IJMPR 2021, 5(2), 120-128

International Journal of Modern Pharmaceutical Research
www.ijmpronline.com

ISSN: 2319-5878
IJMPR
Review Article
SJIF Impact Factor: 5.273

# CURRENT UPDATED REVIEW ON PRONIOSOMES AS A NOVEL APPROACH FOR DRUG DELIVERY

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**Received on: 21/02/2020**
**Revised on: 13/03/2021**
**Accepted on: 03/04/2021**

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## ABSTRACT

Proniosomes are one of the novel provesicular drug delivery systems which are dry formulations coated with carrier such as non-iconic surfactants. Proniosomes are formulated in such a manner that they can overcome the drawbacks of niosomes such as physical instabilities, fusion and aggregation. Proniosomes can be administered by various routes like oral, intravenous, buccal, topical, transdermal, ocular etc. Proniosomes are liquid crystalline compact niosome hybrids which upon hydration form niosomes. They help in reducing physical stability problems involved with niosomes such as leaking, fusion, aggregation and provide convenience in dosing, distribution, transportation and storage showing improved results than conventional niosomes.

**KEYWORD:** Proniosomes, provesicular drug delivery systems, niosomes, intravenous, buccal, topical, transdermal, ocular.

## INTRODUCTION

Proniosomes are dry formulation of water-soluble carrier particles that are coated with surfactant. They are rehydrated to form niosomal dispersion immediately before agitation in hot aqueous media within minutes. The fundamental object of development controlled and targeted release dosage form is that improve the therapeutic effect of drug improve drug safety margin of high potency drugs by the increases plasma concentration, and also decrease side effects.[1] Main object of Novel vesicular drug delivery system is that drug rate work on need of body throughout the period of treatment and controlled and targeted effect on the site of action, drug is encapsulated in to vesicles that manner prolonged drug action.[2]

Various type of carriers are utilized to carry drugs at the target site in the body part like tissue organ which include, Niosomes, proniosomes, liposomes, microsphere, electrosomes, phytosomes etc.[3] Vesicular drug delivery like a colloidal particle in which amphiphilic molecule made a concentric bilayer covered by aqueous compartment. The amphiphilic molecules like surfactants (non-ionic), phospholipid (phosphatidylcholine, phosphatidylserine etc.,) is adding combination or separately with cholesterol.[4] Proniosomes evaded the problems associated with niosomes like fusion, aggregation, physical stability, sedimentation, aggregation leakage of drug. Proniosomes are dry free- flowing formulation of surfactants- coated carrier, which can be rehydrated by brief agitation is hot water to form multillamellar niosomes.[5]

Proniosomes can deliver both the hydrophilic and hydrophobic drug. Proniosomes can be converted into niosomes upon hydrating with hot water right before the use. As niosomes are associated with various drawbacks such as physical instabilities like fusion, aggregation of particles and leakage of the drug these are formulated into proniosomes. The principle advantage of proniosomes is that the amount of carrier required for maintaining the surfactant ratio can be easily adjusted. Proniosomal gels are the very recent provesicular drug delivery systems which offer the drug delivery through topical or transdermal route in a versatile manner. Proniosomal gels are becoming more popular because of a wide range of applications and better percutaneous absorption compared to other semi solid preparations.[6] Niosomes have received great attention as an alternative potential drug delivery system to conventional liposomes. Niosomes are uni or multilamellar spheroid structures composed of amphiphilic molecules assembled into bi-layers. They are considered primitive cell models, cell like bioreactors and matrices for bio-encapsulation. They are alternative to liposomes as they possess greater stability and overcome the problems associated with liposomes like chemical instability, variable purity of phospholipids and high cost.[7] The additional merits with niosomes are low toxicity due to nonionic nature, no requirement of special precautions and conditions for formulation and preparation.[8] Niosomes are non-organic surfactant vesicles that can entrap a solute in a manner analogous to liposomes. They are osmotically active, and are stable on their own, while also increasing the stability of the entrapped drugs. The size of niosomes

is microscopic and lies in Nano metric scale.[9,10] Niosomes possess an infrastructure consisting of hydrophilic and hydrophobic moieties together, and as a result, can accommodate drug molecules with a wide range of solubilities.[11] Proniosomes minimizes problems of niosomes physical stability such as aggregation, fusion and leaking and provide additional convenience in transportation, storage and dosing.[12] Vesicular drug delivery systems are novel means to increase the bioavailability of the enclosed drug with more advantages over than the conventional dosage forms. Niosomes or non-ionic surfactant vesicles area microscopic lamellar structure of size range 10–1000nm consisting of spherical, uni- or multi-lamellar and polyhedral vesicles in aqueous media. For example, aggregation, fusion, drug leakage or hydrolysis of the active compounds, thus raising concerns over their adoption.[13,14]

