their effectiveness depends on entry into the armour. Although it has an effective barrier function, some nanomaterials can penetrate this obstacle, depending on their size and structure. Three routes are used for penetrating nanoparticles: (1) intercellular, (2) transcellular and (3) follicular permeation. Intercellular permeation is very hard and depends on the ability of the solutes to penetrate the pores of the skin which are expected to be less than 36 nm in size. The tight matrix of corneocytes also makes transcellular permeation very unlikely. However, the presence of hair follicles helps to penetrate and permeate topically applied nanosized particles. In the past, appendage offices have been thought to occupy 0.1 percent of the skin surface. Nevertheless, new evidence suggests that follicular distribution depends on the body, with some regions (i.e. the forehead) containing a significantly higher number of follicular apertures. This indicates that while follicular openings can be used as a gateway for the transport of nanoparticle medicines into the hair follicle, there are important differences in percutaneous absorption of appendage-free and large areas. **[51]**

The hair follicle represents disruptions in the potential barrier of the skin that not only serve as an entry point for these topically applied compounds and an important reservoir for the transport of drugs and cosmetics. A study by Tenjarla et al., for example, found that corticosteroid penetration in the hairy skin was significantly increased compared to the hairless skin. The size of a particle was suggested to determine the depth of follicular penetration. Many studies have shown that the smaller the particle size, the greater its ability to penetrate the follicular canal. Interestingly enough, the optimum size for follicular penetration was found by a study by Patzelt et al. between 400 to 700 nm, each of which can select different structures within the hair follicle. The authors found that the sebaceous gland could be targeted by selecting 230 nm of particles and the volume could be targeted by selecting 643 nm particles. It is worth mentioning that these particles can penetrate follicular orifices which are supposed to have a diameter of no more than 200 nm. Although the results contrast with previous work, a mechanical effect can be explained instead of an effect specific to the particle size. **[52]**

It was even hypothesized by Lademann et al. This hair movement can pump the nanoparticles deeper into the hair follicles. Therefore, by changing the particle size, a variety of cosmetic modalities can be used to selectively target the structures in the follicle. Furthermore, nanoparticles have demonstrated superiority over non-particle storage formulations; one study found that particle movement was delayed, indicating that they had increased storage in the hair follicle. **[53]**

8 Nanoparticles in Hair Cosmeceuticals

8.1. General Appearance

Hair is a sign of youth, with hair quality positively linked with good health. It is therefore no wonder that the market in hair care is spent an estimated $83.1 billion. Nanotechnological innovations aim to improve the stability of cosmetic ingredients, increase the aesthetics of products and target active ingredients at the focus structures with controlled releases and long-lasting effects. Many research has concentrated on using nanomaterials to improve hair cosmesis maintaining brightness, silkiness, and hair health. Here we have outlined some ways in which nanomaterials have modified the benefits of hair cosmetics. Research shows that nanomaterials have entered on the market in almost every personal hair care product. Nanomaterials have been included in Shampoos to optimize residential scalp and hair follicle contact time, enabling active agents to make a protective film, sealing moisture within quotas (i.e. preventing transfollicular waste of water). Typically, the cuticle layer opens with hot water during washing, exposing the emulsion layer of the hydrolipid, which allows the external water absorption and prevents internal water loss. Due to its hydrophobic characteristics, Silicone accumulates on the scalp rather than permeates the hair in traditional shampoos. However, if silicone oil is incorporated in nanomaterials, because of its small size it can quickly diffuse into hair fibre. This leads to better moisture, gloss and lubrication of the hair. The advantage of this formulation is that the cuticle of hair fibers is not destroyed, but rather that its nano-size allows the hydro-lipid emulsion layer to be penetrated. Contrary to shampooing, the primary purpose of which is to clean hair, conditioning is responsible for replenishing the necessary materials for correct growth, texture and health. Seracin, a silkworm-derived product, was included as cationic nanoparticles in the conditioning agents and has proved useful in the repair, restoration and texture of damaged cuticles. Another study found a significant improvement in dry hair even after repeated shampoos (emulsions with droplet diameter below 100 nm).

