PHARMACEUTICAL NIOSOMES DRUG DELIVERY: A COMPLETE REVIEW OF NEW DELIVERY SYSTEM

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ABSTRACT:

Over the past ten years, people working in the field of drug delivery systems have become increasingly interested in desi gning vesicles as a tool to improve drug delivery. A hydrating mixture of cholesterol and nonionic surfactants forms niosomes, which are vesicles. Liposomes, microspheres, engineering science,small emulsions, antibody loaded drug delivery , magnetic micro capsules,implantable pumps, and niosomes are just a few of the unique methods employed to administer these medicatio ns. There are two requirements before designing and developing a novel drug delivery system (NDDS). It must first spre ad the medication at a preset rate and then release an amount of medication at the site of action that is therapeutically e fficacious. These requirements cannot be satisfied by conventional dose forms. In essence, niosomes are non-ionic surfactant-based vesicles in which a group of surfactant macromolecules forms a bilayer to form a membrane that entirely seals off an aqueous solution of solute. Targeted medication delivery is made possible by the reasonable circulation persistence of niosomes. An overview of niosome preparation techniques, niosome kinds, characterisation, and applications is also included in this paper.

Due to qualities including improved drug penetration, local depot for continuous drug release, and a rate-limiting membrane for modulating systemic absorption of pharmaceuticals via the skin, niosomes, vesicular nanocarriers, are gaining a lot of attention as prospective transdermal drug delivery systems. There are a number of theories put up to explain why niosomes can improve medication transfer through the skin. This review aims to provide an exhaustive collection of recent studies in this fascinating field, with special emphasis on the methods used to maximise the potential of niosomes. Niosomal carriers are suitable for the transdermal delivery of a variety of pharmacological agents, including antioxidant, anticancer, anti-inflammatory, antimicrobial, and antibacterial molecules.

KEYWORDS: *Niosomes, Structure, Methods, Compositions, Vesciles*

INTRODUCTION:

Niosome are the surfactant-based vesicle which is non-ionic. As an incipient, niosomes are formed mostly by non-ionic surfactant and cholesterol incorporation. Niosomes and liposomes are structurally similar to each other, they both are bilayer. Although, materials which are used to prepare niosomes make them more stable. Hydrophilic and lipophilic drugs both can entrap, either in aqueous layer for hydrophilic drugs or in a vesicular membrane materials made of lipid for lipophilic membrane.

In 1909, Paul Ehrlich, initiated the era of development of targeted delivery, he envisaged a drug delivery mechanism which would target to diseased cell directly. Definition of drug targeting are as the ability to direct a therapeutic agent, specially desired site of action with no interaction or little bit interaction with the tissue which are non targeted. The medication is encapsulated in a vesicle of niosome drug delivery system. Non-ionic surfactant which form amphiphillic is formed by vesicle in niosomes, such as span-60 which are stabilized by addition of cholesterol and small amount of anionic surfactant. Example-Dicetyl phosphate.

Niosomes are a completely unique drug transport device, which entrapped the deliquescent drug in the center hollow space and hydrophobic remedy withinside the non-polar vicinity present the various steel layer thence every hydrophilic and hydrophobic tablets might be included into niosomes. The niosomes are ampiphillic in nature, for the duration of which the medicine is encapsulated extraordinarily sac that's created via way of means of non- ionic wetter and as a result the call niosomes. The niosomes length can be a totally little and microscopic.The number one niosome formulations have been evolved and proprietary via way of means of L'Oreal in 1975.Within the presence of accurate combos of surfactants and fee inducement sellers from the thermodynamically strong vesicles. Niosomes are in large part studied as an trade to liposomes due to they alleviate the hazards associated with liposomes. Niosomes conquer the hazards related to liposomes cherish chemical instability. Chemical instability of liposomes is due to their predisposition to aerophilic degradation and variable purity of phospholipids. the maximum cause of growing niosomal device is chemical stability, biodegradability, biocompatibility, chemical stability, low manufacturing cost, easy garage and coping with and coffee toxicity. Niosomes might be administrated thru severa routes which include oral, parentral, topical. Niosomes are used as a provider to supply differing sorts of tablets cherish synthetic and herbal, antigens, hormones and distinctive bioactive compounds this newsletter presents a few Salient alternatives of niosomes at the side of an define of the education strategies and additionally the contemporary packages of niosomes in encapsulation and transport of bioactive compounds. speedy and critical development in the use of generation in remedy and designation of illnesses has created a substitute area known as nanomedicine and linked subfields, which include pharmaceutical nanocarriers known as new branches of clinical science. Nanostructures might be made up of severa substances collectively with polymers, metals, steel oxides, nanogel, lipid-based companies (liposomes) and wetter based companies (niosomes). Reducing the scale of drug companies to a nanoscale has numerous edges collectively with growing the pharmacology and biodistribution of healing sellers, lowering toxicity via way of means of accumulation of the drug in the goal site, facilitating drug passage among the cells and growing their retention time in organic structures that growth the efficaciousness of the drug. Novel drug-transport structures play main roles in remedy development. This generation is an technique to reinforce the drug unharness profile, absorption, distribution, and removal of tablets. to make a substitute drug- transport device, 2 requirements ought to be considered: First, the drug need to be discharged in accordance to a programmed rate. Second, it need to unharness powerful amount of the lively element at the goal site; doses of historic paperwork are not capable of meet those goals.Vesicles structures with a bilayer membrane and crater in the indoors have attracted extra interest as drug-supply .

