"PHARMACEUTICAL IN COSMETICS IS COSMECEUTICAL" A STUDY ON RISE OF PHARMACEUTICALS IN BEAUTY PRODUCT, EVALUATING SAFETY AND EFFICACY.

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Abstract

The use of pharmaceutical ingredients in cosmetics products is becoming more common as consumers look for skincare solutions that not only improve appearance but also treat skin condition. The growing demand for products that combine beauty and therapeutic effects has led to the rise of cosmeceuticals, which lie between cosmetics and medicine. This research explores how pharmaceutical compounds such as retinoid, antioxidants, hyaluronic acid, vitamins, and herbal extracts are used in cosmetics to help with issues like acne, aging, dryness, and hyper pigmentation. It also discusses how these active ingredients are formulated to be safe, effective, and easily absorbed by the skin. This paper also looks at the need for proper testing, labelling, and regulation to protect consumers. Overall, the study highlight how pharmaceutical science play a bigger role in the cosmetics industry, global trend and shape a future of skincare.

Introduction

Raymond reed coined the term " COSMECEUTICAL" in 1961 but the concept was further popularized by DR. Albert kligman as an American dermatologist in 1971 reintroduced the "COSMECEUTICAL" by developing a formula to improve the appearance of UV damaged and wrinkled skin, by using retinoic acid.

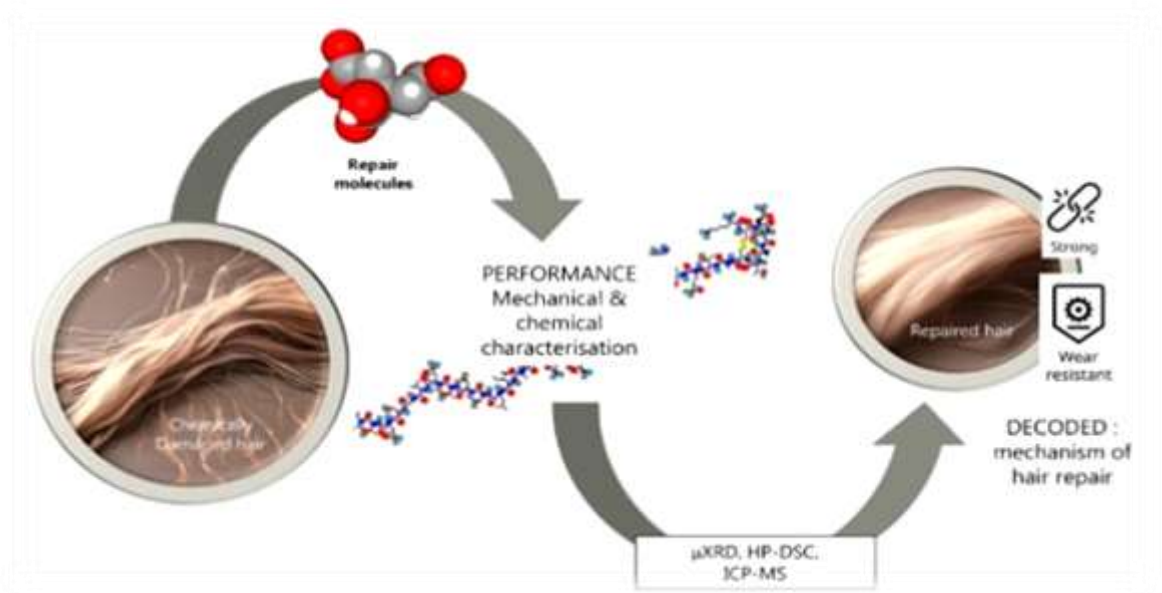
Cosmeceuticals are the cosmetic products with the pharmaceutical activity ingredients and intended to enhance the health and beauty of skin. Pharmaceuticals are essentially drug product. The FD&C Act defines drugs as " article intended for use in the diagnosis, cure, mitigation, treatment, or prevention of disease and articles intended to affect the structure or any function of the body in human. Cosmeceuticals is the fastest growing segment of the natural personal care industry. Cosmecuetical are cosmetic product with bioactive ingredients purported to have medical benefits. Cosmeceutical represent a hybrid between cosmetics and drugs and they stand for products that contain active ingredients capable of altering structure or function. Cosmetic-pharmaceutical hybrid intended to enhance the health and beauty of skin. Some cosmeceutical are naturally derived while others are synthetic, but all contain function ingredients with either therapeutics, disease, fighting or healing properties. Traditional cosmetic are generally meant for beautifying the body and improving the skin's external appearance superficially. Cosmeceutical ingredients must be safe , efficacious, novel, stable, inexpensive to manufacture and can be metabolized with skin. Cosmeceutical improve appearance by delivery nutrients necessary for healthy skin and are generally presented as lotion, creams, gels, pastes, and dyes like formulation and are mostly targeted at dermatological issues. Terms like cosmetics, nutricosmetics, performance cosmetics, functional cosmetics, and dermaceuticals are similar to the term cosmeceuticals.

All of these terms follow the same definition that cosmeceuticals formulation are neither pure cosmetics, nor pure drugs, they are hybrid products which lies between drug and cosmetics.

Hair-care cosmeceutical product :-

The appearance of the hair is a feature of the body over which humans, unlike all other land mammals has direct control.

Hair care, colour, and style plays a important role in people's physical appearance and self perception. Among the earliest forms of hair cosmetics procedure in ancient egypt were hair setting by the use of mud and hair colouring with henna. In ancient greece and rome, countless ointments and toxics were recommended for the beautification of the hair, as well as remedies for the treatment of hair applied topically to the scalp and hair while they can never be used for therapeutics purposes, they must be harmless to the skin and scalp, to the hair and to the mucous membranes should not have any toxic effect, general or local in normal conditions for their use.



A hair cosmeceutical product contains –

Special care ingredients, conditioning agents, and hair growth stimulants. A number of ingredients are fatty ingredients, quaternized cationic derivatives, hydrolyzed protein, cationic polymer and silicon. Therefore, current antidandruff agents that are octopirox, zinc pyrithione and ketoconazole.

A minoxidil related compound (2,4-diamino-pyrimidine-3-oxide) is a cosmetics agents acting as a tropical hair growth stimulants used to prevent inflammation and perifollicular fibrosis.

Skin-care cosmeceutical product :-

Cosmetics and skin care products are widely used in everyday grooming. Skin is the largest gland in the body and it protects internal environment from external harmful radiation, air pollution, toxic material as well as normal aging process which cause damage to building blocks of skin. Use of cosmetics or other beauty products will not cause the skin heals or maintain as it is, cosmeceutical products have medicinal or drugs like properties that are able to affect the biological functioning of skin by the type of functional ingredients that they contain. Skin care cosmeceutical products enhance the appearance, texture or the functioning of the skin.