The emulsion made the hair shiny, less fragile and non-greasy. The fat of hair could be controlled by another compound containing nanoparticles like oxides, hydroxides, carbonates, silicates and phosphates. In the end, zinc and chitin nanofibril complexes use reduced hair flakes (as measured in the count of corneocyte) and the sebum (as measured by milligrams of superficial lipid in vitro and in vivo per square centimeter of skin surface). The inclusion of nanomaterial in the formula improves the deposition of the ingredients in the hair and directly impacts the synthesis and formation of amino acids in the repair of the damaged cuticle and cortex. In this environment, nanomaterials can improve hair cosmesis by fostering increased contact between the hair shaft and follicle, increasing the number of active ingredients incorporated in the target area. Encapsulation of nanomaterial ingredients optimizes penetration and allows previously insoluble compounds to be produced. This platform therefore offers several advantages for topical applications that are an innovative technology that should be used continuously for commercial cosmetic products. **[56].**

8.2. Hair Color

Roughly 1/3 of the general population use permanent hair dyes with the hair dye manufacturing becoming a multi-billion dollar industry. Most consumers buy permanent hair dyes, a product which, due to its lasting impact, ease of use and changeability, has gained considerable popularity (i.e. allows every colour to be achieved). However, the use of synthetic colours, including hypersensitivity reactions, is associated with adverse events. Several epidemiological studies even link their use with an increased risk of lymphoma and multiple myeloma non-Hodgkin. In this light, the cosmetics industry has developed new teeth and precursors as an alternative to permanent hair teeth. The use of colour hair nanotechnology dates back to when Greek and Roman civilizations were able to synthesise quantum points into a hair shaft, using a recette of black hair, lime and water. More recently, an alkaline HAuCl4 solution enabled gold nanoparticles in human hair to be synthesized. White hair fibres treated with this solution provided various shades (from pale yellow to deep brown), depending on time, with colour remained even after repeated washing (Figure 4). Another study revealed that the incorporation into hyaluronic nanoparticles of p-phenylenediamine (PDA), the principal chemical involved in hair dyeing, successfully reduced toxicity and increased cell viability compared to PDA alone. Interestingly, only the cuticles and cortex of bleached hair fibres could penetrate 206 nm silica-colored nano-particles **[57].**

The authors postulated that bleaching destroys the disulfide bonds in the cuticle of the hair and in the cortex, destroying the lipid bond between the surface of the protein. This allows the protein surface of the hair to interact with nanoparticles, enabling the silica nanoparticles to spread into the hair fibre. A method for coloring or lightening keratin fibres using quantum point nanoparticles luminescent, capable of emitting visible light**[58]** are described by Gourlaouen and Lee. The nanoparticles provide a permanent, wash-resistant colour without keratin fibres being destroyed. Finally, carbon nanotubes improve the affinity of hair fibres to carbon black **[59].** Carbon black, a pigment used in various cosmetic formulations for die-white / grey-black hair, has many constraints because of its poor interaction with hair, ultimately staining other contact surfaces (i.e., pebs, brushes, clothing, skirts). The small dimensions and increased surface-to-volume rate of carbon nanotubes lead to increased affinity and long-lasting interaction with hair fibres.

In addition to the hair shaft, hair follicles also provide a therapeutic focus. As mentioned above, specific sites in the hair shaft can be targeted by manipulating the particle size selectively. For example, topical liposome-trapped melanin has been shown to modify the pigment of the hair follicle in the bulge region via delivery. Nanotechnology developments are therefore offering new possibilities for hair colouring applications, enhancing their lasting effect while limiting toxicity.

Permanent hair dyes are extensively used by around one-third of the general population, with hair dye manufacturing developing into a multi-billion dollar industry. The majority of consumers purchase permanent hair dyes, a product that has gained significant popularity due to its lasting effect, ease of application, and changeability (*i.e.*, allows any color to be achieved). However, the use of synthetic dyes has been associated with adverse events, including hypersensitivity reactions. Several epidemiologic studies have even associated their use with an increased risk of non-Hodgkin's lymphoma and multiple myeloma. In light of this, the cosmetics industry has turned towards developing new dyes and precursors as an alternative to permanent hair dyes. The use of nanotechnology to color hair dates back to when Greek and Roman civilizations could synthesize quantum dots within the hair shaft using a recipe of litharge, slaked lime, and water to blacken hair. More recently, an alkaline solution of HAuCl4 allowed for the synthesis of gold nanoparticles inside human hair. In this study, white hair fibers treated with this solution gave different shades (ranging from pale yellow to deep brown) in a time-dependent manner, with color remaining even after repeated washing. Another study found that incorporating *p*-phenylenediamine (PDA), the principle chemical involved in permanent hair dye, into hyaluronic nanoparticles successfully reduced toxicity and increased cell viability compared to PDA alone. Interestingly, 206 nm silica colored nanoparticles could only penetrate the cuticle and cortex of bleached hair fibers**.[57]**