Proniosomes are semisolid, liquid crystal (gel) product of nonionic surfactant which on hydration converts into niosomes. Proniosomes when applied onto the skin surface transform into niosomes due to the hydration by water from the skin which would provide an occlusive condition and offer a potential for drug delivery through the transdermal route.[15] Proniosome have shown equal or greater efficacy in drug release performance when compared with conventional niosomes. Typically, proniosomes may contain various non-ionic surfactants like span 20, 40, 60, 80, and 85, tween 20, 40, 60, 80; lecithin, alcohol (ethanol, methanol, and isopropyl alcohol) and chloroform. Most of surfactant used to make non-ionic surfactant vesicles have a low aqueous solubility. However, freely soluble non-ionic surfactants such as tween can form the micelles on hydration in presence of cholesterol.[16]

a) Cholesterol concentration into proniosomal formulations could affect vesicle stability and permeability.
b) Formulation containing cholesterol increases the entrapment efficiency of drugs compared to formulation containing lecithin only.
c) The incorporation of lecithin into formulation requires special treatment during preparation and storage, which makes the product less stable and highly expensive.

**Structure of Proniosomes**

Proniosomes are microscopic lamellar vesicles, combine with non-ionic surfactants (Span, Tween etc.) and cholesterol followed by the addition of an aqueous media. The arrangement of the nonionic surfactants are in such a way that the hydrophilic portion phase outward and the hydrophobic ends are in opposite direction to form a bilayer.[17]

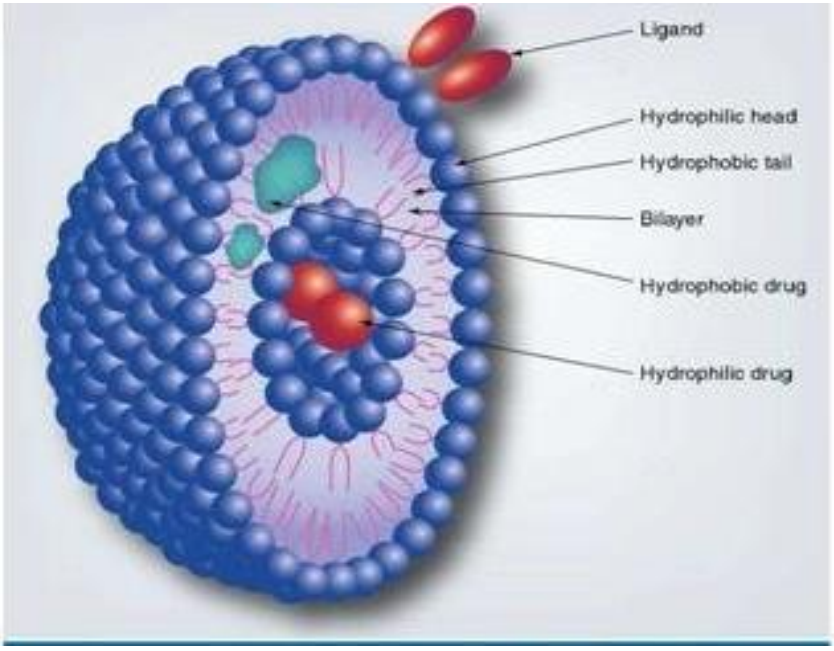


**Figure 1: Structure of Proniosome.**

**TYPES OF PRONIOSOMES**

According to the type of carrier and method of preparation of proniosomes they are of two types.

**Dry granular proniosomes**

1. Sorbitol based proniosomes
2. Maltodextrin based proniosomes

- Sorbitol based proniosomes is a dry formulation that involves sorbitol as a carrier, which is further coated with non-ionic surfactant and is used as a noisome within minutes by the addition of hot water followed by agitation.
- Maltodextrin based proniosomes are prepared by fast slurry method.