Skin lightning agent:-

Skin lightning agents are applied to treat hyper pigmentation. Hyper pigmentation is the process of changing of colour intensity of the skin to darker hue, which occurs when melanin level get increased into the epidermis as well as the dermis or both.

Mainly two pathophysiologic process are the reason for this change one is melanocytosis (increased number of melanocytes), and another one is melanosis (increased amount of melanin. Agents which are main reason of skin lightning works best when melanosis or melanocytosis is confined to the epidermis.

When skin lightning agent used topically then it produces a reversible depigmentation of the skin by inhibiting of the enzymatic oxidation of tyrosine to 3,4-dihydroxyphenylalanine (dopa). Melisma like disorders which occurs due to hyper pigmentation are also treated by the SLA.

All SLA act on the natural production of melanin and mostly used SLA are known as competitive inhibitors of tyrosinase, it one of the key enzymes in melanogenesis.

Sunscreen agents :-

Sunscreen agents are used to prevent sunburns, skin cancer, chemical sunscreen agents and physical sunscreen agents are those are the two types of sunscreen agents. Chemical sunscreen agents are those

which protects the skin forms the sun by absorbing the ultraviolet (UV) and visible sun rays, while physical sunscreen agents are those which reflects, scatter, absorb, or block the rays.

Creams , lotions, gels, ointment, pastes, oil, butters, stick, and sprays re the common forms of sunscreen.

Moisturizing agents :-

Stratum corneum is the outermost layer of the epidermis which consists of keratinized cells. It is primary barrier between the body and the environment. Its main purpose is to keep inside in and outside out , this layer is rich in cholesterol , free fatty acid and ceramids.

Various oily preparation like mineral oil, lanolin, cyclo methicone, etc. Have been used to reduce fine lies, smoothen and hydrate the skin. Some components like lycyrrhetinic acid, telmestine, caramide-dominant barrier repair lipids have anti inflammatory properties.

Structure and function of the human skin:-

The skin is the largest waterproof and most protective external barrier between the internal structured organs. The total weight of human adult skin is approximately 3.6 kg.

The structure of the skin is shown

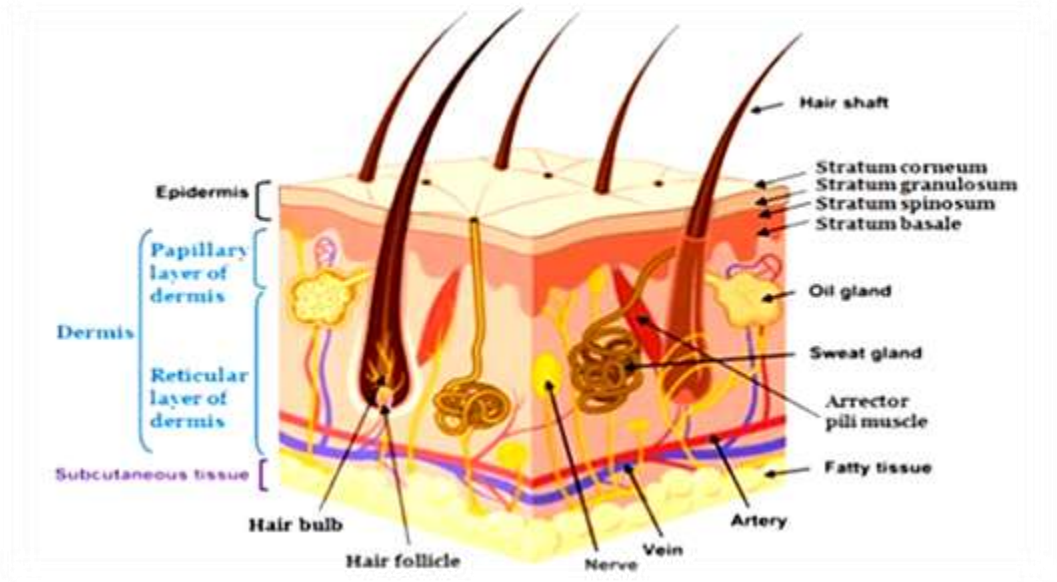


Fig :- Anatomy of the human skin.

It is composed of generally three types of layers; Epidermis, Dermis and hypodermis.

The epidermis layer consists of a total of five portion i.e :- stratum corneum (outermost epidermis portion), stratum lucidium (present only hairless part of the body), stratum granulosum, stratum spinosum and stratum basale (deepest epidermis portion). However , this layer contains many cells such as melanocytes, langerhan's cells , and

markel's cell , but keratinocytes are the most dominant epidermis cell type. The intricate network of this largest organ provides a shielding barrier effect against the different environmental stresses.

The outermost layer of our skin, known as the stratum corneum, presents a formidable challanges for any topical or transdermal treatments. Its intricate physiology comprises densely packed lipids and proteins. Skin hydration refers to the moisture content present in both the epidermis and dermis layers. Maintaining optimal skin hydration stands as a pivotal factor in ensuringskin health. The flexibility of the epithelium is preserved when it retains a water content within the range of 10-20% . This balance is upheld through components, including the natural moisturizing factor and specific intercellular lipids within the stratum corneum, contributing significantly to skin homeostasis.

The skin serves a crucial role as a protective barrier, shielding underlying tissues from dryness, infections, physical strains, and irritation from chemicals.

Water plays a vital role in maintaining the skin health, particularly in its outermost layer, the stratum corneum. The regulation of water loss from the kin is a critical process that relies on the intricate structure of the SC. Retaining water in SC hinges on two factor :-

→ First , the presence of natural moisture absorbing elements within corneocytes, collectively known as the natural moisturizing factors and,

→Second, the organised arrangements of intercellular lipids in the SC, forming a barrier that controls trans epidermal water loss(TEWL).

Adequate water content in the SC is crucial for its proper maturation and the shedding of dead skin cells. Increased TEWL disrupts the enzymatic functions necessary for normal shedding, resulting in visible presence of dry, flaky skin.

As individual age a combination of internal and external factors leads to a decline in the skin barriers function. Aged skin becomes more prone to persistent, dryness, and itching, hightened susceptibility to skin infections, autoimmune conditions, vascular compilation, and an increased risk of developing skin disorder.

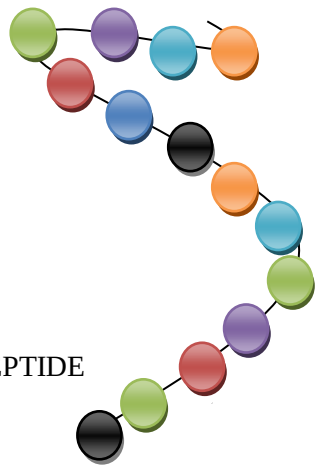
Most of the cosmeceutical formulation use fundamental ingredients such as peptides, retinol, coenzyme Q-10, alpha lipoic acid , alpha hydroxy acid, beta hydroxy acid, aloevera, panthenol, kinetin, and vitamins A, C, E.

