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A Comperhensive Review on Liposomes in Cosmetics and Cosmeceuticals

Dr. P. Shanmugapandiyan*[1], Mr. Molishwaran[1]

*[1] Professor, School of Pharmacy. Sathyabama Institute of Science and Technology, Chennai.

Tamil Nadu – 600119

[1] M. Pharm, Department of Pharmaceutics, School of Pharmacy. Sathyabama Institute of Science and Technology, Chennai. Tamil Nadu – 600119

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ABSTRACT:
The significance and useful function of liposomes in cosmetics will be explained in this article. To transfer the active medicinal ingredient to its site of action, pharmaceutics offers a wide range of dosage form design options. However, there are certain restrictions on getting the active component to the intended location in cosmetics because the skin serves as the body's first line of defence against the outside world and keeps many chemicals from penetrating the underlying layers or systemic circulation. As a result, we looked into the function of liposomes in cosmetics and examined sources that examined the characteristics and uses of liposomes in cosmetics. The components of liposomes, their discovery and entry into the cosmetic profession, and their definition are all covered in this article. Following that, it presents several varieties of cosmetic liposomes that, depending on their unique qualities, can be used in a range of cosmetic formulations. Lastly, the advantages of using liposomes in cosmetics are examined. Liposomes can be used to improve certain qualities and overcome limitations including low penetration, solubility, stability, duration of impact, and excessive side effects or expenses.

INTRODUCTION:

Despite the fact that a large range of amphiphilic molecules are used in the production of liposomes, these molecules may be uncharged positively, negatively, or oppositely Liposomes' membrane is mostly composed of natural or synthesized phospholipids with charged polar heads; adding cholesterol will make the membrane more stable. The parameters of the structural phospholipids utilized determine the qualities of liposomes. Lecithin's, which are phospholipids frequently found in liposomes, are mostly extracted from natural sources like eggs, soybeans, or synthesized. Phosphatidylcholine is the most prevalent of the glycerophospholipid combinations known as lecithin's. Cholesterol is another substance frequently utilized in liposomal membranes. Although cholesterol by itself does not create a double-layered structure, it does allow liposomes to retain the trapped material inside for a longer period of time when added to the compound. Depending on sophistication, other stabilizers might also be involved.

2. Evidence Acquisition

2.1 – History

Bernard (1947) first hypothesized during microscopic observations that amphiphilic molecules in aquatic systems could form vesicular structures. ammonium oleate in water to produce myelin body nations. By employing negative staining with 2% sodium phosphate and ammonium molybdates, Bangham and Horne (1992) used electron microscopy to observe the difference in phosphatidylcholine (lecithin) or its combination with cholesterol in water. The results

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demonstrated that upon shaking or sonication, a respectable number of vesicles of various sizes were generated. Wizeman later named these vesicles liposomes, which are made up of soma (body) and lipos (fat). Liposomes were only employed as a synthetic model of bio membranes until the early 1980s, at which point they were used to carry medicinal compounds. Mezei and Gulasekharam documented the effectiveness of using liposomes for topical medication delivery. Christian Dior's Capture anti-aging lotion was the first liposomal cosmetic product to hit the commercial market in 1986. Numerous more products have since followed.

In 1987 and 1990, Laboratories RoC introduced two products in the skin care industry: Myo sphere, the first emulsion containing liposomes, and the first liposome Male face cream. Following the introduction of the first liposomal formulation in 1987, numerous more products were produced, the majority of which claimed to be effective for slimming. Other kinprotectives, like sunscreens or self-tanning creams, were also introduced in 1988 and after.

In 1989, a liposomal formulation was created, and liposomal products in cosmetics are not just for skincare and hair care. Since then, though, only few further liposomal products that are suitable for hair have entered the market. In 1988, a powder was created as the first makeup product to incorporate liposomes; mascara and various foundations followed.

2.2 – Definition

Liposomes are spherical vesicles with one or more bi layer membranes (Lamella) enclosing their central aqueous portion. These membranes are often accompanied by aquatic settings. When phiphilic lipids come into contact with an aqueous environment, these vesicles are created. Their sizes range from 15 nm to several microns. The use of liposomes has moved beyond medicine delivery to the cosmetic industry over the past 30 years, and it is currently the most well-known cosmetic delivery technology. Because of their unique structure, liposomes can be used as a drug delivery method, transporting lipophilic compounds via the nonpolar tails of the bilayer region and hydrophilic drugs through their enclosing aqueous part.

3. TYPES OF COSMETIC LIPOSOMES

Cosmetic liposomes are classified into many categories based on their composition and indications. One of these sorts can be used, depending on the qualities we want our cosmetic product to have.

Transferosomes:

Transferosomes are extremely reactive, deformable, and effective liposomes that have been used up to this point for direct transdermal medication delivery. Due to their small size (300–200 nm), they can readily penetrate the epidermis and move through the stratum corneum of the skin via an intracellular or transcellular pathway with the aid of two long, elastic layers on their surface. These liposome species are composed of cholesterol and phospholipids, together with surfactants such sodium cholate (salt of citric acid).