**Liquid crystalline proniosomes**

This type of proniosomes are reservoirs for transdermal delivery of the drug. The transdermal patch involves an aluminum foil as a baking material along with a plastic sheet. Proniosomal gel is spread evenly on the circular plastic sheet followed by covering with a nylon mesh.[18]

**ADVANTAGES OF PRONIOSOMES**

a. Proniosomes do not require any special conditions of storage as in case of niosomes and liposomes.
b. They are physically stable compared to niosomes.
c. Proniosomes are easy to handle, store and transport.
d. They are easy to use as they can be hydrated just before use.
e. Proniosomes are uniform in size.
f. Hydration of proniosomes is easy than liposomes and niosomes.[19]
g. Avoiding the problem of physical stability like fusion, aggregation, sedimentation and leakage on storage.
h. Avoiding hydrolysis of encapsulated drugs which limiting the shelf life of the dispersion.[20]
i. Ease on storage and handling.
j. No difficulty in sterilization, transportation, distribution, storage uniformity of dose and scale up.
k. Drug delivery with improved bioavailability, reduced side effects.[21]
l. Entrapment of both hydrophilic and hydrophobic drugs.
m. Shows controlled and sustained release of drugs due to depot formation.
n. Biodegradable, biocompatible and non-immunogenic to the body.
o. Shape, size, composition, fluidity of niosomes drug can be controlled as and when required.[22]

**PRONIOSOMES PREPARATION METHODS**

**1. Slurry method**

In a round bottom flask prepared a slurry, usually solvents are used for prepared the slurry and maltodextrin as a carrier. To found the free-flowing powder of proniosomes applied vacuum for during slurry, first take a round bottom flask containing carrier (Maltodextrin, lecithin), to evaporate the solvent flask attached to the rotary evaporator to 50-60 rpm at temperature 45-47 °C. To find the dry free flowing product, reduced the pressures 600 mm Hg and found the dry formulation, store tightly closed container under refrigeration.[27-28]

**Advantages of Slurry Methods**

a. Maltodextrin like polysaccharide which is easily soluble in water and it is used as carrier material in formulation; they were easily coated by simply adding surfactant in organic solvent to dry maltodextrin.
b. Due to uniform coating on the carrier, it protects the active ingredient and the surfactants from hydrolysis and oxidation.
c. The higher surface area results in thinner surfactant coating which makes the rehydration process efficient.[29]

**Disadvantages of slurry method**

a. Method is time consuming and involves specialized equipment with vacuum and nitrogen gas.
b. The thin film approach allows only for a predetermined lot sizes so material often wasted, so small quantities and small dose batch can be tedious one.[29]

**2. Coacervation phase separation**

In a stopper glass vials required number of surfactants, cholesterol and lecithin mixed with solvent stopper used to prevent the loss of solvent. This mixer was heated and then mixed by a glass rod after complete mix all ingredients small amounts of buffer solutions was added to the prepared mixture and heat again on water bath for 10 minutes, then found a clear solution, this solution left for 24 hours at room temperature clear solution converted in to proniosomal gel.[30, 31]

**Advantages of Coacervation phase separation**

a. Method is simple and without time consumable so it does require any specialized equipment.
b. Specially adopted for gel preparation
c. Small quantities or small dose formulation can be prepared on lab scale.[29]

**3. Spray coating method**

In this method carrier take in a round bottom flask and attached with rotary evaporator and then prepared a mixture by required amount of cholesterol and surfactant and spray on the carrier the evaporator evacuated and kept in rotating flask and temperature maintain 65-70°C under the vacuum for 15-20 minutes. Evaporation continued and all surfactants are added till the dry powder of proniosomes were not prepared.[32,33]

**Advantages of Spray coating method**

It's a simple method suitable for hydrophobic drug without concerns of instability or susceptibility of active pharmaceutical ingredient to hydrolysis.[29]

**Disadvantages of Spray coating method**

a. Method is time consuming and involves specialized equipment with vacuum and nitrogen gas.
b. The thin film approach allows only for a predetermined lot sizes so material often wasted so minute quantities or small dose batch can be tedious one.[29]