In addition to making general observations about niosomes as percutaneous permeation enhancers and discussing the results of studies conducted over the past five years on niosomal drug delivery systems for transdermal applications, this review provides a brief overview of issues related to niosomes by outlining their chemical composition, structure, benefits, and applications.

The last 30 years have seen a lot of interest in niosomes, vesicular nanocarriers, as prospective drug delivery methods because of their distinct benefits. They have amphiphilic molecule-based lamellar (bilayer) structures encased in an aqueous compartment. Surfactants are amphiphilic molecules with hydrophobic (tails) and hydrophilic (heads) groups that have the ability to self-assemble into a variety of geometries, such as micelles or a planar lamellar bilayer.

ADVANTAGES OF NIOSOMES:

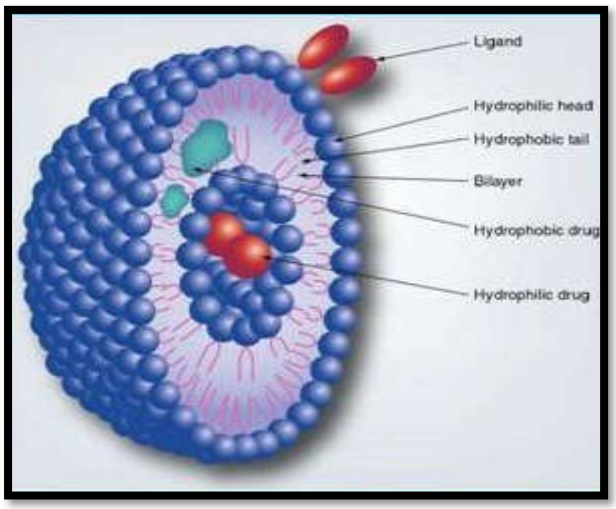
1. Niosomes are chemically stable, Osmotically active and have long storage time as compared to liposomes.
2. Surface of niosomes formation and matification is very easy, because of hydrophilic heads of the functional group.
3. Biodegradable and non-immunogenic.
4. Lipophilic Drugs can entrap into vesicular vilayer membrane and hydrophilic drugs can entrap in aqueous compartments, both can serves as drug delivery systems.
5. Therapeutics performance can improve drug molecules by protecting drug from environment which is biological , results in better controlled drug delivery and availability by drug effects restricting to target cells in targeted carriers and clearance delaying from circulation in sustained drug delivery.

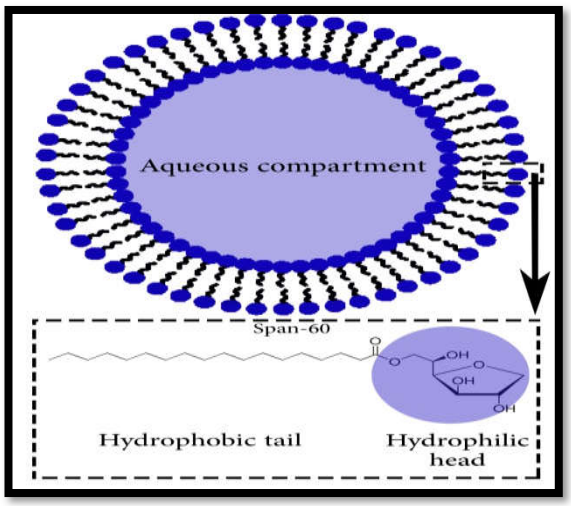
DISADVANTAGES OF NIOSOMES:

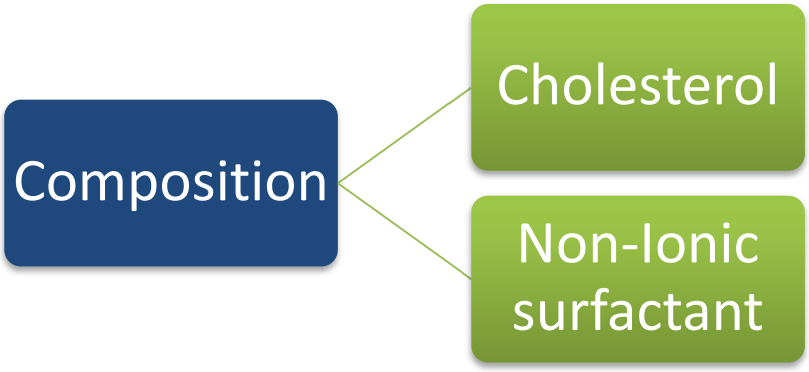
1. Fusion.
2. Aggregation.
3. Entrapped drugs are leaked.
4. Physical instability.
5. Encapsulated drugs are hydraysis in which limiting the self-life of the dispersion.

STRUCTURE OF NIOSOMES:

Niosomes vesicles consists of vesicle emphiphilic forming that is non-ionic surfactant such as span 60.Which is stabilized by addition of cholesterol small amount of an ionic such as dicetyl phosphate which helps in vesicle stabilizing.





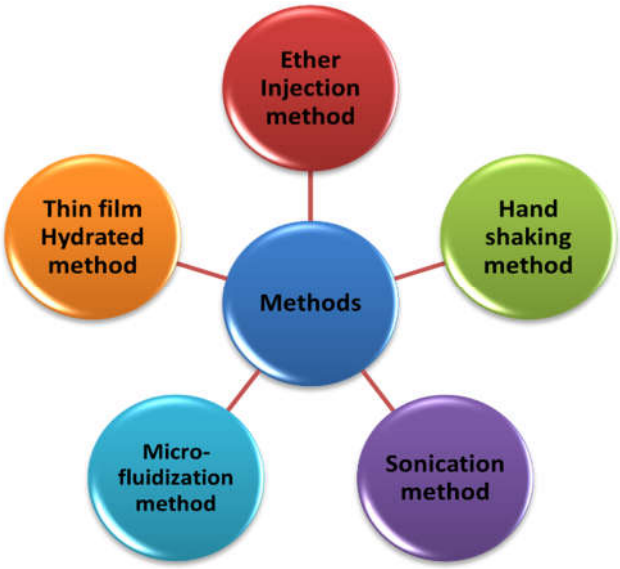


- **Cholesterol:** It is derivative of steroid used to provide proper shape and rigidity and conformation to niosomes preparation.
- **Non-ionic surfactant:** Example of ionic surfactant which are generally used for niosomes preparation .
  - Spans (Span 60,40,20,80,85)
  - Tweens (Tween 20,40,60,80)
  - Brigs (Brig 30,35,52,58,72,76)

Non-ionic surfactant passes a hydrophilic head and hydrophilic tail.

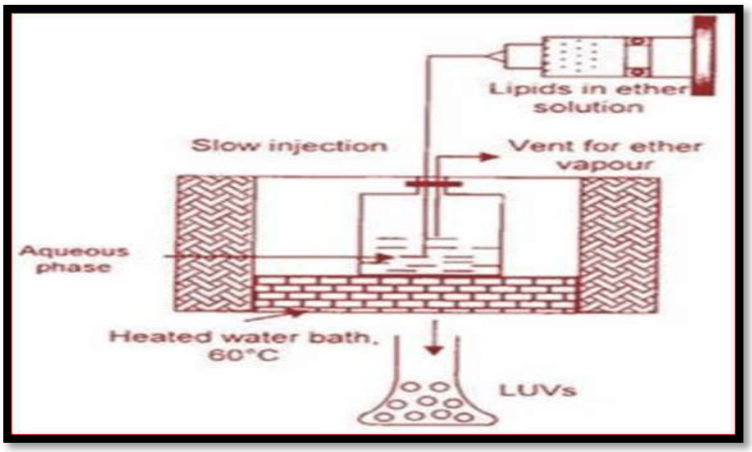
METHODS OF PREPARATION:

Niosomes can be prepared by various methods some are as follows:



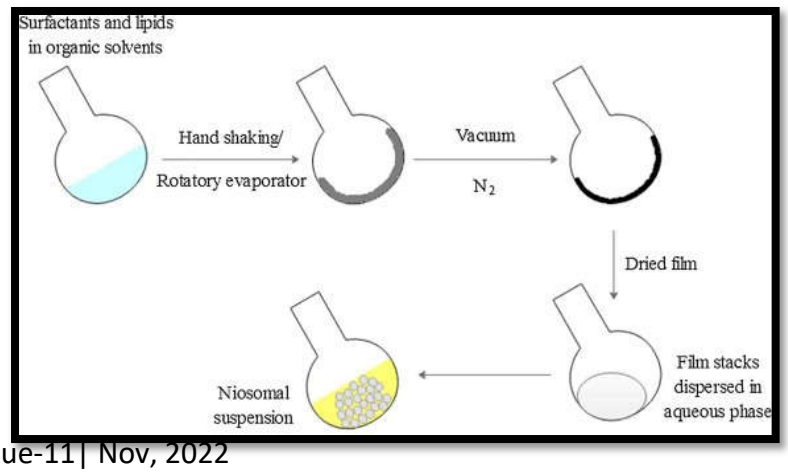
1. Ether Injection method:

Phospholipids are dissolved in diethyl ether and mixture was injected into water. When water was heated to 55-65 ºC diethyl ether evaporated and for motion of liposomes were formed. Liposomes diameter prepared by this method approximately 70-190 nm.



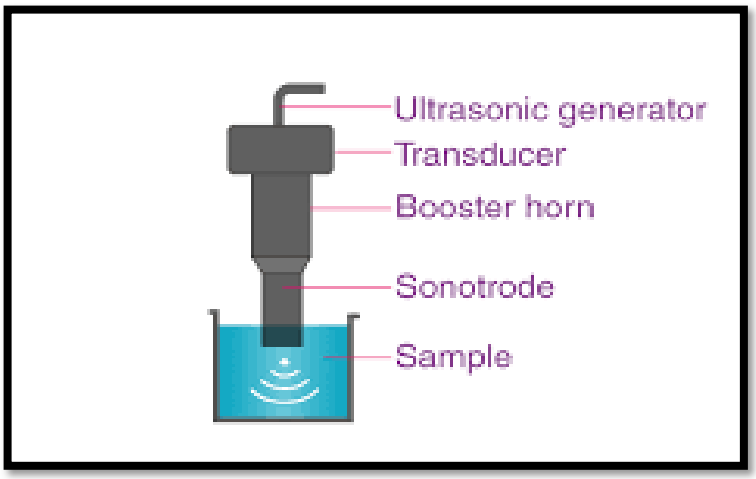
2. Hand shaking method:

It forms vesicles as compared to ether injection method with greater diameter. Reverse phase evaporation produced from small size niosomes. Smaller size vesicles and greater uniformly gives Micro-fluidization method.



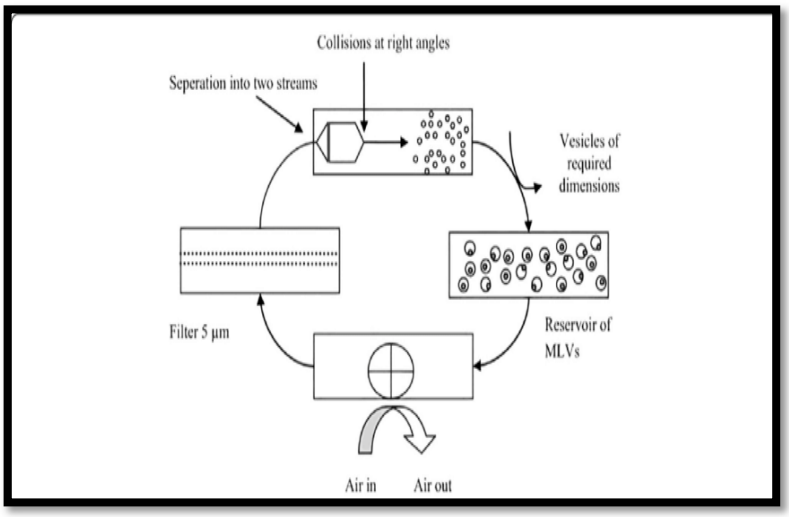
3. Sonication method:

In this method, an aliquot of drug solution in buffer mixture of surfactant / cholesterol mixture was added in a 10 ml glass vial. At 60 °C mixture was probe sonicated for 30 min by using a sonicator with titanium probe to yield niosome.

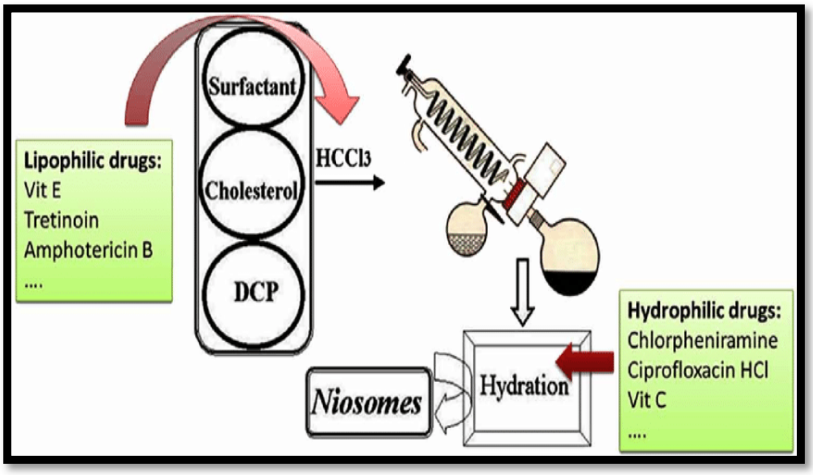


4. Micro-Fluidization method:

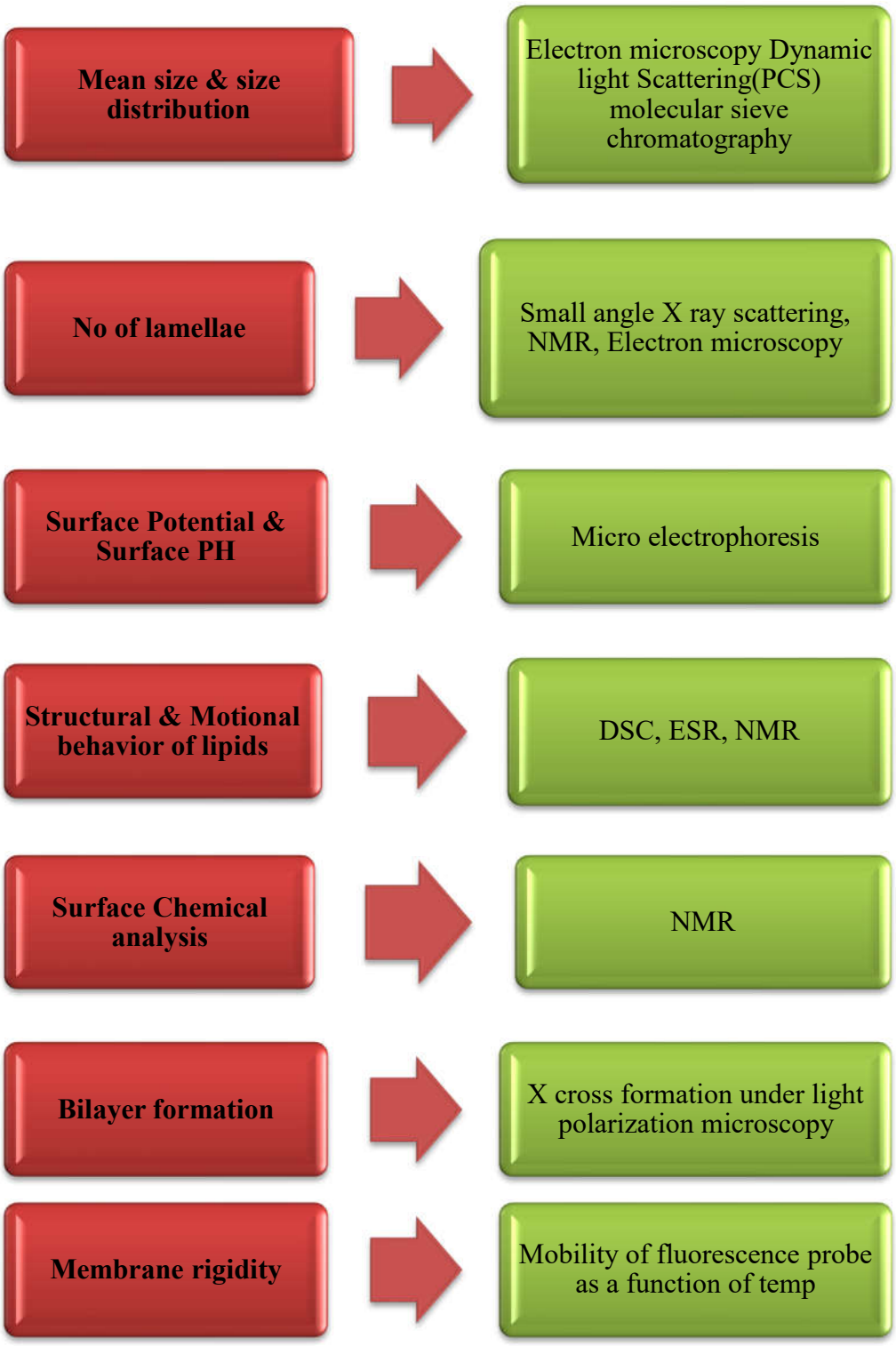
It is a recent technique, unilamellar vesicles were used to prepare by this technique to define size distribution. Submerged principle was based in this method , in which two fluidized streams interaction take place at high ultra-velocities.