PEPTIDES :-

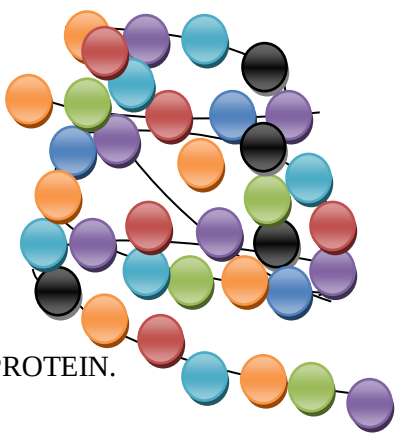
Peptides are strings of amino acids that are added to some skincare products to boost their effectiveness and serves as signalling molecules within the body, instructing cells on how to function

- GHK-Cu (copper peptide) is often cited as one of the best peptides for skin, particularly for its anti aging and regenerative properties.
- Acetyl hexapeptides-8 (argireline)Known as botox in a bottle, it relaxes facial muscle and reduces appearance of wrinkles.
- Matrixyl (palmitoyl pentapeptide-4) reduces wrinkles depth and volume while boosting collagen production.
- SNAP-8 :- works similarly to argireline by relaxing facial muscles and smoothly fine lines.
- Signal peptides (like matrixyl 3000) :- help to firm and tightened sagging skin

AMINO ACID



PEPTIDE

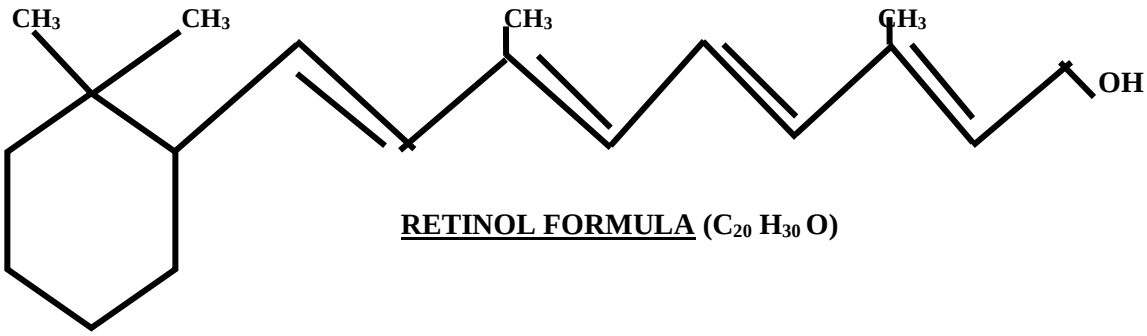


PROTEIN.

RETINOL :-

Retinol increases skin cells production (proliferation) it helps unclog pores. Retinol also exfoliates your skin and increases collagen production. Retinol , a form of vitamin A is popular ingredients in cosmetic products.

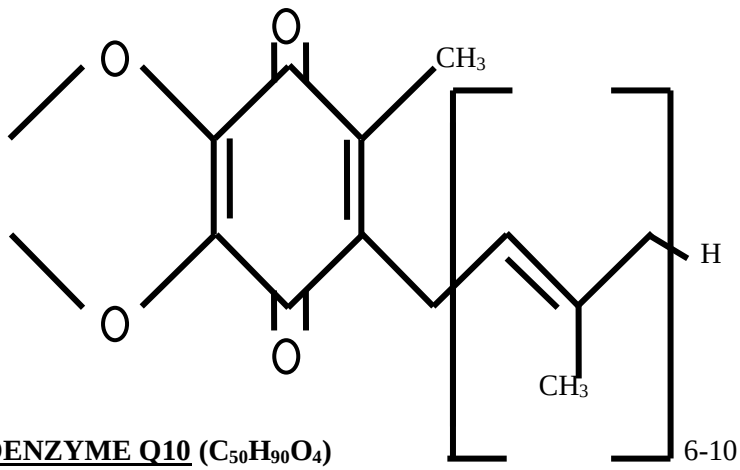
Primarily used for its anti aging and acne fighting properties. It can reduce the appearance of wrinkles, fine lines, and blemishes and improve skin texture , while generally safe for people , retinol can cause dryness and irritation especially for those with sensitive skin. Retinol boosts skin cells turnover for smoother skin.



RETINOL FORMULA (C_{20} H_{30} O)

CO-ENZYME Q-10 :-

Coenzyme Q-10 a popular ingredients is cosmetics due to its antioxidant and anti aging properties. Coenzyme Q-10 also known as ubiquinone. Ubiquinone is often used for its anti aging properties. Ubiquinone is a naturally occuring compound in the human body and commonly used in cosmetics , but its levels decrease with age making topical application beneficial.



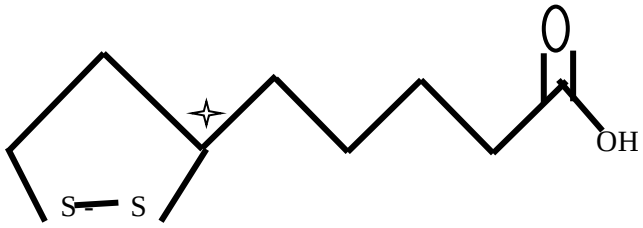
COENZYME Q10 ($C_{50}H_{90}O_4$)

ALPHA LIPOIC ACID (ALA) :-

ALA is also known as thioctic acid or 1,2-dithiolane-3-pentanioc acid. Its powerful antioxidant used in cosmetics for its anti aging and skin protective properties. It helps protect the skin from oxidative stress, reducing the appearance of fine lines, wrinkles, and age spot.

Thioctic acid also promotes collagen production, improving skin firmness and elasticity.

ALA has been shown to inhibit melanin production, resulting in a more even skin tone and reduced discoloration. ALA may help reduce hyper pigmentation, such as dark spot and melasma.

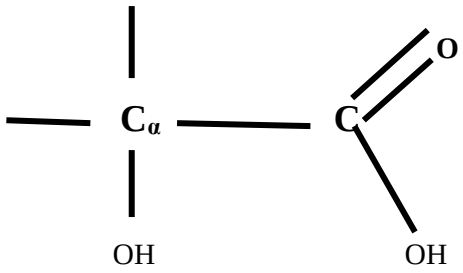


ALPHA LIPOIC ACID ($C_8H_{14}O_2S_2$)

ALPHA HYDROXY ACID (AHAs) :-

AHAs are a group of chemical compounds derived from natural sources like fruits and milk. Commonly used in cosmetics for their exfoliating and skin renewing properties. Products containing AHAs are marketed for a variety of purpose, such as smoothing fine lines and surface tone, unblocking and cleansing pores and improving skin condition in general.