Authors postulated that bleaching destroys the disulfide bonds in the hair's cuticle and cortex layers, destroying the bond between the lipids and the protein-rich surface. This allows the hair's proteinaceous surface to interact with nanoparticles, allowing for the diffusion of the silica nanoparticles into the hair fibers. Gourlaouen and Lee describe a method for coloring or lightening keratin fibers using quantum dot luminescent nanoparticles, capable of emitting visible light **[58].** The nanoparticles provide a lasting, wash-resistant color without the destruction of the keratin fibers. Lastly, carbon nanotubes enhance the affinity of carbon black for hair fibers **[59].** Carbon black, a pigment used in various cosmetic formulations for dying white/grey hair black, has many limitations given its weak interaction with hair, ultimately staining other contacting surfaces (*i.e.*, combs, brushes, clothing, scalp). The small size and increased surface-area-to-volume ratio of carbon nanotubes result in enhanced affinity and interaction with hair fibers for a lasting effect.

In addition to the hair shaft, hair follicles provide an additional target site of therapeutic interest. As mentioned above, it may be possible to selectively target specific sites within the hair shaft by manipulating the particle size. For example, topical liposome-entrapped melanin demonstrated the ability to modify the hair follicle's pigment via delivery to the bulge region. Therefore, nanotechnology developments are providing new possibilities for hair dye applications, enhancing its lasting effect while limiting the toxicities.

8.3. Hair Growth and Removal

The most common form of human hair loss is Androgenic alopecia (male hair loss pattern), affecting about 50 percent of adult men by 50 and nearly all men in the Caucasus by 80. In addition, the interplay between genetic factors and ageing factors without any underlying disease process results. However, despite its prevalence, male baldness harms socio-emotional events (self-awareness, helplessness, envy, etc.) with a heightened cognitive concern and psycho-social distress. Because the horny and sebum plugs block follicular pores, the drug permeability through the keratin layer is sluggish. Nanotechnology has become a promising system for drug delivery that allows enhanced hair pores to permeate with sustained effects. Zhou et al . reported that fullerene nanomaterials could stimulate new hair growth and induce the formation of hair follicles in the skin of murine and human dermis**[60].** The effect is believed to be due to the capacity of fullerenes to scavenge free radicals, inhibiting the oxidative stress of apoptosis and ageing of the hair follicles.

Minoxidil and finasteride are currently the only two U.S.-approved treatments. Food and Drug Administration for one study found that minoxidil encapsulation into solid lipid nanoparticles demonstrated a similar skin penetration to commercial solutions without the potential for corrosion (i.e., dryness, irritation, burning, etching)**[61].** Finasteride, a 5-α reductase inhibitor that prevents the peripheral conversion to dihydrotestosterone, has a variety of unwanted side impacts following oral administration, and finasteride is proposed as a feasible alternative to oral administration to maintain high skin retention in the skin to reduce the dosage. **[62]** Moreover, polynanoparticles loaded with a variety of hair-growing ingredients (hinokitiol, gylcyrrhetinic acid and 6 benzyl amino purine) were 2–2,5 times more permeable to scalp-pore than checks and enhanced hair growth by accelerating the transition from the telogen to the anagen phase of the hair cycle **[63].** The second study showed significantly higher levels of hair growth in vivo than saline and minoxidil solutions controls **[64]** in a nanocapsule containing hinoxidil infused into a hair clearing or hair shampoo. In contrast, unwanted or excess hair can also have adverse psychological effects and impair quality of life. Because of its widespread effect, people often turn to new hair removal measures, including rashing, waxing and depilatory creams. Laser hair removal has been publicised and its therapeutic and cosmetic utility has gained significant popularity. Laser hair removal is an established method of permanent hair follicles destruction; however, current procedures involve repeated care with very high costs and low efficacy rates for removing lighter coloured hair (grey, white, blonde and red). A patent has been issued recently to develop nanoparticles that can remove unwanted hair **[65]**. The patent claims that the topical application of plasmonic nanoparticles located within the hair follicle to target structures can be activated lightly to locate thermal damage. These results together suggest that topically used nanomaterials are a successful carrier for hair-changing ingredients, which are a possible new therapeutic opportunity for hair loss and hair removal.