Niosomes:

Niosomes are tiny vesicles made of dialkyl or alkyl polyglycerol ether class non-ionic surfactants. Niosomes are particularly helpful in the cosmetics and skin care industry because they can boost the penetration and efficacy of products, raise the bioavailability of substances that are poorly absorbed, and improve the stability of medications.

Novasomes:

Novasomes are 0.1–1.0 micron non-phospholipid oligolamellar lipid vesicles that are a type of liposome or modified niosome that are produced by com binding the monoester, cholesterol, and free fatty acids of polyoxymethylene fatty acids in a 74/22/4 ratio. Their ability to cleave to skin or hair shafts gives them even more advantages when utilized in cosmetic preparations. Additionally, this permits prolonged release and improves the efficacy and texture of these cosmetics.

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Marinosomes:

These kinds are produced from marine lipid extracts that are rich in omega-3 polyunsaturated acids, specifically eicosapentaenoic acid and docosahexaenoic acid. fatty acids with ratings. They are converted to their anti-inflammatory and anti-proliferative metabolites by the skin's epidermal enzymes, which aid in the treatment of numerous inflammatory skin conditions. This type of liposome is safe for skin and ocular contact, according to toxicity tests.

Ultrasomes:

The endo nuclease isolated from Micrococcus luteus entraps itself to generate ultrasomes, a distinct type of liposome. They aid in the detection of ultra. UV rays damage the skin and can accelerate therapy by up to four times. By removing the damaging effects of UV radiation on DNA and suppressing the expression of certain cytokines, such as interleukin 1, 6, and 8 and tumour necrosis factor alpha, ultrasomes also serve as immune system protectors, lowering the incidence of skin cancer.

Photosomes:

Enzymes for photolysis that were isolated from the sea plant Anacystinidu lans are released by photosomes. Sunscreens make considerable use of them, which pre-prevents light from destroying the DNA of the cell, preventing immune system suppression and lowering the danger of cancer induction.

Ethosomes:

These liposome types are phospholipid-based soft, flexible multilayer vesicles. 20% to 50% ethanol, water, and phosphatidylcholine. However, some are non-invasive carriers that allow the component to enter the epidermal layer deeply and improve systemic circulation. Ethosomes are distinct due to their high ethanol content. When combined with a vesicle, ethanol can penetrate the horny layer since it is known to induce an imbalance in the two-lipid layer of the skin. They have superior qualities for effective cosmetics distribution to the skin in terms of both quantity and depth as compared to traditional liposomes.

Asymmetric oxygen carrier system (AOCS) liposomes:

The purpose of this system is to oxygenate the skin. The double-layered membrane of the oxygen carrier vesicles encloses a phospholipid layer and a perfluorocarbon nucleus. Although hydrocarbons have a hydrophobic structure that makes them immiscible with water, they can dissolve large amounts of various gases, including oxygen. Therefore, by positioning it in the middle of the liposome, we may create systems that are appropriate for delivering oxygen to the skin.

Yeast based liposomes:

These are made from yeast cells and give skin vitamin C, which aids in skin restoration, skin relaxation, and skin oxygenation. They energize the skin. The skin feels healthier thanks to fibroblasts in their liposomal form. The amount of cellular vitamin C taken rises dramatically when the liposome is utilized as a carrier.

Phytosome:

These sophisticated herbal liposome preparations were created by combining phospholipids with plant extracts such flavonoids, glycosides, and Ter penoids. Because of their high lipid profile and improved skin penetration, phytosomes are widely utilized in cosmetics to improve the skin's absorption of phytoconstituents.

Sphingosome:

Since ceramides and other similar molecules can make up for the water deficit and restore the skin's barrier function, sphingosomes are liposomes made of ceramides with the goal of normalizing damaged or dehydrated skin.

Nanosome:

Nanosomes are extremely tiny liposomes with a low nano meter size range that are made from extremely pure phosphatidylcholine. They are used to prevent aging. serum for improved performance intended to transform skin into a stage of health and youth.

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Glycerosome:

Glycerosomes are modified liposomes that also include phospholipids and glycerol. One of their unique qualities is their capacity to provide cosmeceutical provide the skin with high-performance, healing, and beautifying active ingredients. Recently, 80–110 nm uni lamellar glycerosomes encapsulating quercetin were created, and they show improved kind defence function. They will be used in the production of antioxidant skin lotions in the future.

Oleosome:

Natural liposomes, oleosomes are a storehouse of colors, vitamins, and oils. They have been shown to be present in a range of oil-bearing plant seeds and fruits. to be effective personal care delivery systems. Sea buckthorn fruit flesh oleosomes have shown excellent stability and antioxidant qualities.

Invasome:

Liposomal vesicles called invasomes contain trace levels of ethanol and terpenes or terpene combinations, which function as powerful transporters with increased characteristics of skin penetration. Soft liposomal vesicles with high membrane fluidity are called invasomes. By changing the order of stratum corneum packing, the presence of ethanol and terpenes gives invasomes unique characteristics that result in the simultaneous advantage of liposomes as possible carriers and terpenes, which improve skin permeability and cutaneous distribution.