Some AHAs like glycolic acid can also stimulate collagen production in the skin , which can improve skin elasticity and reduce the appearance of wrinkles. AHAs in glycolic acid, lactic acid, and mandelic acid etc.



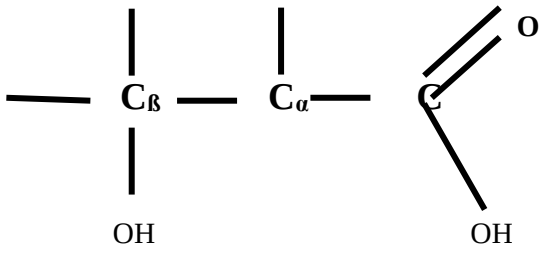
ALPHA HYDROXY ACID (R-CH(OH)-COOH)

BETA HYDROXY ACID (BHAs) :-

BHAs are another category of exfoliating acids known as beta hydroxy acid. BHAs particularly salicylic acid are commonly used in cosmetics as exfoliants and acne treatment , including rough and bumpy skin , acne , psoriasis, seborrheic dermatitis.

BHAs are also used to address fine lines, wrinkles, and hyper pigmentation. They work by penetrating pores to loosen dead skin cells, reducing inflammation and improving skin texture.

Beta hydroxy acid have salicylic acid, beta hydroxy butanoic acid, tropic acid, and trethocanic acid .



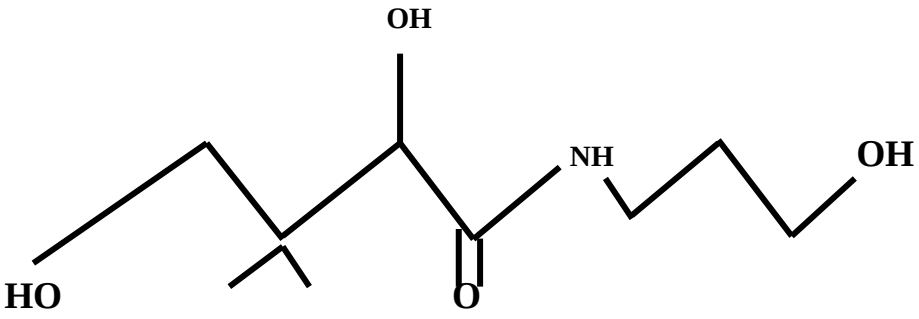
BETA HYDROXY ACID ($CH_3CH(OH)CH_2CO_2H$)

PANTHENOL :-

Panthenol also known as provitamin B_5 is a common ingredients is cosmetics due to its moisturizing and soothing properties. Panthenol can strength the skins natural barrier which helps protect it from environmental damage and moisture.

In hair products panthenol can improve hair elasticity, making it less prone to breakage and can also add shine and manageability.

Panthenol is generally considered safe for use in cosmetics and has been approved by the FDA and the european commision . Panthenol can also help to reduce irritation caused by other ingredients in a cosmetic products.

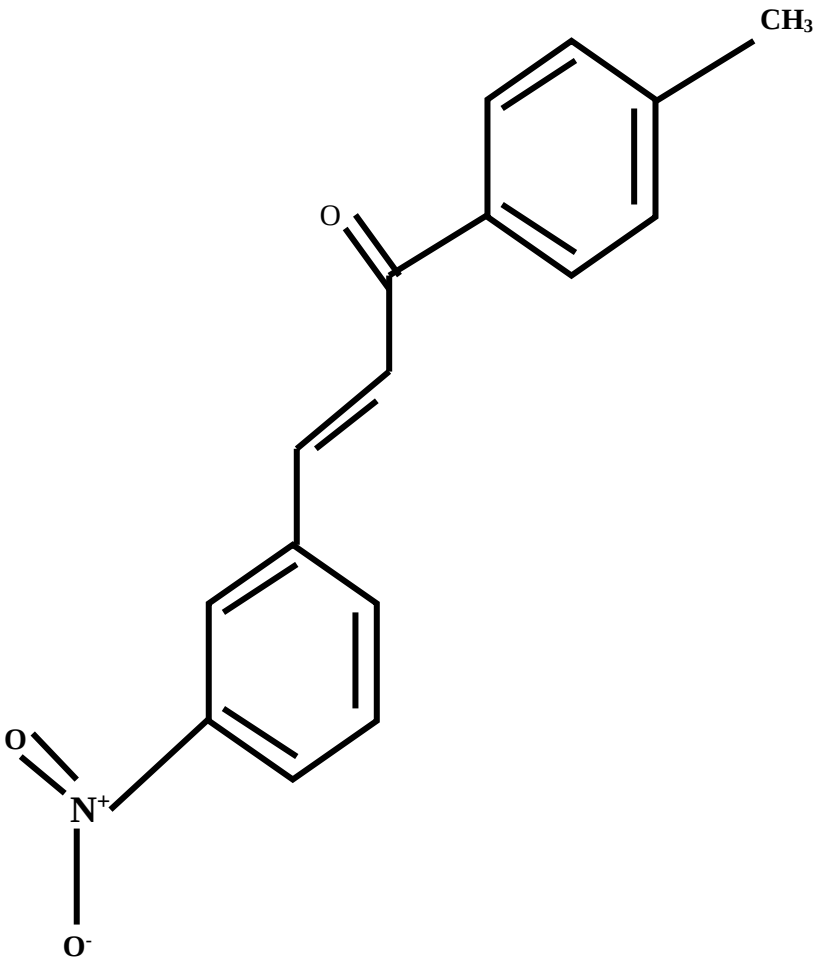


PANTHENOL ($C_9H_{19}NO_4$)

ALOEVERA :-

Aloevera is a popular ingredient in cosmetics widely recognised for its moisturizing soothing and repairing properties. Aloe stimulate fibroblast which produce the collagen and elasting fibres making the skin more elastic and less wrinkled.

Aloevera helps hydrate the skin, soothing and calming , repairing properties, anti inflammatory, anti aging, anti acne, and promote healing. Aloevera has shown other therapeutic properties including anti cancer, antioxidants, anti diabetic, and anti hyper lipidemic .