9 Lip Care.

9.1 Eczema on lips

Eczema on the lips, which is also known as lip dermatitis or cheilitis, causes the lips to become red, dry and scaled. It refers to a group of conditions of the skin which can lead to rash, cracked skin and painful bubbles. People with eczema usually have flare-ups and remission periods throughout their lives. People can get eczema on their lips because of genetic or environmental factors, such as lip-product irritation or usual lip lacing. Lip eczema often arises after contact with substances that cause irritation or an allergic reaction. Eczema is not usually infectious. But angular cheilitis is contagious as it is caused by infection. People with eczema symptoms on their skin should be able to visit a doctor or dermatologist to diagnose, treat and help identify possible allergens.

9.2 Chapped lips

Lips tapered or cracked are the term used to describe dry lips. Chapped lips can be caused by some factors including:

- Weather
- Excessive liquidation of lips
- certain drugs

Chapped lips are a common condition for most people only. However, a more severe form of chapped lips can develop, called cheilitis. Cheilitis can be caused by an infection with the skin at the corners of the lips that is cracked.

9.3 Nanoparticles in lip care

Nanocosmeceutical lip care products include lipstick, lip baking, lip gloss and lip volumizer. A variety of nanoparticles can be coalesced into lip-gloss and lipstick to soften the lips and prevent the pigments from moving from the lips and maintaining colour for a longer time. The liposome-containing lip volumizer increases lip volume, moisturizes and outlines lips and fills wrinkles in the contour of the lip.

Liposomes are structures of the vesicle of an aquatic core covered with a variable-size lipid bilayer (from 20 nm to micrometric scales), perfect for the transport of hydrophobic or hydropathic compounds. Niosomes are also nanocarrier types, which are bilayered vesicles composed of anionic surfactants, containing cholesterol or not. These nanocosmeceuticals can be fused into lipsticks or glosses, increase lip volume and delineate and fill lip wrinkles, which can usually improve lip moisture. One such example is the volumizer Fillderma Lip (Sesderma), with low molecular weight of hyaluronic acid (nanosomes), mimetic peptides, niacinamide and collagen. Another example is the Primordio Optimum Lip (Lancoa) which includes next alpha-hydroxy acid vitamin E-filled nanocapsules to decrease the finest lines of the lipstick's adhesion. **[66].**

The nanoscale particles used in lipsticks are also vital to reduce the visual appearance of the wrinkles since these lipsticks have skin-like tones. This improvement in optical performance is because of the reinforcing ability of iron oxides and of micro-plaques of titanium dioxides.

Carbon black is a carbon substance of the same size as fullerene (1 nm approximately). Carbon black is a catalyst, absorbent agent, pigment, conduit and modification of the thermal, optical and mechanical properties used in the formulation used in many applications. In the cosmetic market, there are nano-thin spherical powders (0.412 μm), which confer the formulation of intensive colour and high UV resistance. Degradation of light. Models Own Bluebelle is an example of such a product.