4. APPLICATION OF LIPOSOMES IN COSMETICS

Liposomes can function as active agents in and of themselves as well as carriers of cosmeceutical substances. When skin is harmed by dehydration or eczema nature, empty liposomes can have a strong interaction with skin lipids, proteins, and carbohydrates, assisting the skin in returning to its normal state and enabling the stratum corneum to carry out its defensive role as intended.

They serve many purposes when employed as delivery vehicles for active compounds, which means that in addition to the effects of the chemicals themselves, they may also penetration, solubility, or stability, which results in a prolonged effect and isolation of the chemical from the environment, reducing toxicity, increasing control over pharmacokinetics and pharmacodynamics, and making the product cost-effective.

5. TO OVERCOME THE SOLUBILITY LIMITATIONS

Because of their aphasic nature, liposomes are able to retain hydrophilic, amphiphilic, and lipophilic molecules within their structure, which contributes to their solubility.
will indicate its location. The lipid bilayer of the lipidome contains general, lipophilic, and amphiphilic compounds, while the aqueous centre or external aquatic phase contains hydrophilic agents. This arrangement reduces material loss during storage.

Liposome are mostly used in aqueous systems and from this feature we utilize to carry hydrophobic sub stances in aqueous formulations.

Our four fat-soluble vitamins—A, D, K, and E—all contribute significantly to the health and appearance of our skin, and their deficiencies produce a range of skin conditions. Vitamin E, for instance, is one of the stable fat-soluble substances frequently found in cosmeceuticals for skin protection qualities like improved skin hydration, anti-aging, and disease prevention.

Given that they are insoluble in water, we must employ fatty bases, such as fat-based lotions, to make a cosmetic product containing these vitamins. In contrast to Products that are water- or oil-based have low compliance because of their undesirable or unnaturally greasy feel. Encapsulating fat-soluble vitamins in liposomes allows problems caused by lipophilicity to be resolved because liposome particles dispersed in water are affinative for the skin.

Similar to the last example, liposomes can be used as a water-based lip care product to enhance the condition of the lips. The volume of water that escapes the surface of the lips is nearly three times more than that of other skin surface regions. Effective lip care is crucial since lip motions are more frequent and wrinkles or lines are much deeper on the lips than on other areas of the face.

For hyperpigmented skin, a low water-soluble substance like linoleic acid (LA) is recommended to produce whitening results. The action of liposomal compounds as enhancers of the skin-whitening properties of linoleic acid. Vitamin E or retinoic acid-containing liposomes may be included in skin-whitening formulations to lower the ascorbic acid oxidation rate.

Increase Stability

Many substances are prone to oxidation, degradation, or loss of performance against environmental threats. By using liposomes, we can shield the enclosed ingredient from destructive factors. An endogenous antioxidant system protects the skin from the damaging properties of free radicals. How ever, exposure of skin to ultraviolet radiation leads to the amount of pro-oxidants to overtake antioxidants resulting in oxidative stress and photoaging of skin.

The utilization of topical antioxidant supplementation is an approach adopted by cosmetic industries for the purpose of quenching free radicals.

However, many bioactive sub stances are prone to change due to light exposure or storage methods. One plan for over whelming this effect on the skin is the preparation of liposomes that allow the encapsulation of the antioxidant substances.

Target Selectively

Cells use particular signals to respond to other cells. By altering the membrane's charge or introducing particular proteins, antibodies, or immunoglobulins, we can raise the liposomes' affinity for particular cells. Other methods that have been tried include making liposomes that release the medication in response to particular pH values or temperatures.

It is possible to make liposomes interact with particular organisms. In rare instances, liposomes are designed to avoid various locations as part of avoidance therapy in an effort to reduce toxicity.

Reduce Toxicity and Side Effects

When liposomes are used as cosmetic carriers, the component is contained in an envelope; as a result, the encased material and exterior substances cannot be directly connected. Stated differently, the interactions have the least impact on non-target cells because they are in our sequence.

Furthermore, the material's attraction to the outside world will be reduced when it is separated. Although many compounds don't have inherent toxicity, once They become harmful when they interact with other chemicals. From a different angle, liposomes offer excellent efficacy and targeted component distribution, lowering the minimum dosage and the possibility of intoxication from a high dosage of the substance. A toxin is any substance that enters the body in excess of what is required. We do not let this to happen by applying liposomes containing the least amount to factive ingredient. Additionally, the regulated release of liposomes' active components keeps it from becoming poisonous.

Improvement of Pharmacokinetics and Pharmacodynamics

Due to the limited permeability of skin, many drugs that are applied topically require regular dosages when administered without a delivery mechanism. The use of liposomes can boost the Cosmetic product pharmacokinetics include longer therapeutic index dosages, which improve targeted precision while lowering toxicity. Liposomes can be made to circulate for a long time while maintaining a constant number of components.

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