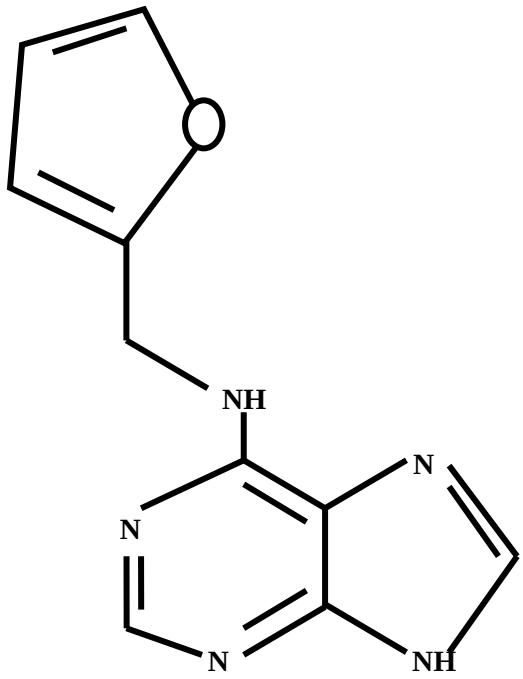
ALOEVERA / ALOEBARBADENSIS ($C_{16}H_{13}NO_3$)

KINETIN :-

Kinetin a plant derived compound is used in cosmetics as an anti aging agents. Kinetin is a synthetic cytokinin a plant hormone and is an adenine derivative that can promote cell growth and division. Kinetin is found naturally in plants and it also exists in human cells.

In skincare its believed to help reduce the appearance of fine lines and wrinkles improve skin texture and pigmentation and enhance skin hydration.

Kinetin has anti aging properties and anti oxidant activity while also offering protection against cellular damage. Kinetin improve barrier function of the skin by modulating keratinocyte differentiation marker, suggesting that it may affect differentiation to improve skin moisture content , TEWL, and other signs of skin aging. Keratin reduce trans epidermal water loss (TEWL).



KINETIN ($C_{10}H_9N_5O$)

VITAMIN A, C, E :- are commonly used in cosmetics for are their antioxidant and skin beneficial properties.

VITAMIN A(RETINOL) :-

Stimulate collagen production which can help reduce the appearance of wrinkles and fine lines. Vitamin A can be affective in anti aging and acne fighting properties. Vitamin A promotes cell turnover leading to a more youthful and radiant complextion.

Retinol = $C_{20}H_{30}O$

VITAMIN C (ASCORBIC ACID) :-

Vitamin C may help with collagen synthesis and wound healing. Vitamin C reduces hyper pigmentation and brightens skin tone. A potent antioxidant that protects skin from damage caused by free radicals and UV radiation.

Ascorbic acid = $C_6H_8O_6$

VITAMIN E (TOCOPHEROL) :-

Vitamin E can improve skin hydration and texture. It reduces inflammation and redness promoting overall skin health. It is another powerful antioxidant that protects the skin from environmental damage.

Tocopherol = $C_{29}H_{50}O_2$

Vitamin A,C,E are often found in anti aging creams, serums and moisturizer. They can be used in combination or separately to address various skin concern and improve the overall appearance and health of the skin.

RESEARCH QUESTION :-

The global market of food ,cosmetics, and pharmaceutical products requires continues tracking of harmful ingredients and microbial contamination for the sake of the safety of both products and consumer as these products greatly dominate the consumer health, directly or indirectly.

The existence survival and growth of micro organisms in the product may lead to physiochemical degradation or spoilage and may infect the consumer at another end. It has become a challenge for industries to product a product that is safe, self stable, and has high nutritional value, as many factors such as physical, chemical , enzymatic , or microbial activities are responsible for causing spoilage to the product within the due course of time. Thus preservatives are added to retain the virtue of the product to ensure its safety for the consumer.

Nowadays, the use of synthetic/ artificial preservatives has become common and has not been widely accepted by consumer as they are aware of the fact that exposure to preservatives can lead to adverse effects on health, which is major concern for researchers.

Naturally occurring phenolic compounds appear to be extensively used as bio-preservatives to prolong the shelf life of the finished product. Based on the convincing shreds of evidence reported in the literature, it is suggested the phenolic compounds and their derivatives have massive potential to be investigated for the development of new moieties and are proven to be promising drug molecules.

The objective of this article is to provide an overview of the significant role of phenolic compounds and their derivatives in the preservation of perishable products from microbial attack due to their exclusive antioxidant and free radical scavanging properties and the problems associated with the use of synthetic preservatives in pharmaceutical products. This article also analyzes the recent trends in preservation along with technical norms that regulate the cosmetic and pharmaceutical products in the developing countries.

Today the world cosmetics industries faces a huge demand and challenges in providing assured quality of cosmetic products with the advancement in technology, globalization and increased purchasing power, the consumer in recent years have become more aware of hygiene and beauty which is the foremost reason behind the rapid development of cosmetic industries. The people behaviour is complex and dynamic as the aspirants of every female community are to look beautiful and attractive.

SIGNIFICANCE OF RESEARCH

Pharmaceutical research provides access to a wide range of active ingredients with proven efficacy and safety profiles. Pharmaceutical principles guide the selection of safe and effective preservatives, emulsifier and other excipients.

This includes vitamins, antioxidants, peptides and other compounds that can be incorporated into cosmetics formulation to target specific skin concern.

Pharmaceutical research contributes to the development of advanced delivery systems, such as liposome, nanoparticle and microencapsulation, which can improve the penetration and efficacy of cosmetic ingredients. These system can help deliver active ingredients to deeper layers of the skin enhancing their effects.

Pharmaceutical standard and quality control measures are crucial in ensuring the safety and efficacy of cosmetic products.

Rigorous testing for purity , stability, and potential toxicity is essential in Pharmaceutical research and is applied to cosmetic development. This helps minimize the risk of adverse reactions and ensures that products meet safety standard. The intersection of Pharmaceutical and cosmetics has lid to the development of cosmeceutical, which are cosmetics products with medicinal or drug like benefits.

These products aim to improve skin health and appearance simultaneously offering both cosmetics appeal and potential therapeutic effects. Pharmaceutical research drives innovative in the cosmetic industry by introducing new technology, ingredients and formulation. This lead to the development of novel cosmetic products with enhanced efficacy and new functionalities.

Pharmaceutical industry significantly impacts cosmetics research by providing a foundation for developing effective and safe cosmetics products. Pharmaceutical principle are applied to formulate cosmetics with enhanced efficacy, better skin penetration, and reduced irritation potential. This include utilizing pharmaceutical ingredients, delivery systems and quality control measures to create cosmecueticals that offer both cosmetics benefits and potential therapeutic effects.

The physical compatibility of a cosmetics products is also essential the incorporation of a preservatives may alter the overall appearance of a cosmetics or medicinal products. Depending on what kind of containers employed for packaging them , the preservatives composition and activities may change in the cosmetics and pharmaceuticals products.

The lipophilic preservatives frequently have a greater possibility of being absorbed by the container. Certain preservatives are incompatible with such as poly ethylene with specific phenolic compounds and mercury or nylon with parabens.

KEY THEORIES OR CONCEPTS

Key concept in cosmetics research paper include natural /organic ingredients, biotechnology / nanotechnology integration, personalized / customized products and the role of delivery systems in enhancing efficacy.