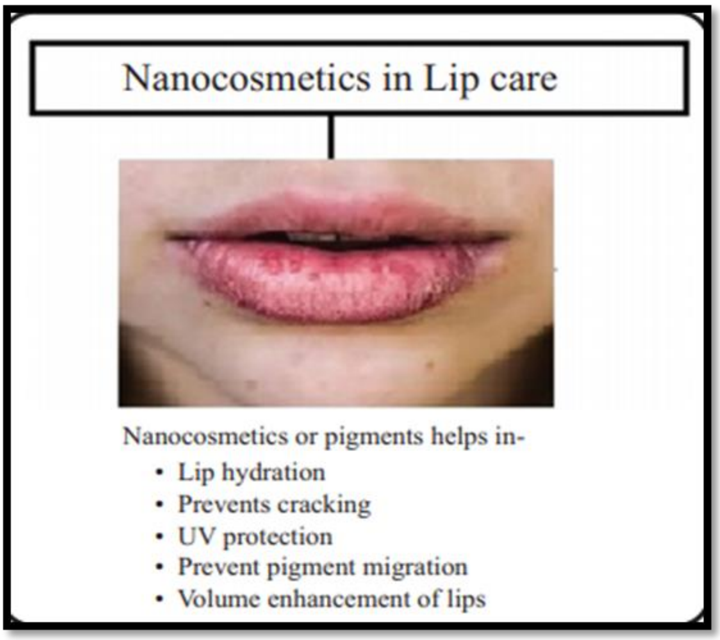

Figure No. 6: Various benefits of Nanocosmetics in Lip care [67]

10 Nail Care

10.1 Onychomycosis

Onychomycosis or uneven fungal infection causes about 50% of nail diseases. The treatment is, however, far from satisfactory. Systemic therapies require long treatment periods and have drug interactions and side effects potential. The use of topical therapies can alleviate these limitations, but the efficiency of topical products in treating onychomycosis is unfortunately somewhat limited. Topical therapies are thought to fail to provide and maintain therapeutic antifungal levels at the target locations, including the nail bed, due to the low permeability of the active ingredients across the nail plate.

As a result, several strategies for improving unusual pharmaceutical delivery have been explored, including chemical and physical improvement (iontophoresis and laser) methods. The products based on nanocosmeceuticals have a greater superiority over conventional products. Nanotechnology-based nail paints have earned them such as increased toughness, quick dryness, durability, chip resistance and elasticity**[68].** New strategies, such as the fusion of silver and metal oxide nanoparticles, have antimicrobial characteristics in nail paints to treat toenails due to fungal infections.

Furthermore, lacquers based on organic solvents are most marketed nail products and formulation approaches with significant limitations. The organic solvents rapidly evaporate when applied to the nail plate, leaving the crystallized medication unable to separate into and spread over the nail plate. Another strategy to improve the uniform delivery of drugs is therefore to formulate vehicles to prevent antifungal crystallization and ensure their release and supply over long periods. The in-vitro release tests (IVRT) conducted with artificial membranes over which the drug is relatively permeable can easily evaluate this capability as, under these conditions, the overall process is primarily limited by the drug release from the formulation.

Figure No. 7: Various benefits of Nanocosmetics in Nail care [69]

11 Penetration of nanoparticles

Nanoparticles' penetration through the skin, biodiversity, excretion and toxicity is determined by the characteristics of nanoparticles (e.g. form, size, area charge). Some of the advantages of nanoparticles included in cosmetics include their unique texture, efficiency and active ingredient **[70]**. Nanomaterials penetrate the skin in three ways: intercellular, intracellular and transappendagal. The nanomaterials spread across lipid bilayers and the matrix of corneocytes on the intercellular pathway; the intracellular pathway comprises aquatic areas surrounded by polar lipids that create microcanal pathways through sweat or a hair follicle **[71].** Lipid bilayers in intercellular spaces, corneocyte matrixes, and high protein levels underneath the stratum corneum can affect the passive movement of nanomaterials through the stratum corneum.

12 Toxicity, safety & hazardous effects of nanocosmeceuticals

12.1 Toxicity associated with nanocosmeceuticals

New technologies and pharmaceutical preparations for nanoparticles are continuously and rapidly growing. In addition to these advances, the process of development and use of nano-based products in society also involves a risk factor. Toxicity issues alongside technological and economic barriers are significant limitations in nanotechnology. Many case studies in recent years have raised problems relating to the safety of nanocosmeceuticals such as cell uptake, genotoxicity and oxidative cell damage. The particle size on the nano range scale makes the particle surface highly active. The penetration into the skin of such highly superficial nanoparticles can result in adverse reactions. Nano-sized TiO2 or ZnO (30–150 nm) are considered safe for the protecting of the skin against harmful solar radiations at levels of up to 25% for use in topical cosmetic products or sunscreens. Several reports have shown that nanoparticles of either TiO2 or ZnOcan did not penetrate beyond the S.C. Skin layer under various test conditions. When exploratory studies of gold nanoparticles were carried out, they were found to be safe with negligible toxicity. Later, there was potential toxicity of changes in the size of gold nanoparticles. Less than 10 nm in diameter, nanoparticles can penetrate deep into the skin and the nuclear membrane, resulting in potential genotoxicity. Nanoparticles should also be prepared in cosmetic products, taking into account toxicity initiating parameters such as morphology and concentration. It has a wide range of significant applications despite the possible challenges associated with nanoparticles. Fullerene Nanoparticles are researched with their excellent antioxidant properties for various dermatological applications, such as antiacne, anti-aging, brightening essence and sunscreens. Numerous case studies have shown that cosmeceuticals based on carbon fullerene can cause brain damage in fish. The colloidal C60 fullerenes have shown genotoxicity in a recent study by Dhawan et al.**[72].**