5. Thin Film Hydrated method: In this method, it involves round bottom flask making a thin lipid film by organic solvent removal formation of heterogeneous liposomes dispersed medium takes place by addition and agitation.



CHARACTERIZATION OF ETHOSOMES:



Applications

1. Many Pharmacological agents potentially applicable for niosomae drug delivery for their actions against various diseases.
2. To design novel drug delivery system, it is used as vehicle for poor absorbable drugs.
3. Anatomical barrier of gastrointestinal tract enhances its bio-availability by crossing them.
4. Reticulo-endothelial system are taken up from niosomal vesciles, such drug is used for the treatment of disease. Ex-leishmaniasis.
5. Rate of drug release over good controller for treating brain malignant cancer.

CONCLUSION:

In summary, from the above study, it can be seen that niosomes showed better therapeutic activity than conventional dosage forms using formulations through the same route of administration. The greatest challenge in topical drug delivery is the barrier property of the skin, which restricts the entry of most drugs. Here, the current data showed that niosomes acted as the best vesicles in dermal drug delivery due to their nanometerscale size and elastic nature. They acted as drug carriers to deliver drug molecules entrapped in or through the skin and, due to the individual lipid components, enhanced penetration into the stratum corneum and subsequent disruption of the intercellular lipid layers within that layer of the skin. In vivo experiments showed an interesting correlation between the better permeation abilities of niosomes compared to other conventional dosage forms in terms of better therapeutic efficacy at the affected site at lower doses of drugs present in the niosomal gel formulation.Comparative in vivo studies of TRA and BPO`s niosomal gel was more effective than acne gel because niosomal gel increased a drug's therapeutic index, resulting in a 4.16fold reduction in BPO dose compared to acne gel. MIC and antimicrobial susceptibility data showed that 28. µg / mL BPO has potent antibacterial activity against acnecausing bacteria such as Staphylococcus epidermidis. Exvivo skin retention studies have shown that niosomes gels have the highest retention of BPO and TRA in the affected skin. It is maximally retained on the skin so that the bacteria that cause acne do not spread. In addition, the "reservoir mechanism" of the iosome allows the MIC to stay at the target site for a long period of time due to the niasome gel. Based on the above data, it can be concluded that the nanovesicle (ie, niosomes) -based dosage form developed here exhibits better therapeutic effects at lower doses compared to conventional dosage forms.

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