Understanding skin and hair biology as well as mathematical modeling for products development are also crucial. Furthermore, concept like “cosmeceutical which bridge the gap between pharmaceuticals and cosmetics are gaining prominence.

NATURAL AND ORGANIC INGREDIENTS

Natural and organic ingredients in cosmetics offer numerous benefits, including reduced risk of side effect, environmental friendliness and nutritional richness.

Organic cosmetic in particular are held to higher standard, requiring a minimum of 95% organically produced ingredients. Common natural and organic ingredients include :-

Botanical extracts :- These extract derived from plants can offer a range of benefits such as anti inflammatory and antioxidants effects.

Plant oil :- examples include olive oil, coconut oil, shea butter and jojoba oil, known for their moisturizing and skin soothing properties.

Essential oil :- Lavendar , tea tree, and other essential oils can provide therapeutic benefits, including relaxation and acne treatment.

Minerals :- Naturally derived minerals can add colour, texture, and sun protection to cosmetic products.

While both natural and organic cosmetics prioritize natural ingredients, organic products adhere to stricter standard regarding ingredients sourcing and production. Organic farming ,such as avoiding pesticides and chemical fertilizers are essential for organic cosmetics.

Several certification like cosmos and eco cert in India help consumers identify genuine organic and natural cosmetics. These certification ensure that products meet specific standard for ingredients sourcing , production method and packaging.

BIOTECHNOLOGY AND NANOTECHNOLOGY

Biotechnology and nanotechnology are revolutionizing the cosmetics industry by enhancing the efficacy and delivery of active ingredients in beauty products.

Nanotechnology enables the creation of smaller, more stable and targeted delivery systems, while biotechnology contributes to the development of novel bioactive compounds .

Biotechnology allows for the development of ingredients derived from natural sources, which are often more biocompatible and less likely to cause irritation.

Biotechnology can contribute to the development of personalized skincare solutions tailored to an individual's unique genetic makeup and skin type.

Nanoparticle such as liposome, solid lipid nanoparticles and nanoemulsions, acts as carrier to delivery active ingredients like vitamins, antioxidants, and peptides deep into the skin, improving their absorption and effectiveness.

VARIOUS USES OF NANOPARTICLES IN THE COSMETIC INDUSTRIES.

- LOTIONS / MOISTURIZERS
- LIPSTICK
- NAIL PRODUCTS
- EMULSIONS
- CLEANSERS
- EMULGEL
- HAIR PRODUCTS

Nanocarrier protect sensitive ingredients from degradation, ensuring they remain potent until they reach their target.

Nanotechnology allows for the customized of products to address specific skin concerns, such s aging, hyper pigmentation, and acne by targeting specific areas or cells.

Anti aging creams :- Nanoparticle encapsulate anti aging ingredients like peptides and antioxidants, delivery them deep into the skin for enhanced results.

Sunscreen :- Nanoparticles of zinc oxide or titanium dioxide offer broad spectrum protection while remaining transparent on the skin.

Acne treatment :- nanoparticles can deliver anti inflammatory and antimicrobial agents to target acne causing bacteria and reduce inflammation.

CONTROVERSIES

The term " cosmeceuticals" has always been controversial with the lack of proper definition. Its difference from individual cosmetics and pharmaceuticals agents, the mechanism, dermatological use, regulatory issues. This activity will also distinguish cosmeceuticals from cosmetics and drugs, the uses of each general regulatory aspects and highlight the role of the interprofessional team in the appropriate utilization of cosmeceticals and on educating patients about them .

The not so clear definition of " cosmetics and drugs" is part of the reasons why there's confusion around cosmeceuticals. In terms of regulation a drug is something that's used to diagnose, treat or prevent disease or to affect the body structure or function.

Although the term cosmeceuticals is steeped in dermatology literature and dominants academics discussion, symposia, and lectures around the world, it is strangely interesting that almost four decades after coming terms. Both in the united states and the European union, a drug is defined as " an articles intended for an use in the diagnosis, mitigation treatment or prevention of disease or intended to affect the structure or any function of the body.

In contrast the FD&C Act of 1938 defines cosmetics as articles intended to be rubbed, poured, sprinkled or sprayed on, introduced into or otherwise applied to the human body or any part there for cleansing, beautifying, promoting attractiveness or altering the appearance without affecting structure or function.

In India a well defined Drugs and cosmetics Act (1940) operates the regulations of cosmetics under the authority of the central drugs standard control organization (CDSCO). But CDSCO also recognize drugs and cosmetics ,not cosmeceuticals.

In a nutshell it is unfortunate that despite the ubiquitous presence, sale, marketing and prescription by dermatologists to date there is no international consensus.

These impact of this deficiency in regulatory nomenclature has far reaching consequences covering the essential of product labelling [prescription or over the counter OTC], the stringency of testing protocol and approval for sale and distribution.

In the US for example in contrast to strict law for drugs there is no requirement for manufacturer to demonstrate either safety of efficacy before marketing a protocol that would otherwise quality as a Cosmeceutical as is the case for drugs.

The Japanese authorities identity that many skincare product qualify as neither pure drugs , nor pure cosmetics in the traditional sense but a mix of the two call them “quasi drugs”.

Currently, cosmeceuticals are a segregated subclass within the domain of a cosmetic or drugs. In Europe and Japan cosmeceuticals are a subclass of cosmetics; however in the US cosmeceutical can only be considered as a subclass of drugs.

METHODOLOGY :-

A cosmetic product on the other hand is used only for cleansing the appearance of the human body without affecting its structure or function, without clear guidelines for cosmeceuticals there can be consequence regarding important factors like product labelling, testing, procedures, and approval for sale and distribution.

For our purpose we might consider a cosmeceuticals to be a product that has some pharmaceutical activity can be applied on normal skin, benefits minor skin disorders, and carriers a low risk profile.

The term “NUTRACEUTICAL” can be referred to as a product that comes from foods but is sold in the form of pills, powder, or other medicinal form . Nutraceutical are often sourced from natural herbs, food industry, and the pharmaceutical industry. When it comes to skincare, thinkof a nutraceutical as a product that is consumed orally and offers benefits similar to a cosmeceutical .

There are many cosmeceutical available and often come is a variety of forms like tablets, creams , or oil for oral use or application directly to the skin.

- Alpha lipoic acid (taken orally)
- Co enzyme-Q 10 (taken orally)
- Vitamin B-complex (taken orally)
- Vitamin C (taken orally and applied topically)
- Hydroquinone(applied topically)
- Retinoids (taken orally)
- Comfrey (applied topically)
- Licorice (applied topically)
- Turmeric (both topical and oral)
- Aloe Vera (both topical and oral)
- Hyaluronic acid
- Allium cepa
- Panthenol (applied topically)

It is just a sample of the types of substances that are commonly used in cosmeceuticals.