13 Safety of the Nanocosmeceuticals

The safety of cosmeceutical products is governed by the safety of their ingredients according to the Scientific Committee on Consumer Products and the European Commission. In contrast, the, DA does not require FDA approval before marketing for cosmetic products and their ingredients. To assess the safety of nanocosmeceuticals, the FDA states that manufacturers can explore safety data for specific ingredients or products that have comparable formulations. The Human Care Products Council also measures the safety of nanocosmeceuticals and compares them with the formulations previously marketed. Individual safety facts and data are made available via various sources, such as the FDA's Generally Recognized as Safe database and the Cosmetic Ingredient Database of the European Commission. A group of qualified experts group an ingredient under General Recognized as safe after being classified as "sufficiently safe under conditions of their intended use**"[72].** While this database primarily assesses ingredients such as food additives, it offers also valuable safety information on the ingredients in personal care and cosmetic products. The Cosmetic Ingredient Review (D.C., USA) is also an independent body that evaluates the safety of the ingredients of cosmetic products. Cosmetic Ingredient Review evaluates and sets out recommendations for ingredients using standardized procedures.

As per the Scientific Committee on Consumer Products safety and European Commission, the safety of cosmeceutical products is governed by their ingredients' safety. On the other hand; the, DA does not require cosmetic products and their ingredients to have FDA approval before marketing. The FDA states that the manufacturers can explore the safety data of the specific ingredients or products with comparable formulations to judge the safety of nanocosmeceuticals. Likewise, the Personal Care Products Council measures and compares the safety of nanocosmeceuticals with the previously marketed formulations. Individual ingredients safety facts and data are accessible through various resources such as the FDA's Generally Recognized As Safe database and the European Commission's Cosmetic Ingredient Database. An ingredient is grouped under Generally Recognized As Safe by a panel of qualified experts after being classed as 'having adequate safety under the conditions of its intended use' **[72]**. Even though this database mainly evaluates the ingredients such as the food additives, it also provides valuable safety inputs on the ingredients present in personal care and cosmetic products. Besides, the Cosmetic Ingredient Review (D.C., USA) is an independent body involved in evaluating the cosmetics' ingredients' safety. Cosmetic Ingredient Review evaluates the ingredients using standardized procedures and specifies the recommendations.

Table No. 1: Commercially available nanocosmeceutical formulations with their uses

Product	Company	Use
A. Liposome		
1.CaptureTotale	Dior	Antiwrinkle effect help in removing blemish and dark spots
2. Advanced Night Repair Protective Recovery Complex	Estee Lauder	As skin repairing agent
3. Clinicians Complex Liposome Face and Neck Lotion	Clinicians Complex	Prevent aging and help to provide nutrients to the skin
4. Kerstin Florian Rehydrating Liposome day creme	Kerstin Florian	Rehydrate the skin and acts as a moisturizer
5.Derosome	Microfluidics	Retaining and preventing loss of moisture from the skin
6. Decorte Moisture Liposome eye cream	Decorte	Whitening the black skin around the eyes and also help in moisturizing
B. Niosome		
1.Niosome+	Lancome	Whitening skin and increasing facial look
2.Niosome+ Perfected Age Treatment	Lancome	Removing wrinkle and also help in skin cleansing
3.MayuNiosome BaseCream	Laon Cosmetics	Moisturizing and whitening
4. Anti-Age ResponseCream	Simply	Antiwrinkle agent

	Man Match	
5.EusuNiosomeMakamPom Whitening FacialCream	Eusu	Removing and decreasing wrinkle formation
6.Niosome+	Lancome	Whitening skin and increase facial look