Cosmetics are a category of health and beauty products that are used to care for the face and body or used to accentuate or change a persons appearance the history of cosmetics is present for at least 7000 years and is present in almost every society around the globe.

India has become one of the emerging countries with large growth in cosmetic industries with each passing year.

South Korea cosmetics industries has experienced substantial growth becoming a global leader and contributing significantly to the nations economy. Driven by the popularity of k beauty and the influence of Korean culture (Hallyu wave).

In spite of the global economic recession, above 350 billion rupees was registered by the cosmetic industries of India in 2009.

In 2024 South Korea cosmetic exports surpassed USD 10 billion, securing the nations position as the third largest exporter globally.

Sunscreen creams and soaps are some of the widely used cosmetics. Even though, cosmetic are considered as boon by huge populations globally the risk and toxicity of the cosmeceutical are not to be excluded.

In silico modelling for cosmeceuticals , circular economy release based on biological stimuli are some of the latest trend in cosmetics.

Hypoallergenic cosmetics products can be defined as the class of cosmetic which tends to produce lesser allergic reactions when compared with other cosmetic formulation.

The two firms charged that FDA had no authority to issue the regulation, but the court upheld FDA. Later the court of appeals of united states stated that the cosmetic companies can continue the labelling term " HYPOALLERGENIC". Process of labelling can reduce the probability of severe allergic reaction in persons with hypersensitive skin and hair.

It can be concluded that cosmetics plays a key role in day to day life and is used by every gender there by creating an increase in cosmetic usage and scope also an important role.

COSMECEUTICAL INDICATION

- **Anti aging in general**
- **Treatment of photo melanosis and photo tanning**
- **Treatment of pigmentation- related disorders like melasma or freckles**
- **Rhytide reaction**
- **Anti inflammatory**
- **Fat loss**
- **Hair growth**
- **Hair fall prevention**
- **Maintenance of skin tone and clarity of complexion**

INDICATION / CLASSIFICATION OF COSMECEUTICALS

There is no single / accepted classification of cosmeceuticals . Broadly they fall into categories based on their chief etiology indication, i.e the condition for which a person would use them or based on their source or biochemical structure.

TARGET CONDITIONS

- **Skin lightning or depigmentation**
- **Sunscreen**
- **Moisturizing agents**
- **Anti wrinkles/ aging**
- **Scar reducing**
- **Anti oxidants**
- **Hair strengthening**
- **Specific disorders related eg:- acne-rosacea, melasma.**
- **Miscellaneous**

The following list enumerates a large number of commonly used and prescribed cosmeceuticals and nutraceuticals.

Managing a new chemical product design and development project is a complex task at different levels. In addition to the technical challenge of the formulation and the definition of process conditions, design teams should also consider the requirements of the organization where the product design is performed.

Therefore the organizational dimensional and its important in chemical product design are explored in this research. Trough a bibliometric literature review it was found that chemical product design methodologies integrating the organizational context have not been through analyzed and are highly required.

In this research through a systematic analysis based on information collected in semi structured interviews with design experts of the cosmetic sector. The characteristics of the organizational context and its effects on the product design process of the sector were studies.

Additionally, information captured during those interviews was formalized in an experts knowledge base of recommendations to support the cosmetic product design process. A tool to adapt to those recommendations to the design process of specific companies was proposed . The tool is applied through collaborative workshop which enable the active participation of the design team in the evaluation of the design process in order to select and implement the most suitable recommendation.

Finally the tool is applied in a organization showing how it can be used to evaluate and improve a real design process. In that case it was formed that the tool proposes adapted improvement solution aligned to the company's value concepts where the design team has the role of evalution and builder of its own design methodology.

Analysis of drugs in biological samples and pharmaceutical products is becoming more important owing to the need to understand the therapeutic and toxic effects of drugs and the continuing efforts to develop more selective and effective drugs levels in body fluids, such as serum and urine can optimize pharmacotherapy and provide the basis for studies on patient compliance, bioavailability, pharmacokinetics , and genetics, organ function and the influencer of comedication.

The quantitative and qualitative analysis of drugs and metabolites is extensively applied to pharmacokinetics studies in addition variables such as time to reach maximal concentration in plasma , clearance and bioavailability have to be known for the approval of a new drug.

Furthermore, Therapeutic drug monitoring (TDM), based on the measurement of drug concentration in blood , can be used to improve patient care.

Although, drug analysis have been performed using various analytical instrument , most of these instruments can not handle the sample matrices directly because pharmaceutical products and biological materials may contain acids , bases , salts , proteins , and other organic compounds with similar properties to the analytes.

In addition the analytes in these complex matrices are often present at low concentration . Despite the development of highly efficient analytical instrument for the end point determination of analytes in pharmaceuticals products and biological samples.

The use of cosmetics and personal care products is increasing worldwide . their high matrix complexity, together the wide range of products currently marketed under different forms imlpy a challenge for their analysis , most of them requiring a sample pre treatment step before analysis.

PERSONALIZED AND CUSTOMIZED PRODUCTS

Personalized and customized cosmetics products are a growing trend in the beauty industries , leveraging technology to offer tailored solutions based on individual needs and preference . these products go beyond traditional " one size fits all" approaches by considering factors like skin type , lifestyle , and even genetic information to create customized formulation.

- Companies develop products based on specific requirements, often using data on specific requirement, often using data from questionnaires , skin analysis , or genetic testing.
- AI , biotechnology and 3D printing are used to analyze skin profiles , create unique formulations and even produces customized dosage.

The personalized beauty market is experiencing rapid growth , driven by consumer demand for effective and targeted solutions.

PERSONALIZED PACKAGING:-

This include customized dosage , instructions and even smart packaging with reminders. Companies like "LESIELLE" offer adaptive skincare systems that allows users to create customized formulations by blending bases with active ingredients.

BENEFITS OF PERSONALIZED COSMETICS

- Address specific skin concern with greater accuracy in targeted solutions.
- Formulations are tailored to individual needs potentially leading to better results as increased effectiveness.
- Personalized products can create a more satisfying and engaging experience for the consumer to enhanced user experienced.
- Customized dosage and instructions can improve medication adherence in pharmaceutical applications have potential for better adherence.
- Personalized and customized cosmetics represent a significant shift in the beauty industry offering targeted and effective solutions based on individual needs.

While challenges exist, the trend is expected to continue , driven by advancement in technology and growing consumers demand for personalized experrience.

SAFETY AND EFFICACY

Pharmaceuticals in cosmetics particular through the development of cosmeceuticals represent a significant advancement in skincare. The integrations of pharmaceuticals in cosmetics present a multifaceted landscape characterized by regulatory challenges efficacy , safety concern , historical development , current trends demographic impacts and ethical implication.