C. Solid lipid nanoparticles		
1.Allure BodyCream	Chanel	Moisturizing the skin and body
2. Soosion Facial Lifting Cream SLNtechnology	Soosion	Antiwrinkle agent and help in nourishing the skin
3.Phyto NLC Active CellRepair	SirechEm as	Rejuvenating skin and help in nourishing with a decrease in pigmentation

D. Nanoemulsion		
1.Vital NanoemulsionsA-VC	Marie Louise	Nourishing skin and miniaturization
2. Precision-Solution Destressante Solution Nano Emulsion Peaux Sensitivity	Chanel	It is moisturizing the skin.
3. Coni Hyaluronic Acid and Nanoemulsion Intensive Hydration Toner	Coni Beauty	Hydrating skin and moisture retention
4. Phyto-Endorphin Hand Cream	Rhonda Allison	Sooth and moisturize the skin
5.Vitacos Vita-Herb Nona-Vital Skin Toner	Vitacos Cosmetics	Moisturizing the skin

E. Gold nanoparticles 1.ChantecailleNanoGold Enerizing Eye	Chantecail	Reducing the aging process by

	e	increasing cell growth
2.AmeiziiNano Gold FoilLiquid	Ameizii	Repairing damaged skin and moisturizing it with increased fairness
3.LR Nano Gold and Silk DayCream	LR Zeitgard	Protect and prevent skin cancer by preventing harmful radiation of the sun
4.O3+ 24 K Gold GelCream	O3+	Providing glowing skin and provide shine
5.Orogold 24K Nano Ultra SilkSerum	Orogold	Prevent moisture loss and keep a healthy skin

F. Nanosphere		
1.Fresh As A Daisy BodyLotion	Kara Vita	Moisturizing the skin and also prevent water loss
2.Hydralane Ultra Moisturizing DayCream	Hydralane Paris	Moisturizing agent and in retaining moisture inside the skin
3.Clear It! ComplexMist	Kara Vita	Help to reduce pimples and prevent acne formation
4.Cell Act DNA Filler IntenseCream	Cell Act of Switzerland	Antiwrinkle agent
5.NanospherePlus	Dermaswiss	Potential anti-aging agent

14 Future perspective

Nanocosmeceuticals are rapidly expanding worldwide. Nanotechnology-integrated cosmeceuticals have shown their practical effects on the treatment of many skin conditions. These products are rapidly marketed and have enormous profits in the personal care product industry in the absence of special guidelines. The awareness of environmental concerns and risks of the side effects of nanoparticle systems is increasing. Accurate, harmonized guidelines and strict rules on future use and advertising of nano-cosmeceuticals are therefore required. For safer and more economical products to the consumer, nanocosmeceuticals, a blend of cosmetics and pharmaceuticals, are highly recommended.

15 CONCLUSION:

Over the past few decades, nanomaterial-based products have increased and reached different markets, e.g. dermatology, cosmetics and pharmaceuticals. Many nanomaterial types were proposed to provide, e.g. liposomes, niosomes, SLNs, NLCs, gold nanoparticles, polymeric nanoparticles, and nanoemulsions as these are produced from biocompatible materials. The nanocosmeceuticals developed show improved stability, biocompatibility, and long action and capacity to improve the skin supply of the payload. Nanoemulsions are an example of significant cosmetic improvements. Their use in personal care products benefits from the possibility of a controlled delivery of cosmeceuticals and a more consistent delivery to the skin by forming a thin film. The ageing of the skin is a complex process caused by endogenous and exogenous factors. The U.V. exposure. Nearly 90 percent of skin ageing processes are caused by radiation. Lifestyle is another factor affecting the progression of skin ageing (i.e. stress, smoking, sleep, alcohol), environmental factors (e.g. pollution), malnutrition, etc. The first signs of ageing are dry appearance, loss of skin elasticity and the appearance of wrinkles. The first signs of skin ageing can now be prevented and delayed. The conventional topical formulations (solution, suspensions, gels, emulsions, powder, aerosols for example) are acceptable to the topical supply of active ingredients but have some restrictions on all these formulations and may jeopardise the safety and efficacy of the treatment. A range of nanomaterials has been developed to overcome these limitations for the supply of active ingredients. The continuous development of skin products with nanomaterial active ingredients provides innovative alternatives in the healthcare and cosmetic fields with beneficial effects on industry and society**.**

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