The efficacy of cosmetic ingredients particularly natural source is under scrunity with a growing demand for substantiated safety data. The rise of cosmeceutical reflect a trend towards products that offer both cosmetic and therapeutic benefits necessitating rigorous efficacy evaluation.

Because of their high specific surface area optimum rheological characteristics and excellent sorptive capacity certain clay minerals such as kaolinite , talc , montmorillonite , saponite , hectorite , palygorskite , sepiolite , are extensively used in the formulation of various pharmaceutical and cosmetic product.

Whether, as active in ingredients or as ideal excipients , these mineral must comply with a number of textural and compositional requirement and have specific technical properties. Their safety and stability characteristic are vitally important .

Cosmetic usage varies significantly across demographics, with cultural and economic factors influencing preference and safety perceptions.

The ethical consideration surrounding cosmetics safety and efficacy raise question about consumer rights and responsibility of manufacturer to ensure product safety , so in cosmeceutical offer potential benefits for skin health but careful consideration of safety and efficacy is crucial.

Consumers should be aware of the potential risks and benefits and healthcare professionals can provide guidance on appropriate use of these product. Concomitant with the growth there has also been a surge of development and employment of novel and innovative technologies for producing safer and more effective cosmeceutical .

Nanotechnology penetration enhancers stabilizers and special excipients are increasing in use. Leading companies are developing formulations that can be conveniently tested on 3D bioprinted live human tissue obviating the need for time and cost consuming elaborate animal and human trials.

USES IN MARKET AND TRENDS

Cosmeceuticals also known as cosmetic products with pharmaceutical benefits are used for a wide range of skin and hair care purpose .

- Lightening the skin or helping reduce the appearance of skin pigmentation.
- Providing protection from the sun's harmful rays as sunscreen.
- Helping keep the skin moisturized.
- Assisting in combating the visible signs of aging such as wrinkles.
- Aiding in reducing the appearance of scars.
- Contributing antioxidant effects , which help protect the skin from damage by substances called free radical .
- Strengthening hair, preventing hair fall , encouraging hair growth and improving hair texture .
- Treating specific skin condition such as acne , rosacea or melasma.
- And various other uses in skin and hair care .

Women remain the top consumers although the use of cosmeceutical by men is steadily increasing.

Two major factors driving the rising trend in the cosmeceutical market are increased consumers awareness of skin and hair health.

They more aware of various skin and hair issues like hyper pigmentation , acne , hair loss and effect of aging .

This hightened awareness is leading them to seek out products that can address these specific concern , boosting the demand for cosmeceuticals.

Initiatives from government agencies and companies to educate the public about skin and hair health are also playing a role in increasing awareness and driving the adoption of cosmeceutical products.

The growing influence of social media and e-cmmerce platforms. Social media platforms have become powerful tools for marketing cosmeceuticals products, with companies using them to showcase products, engage with consumers and promote awareness.

The rise of e-commerce platforms has made it easier for consumers to access and purchase a wider range of cosmeceuticals products, contributing significantly to the markets growth.

Social media also amplifies the influence of skincare experts and influencers, who often promote cosmeceuticals product and trend to their followers, particularly among younger demographics.

The increasing demand for anti aging products, driven by an aging global population and the desire to maintain youthful skin, is a major trend.

The development of new and effective active ingredients in cosmeceuticals is also fueling market growth.

The adoption of corporate dressing culture , leading to increased demand for products that enhance appearance and grooming.

Lastly , the improved buying capacity of consumers also has a substantial contribution to this phenomenon.

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According to the study conducted by Indian cosmetic sector analysis , the cosmetic market is around INR 356 billion. The Indian beauty and cosmetic market have been showing a consistent growth between 15 to 20% per annum.

In 2015 global retail sales of natural products cosmeceuticals were US 2.98dollar billion while, The market is experiencing significant growth with projection indicating a rise US 20 dollar billion by 2025. 13 billion dollar retail sales increase in 10 years.

The South Korea cosmeceuticals market was valued at over USD 474.14 million in 2024 while projected to reach USD 865.27 million by 2034 with a CAGR of 6.20% between 2025 and 2034.

ROLE OF DELIVERY SYSTEM

In cosmetics, pharmaceuticals delivery system plays a crucial role in enhancing the effectiveness and stability of active ingredients . These systems acts as carriers protecting the ingredients from degradation, controlling their release and facilitating their penetration into the skin .

By optimizing delivery these system ensure that cosmetic products achieve desired effects with improved efficacy and safety.

Novel drug delivery system refers to the approaches, formulations , technologies and systems for transporting a pharmaceuticals compounds within the body as required to securely win its desired therapeutic effects.

Drug delivery sysytems (DDSs) square measure developed to deliver the specified variety of medicine effectively to acceptable target sites and to take care of the specified drug levels.

Analysis in newer drug delivery system is being disbursed in liposome , nanoparticle , noisome, percutaneous drug delivery, implants, microencapsulation, and polymers.

Compared to conventional formulations, DDS offer several key advantages :-

- Enhanced drug stability and minimized degradation.
- Optimized drug distribution , leading to increased target concentration and reduced adverse reaction.
- Precise drug localization , timing and targeted release , such as breaking through the blood brain for drug delivery.
- Decreased therapeutic dosage, reduced the toxicity and elevated therapeutic index.

RESULTS

Cosmeceutical offer both challenges and rewards to patients and their physicians . As society holds a youthful and healthy appearance to be of utmost importance , many people feel anxious about their aging skin and seek physicians advice on what to do.

Helping patients understand the degree of improvement that can realistically be achieved as well as potential side effects remains the primary responsibility of the physicians with regard to these products.

Many of the new cosmeceuticals in development sound very exciting but the physician concern is to help patients choose the best products available today.

Some experts recommend that physician pick one or two product with which they have experienced good results and advise their patients on how to incorporate them into their daily skin regimen always reminding patients that even a safe products can evoke redness, cause irritation, or clog pores if used inappropriately.

As technology advances and cosmeceuticals continue to become more sophisticated and more widely used, the medical profession must continue to take an active role in familiarizing themselves with these product and in educating patients about the benefits and risks of cosmeceuticals.

FUTURE POTENTIAL

After adding small amount o cosmeceutical agents to the cosmetic formulations which do not require medical regulations and it would improve the production of cosmeceutical that could help to improve the skin, nail, and body mass growth. New challenges will also be presented to government regulatory agencies as more chemicals with true biological activity are invented and tested.

Further research is needed to fully understand the long term effects of nano particle on human health and the environment , according to the Asian journal of pharmaceutical research.

Advancement is biotechnology will likely lead to more personalized skincare solutions based on individual needs and genetic predisposition.

The cosmetics industry is increasingly focused on sustainable practices, which will drive nano materials and biotechnology derived ingredients.