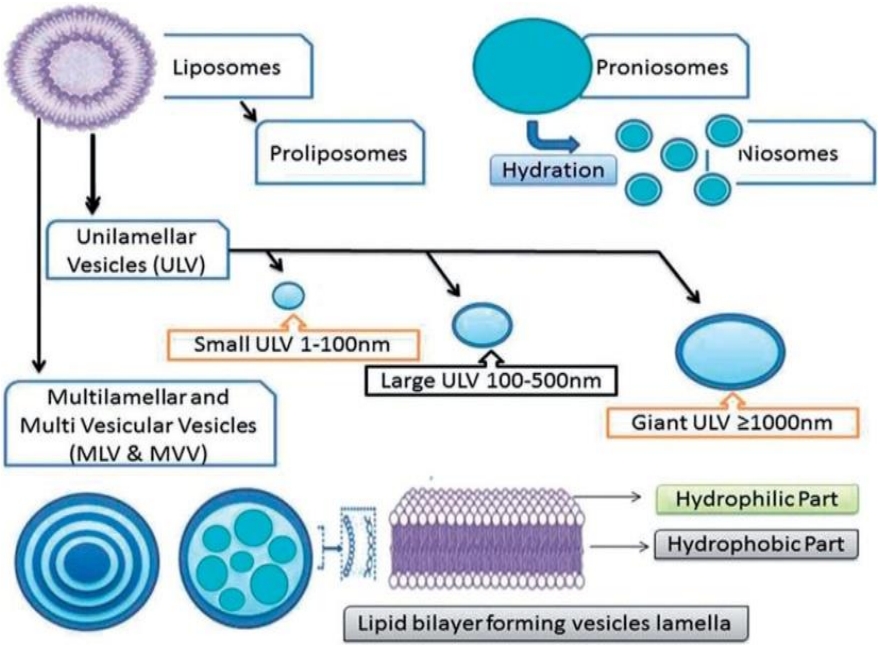


**Figure 2. Schematic representation of various niosomes and proniosomes.**

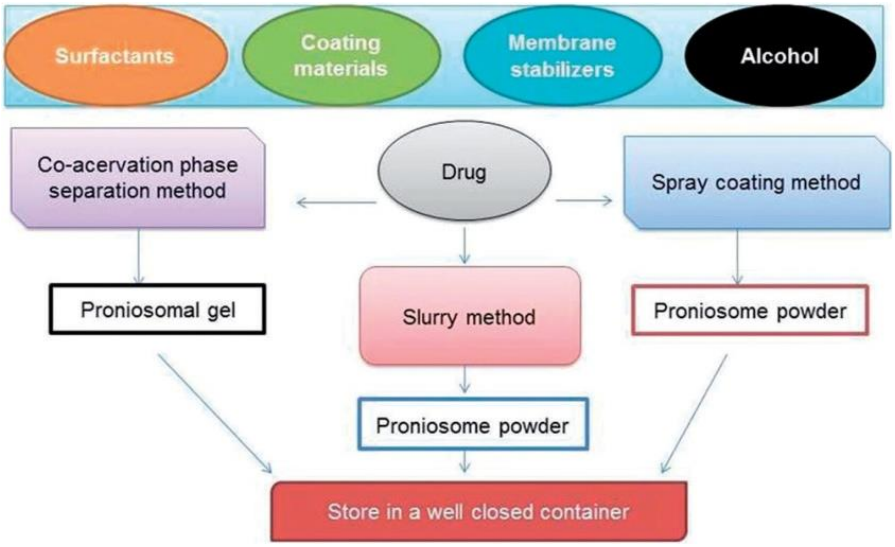


**Figure 3. Materials and methods.**

## COMPONENTS OF PRONIOSOMES

### 1. Surfactant

It is acting as solubilizers, wetting agents, emulsifiers, and permeability enhancers. Chiefly non-ionic surfactants were used in the formulation of proniosomal gel. Based on the hydrophile-lipophile balance (HLB) value of the available surfactants, mainly categorized into w/o emulsifying agent (HLB 3–8) and o/w emulsifying agent (HLB 8–16) usually the HLB value of 4–8 will give the vesicles with high compatibility.

**Table-1 Different Nonionic Surfactants Used in Preparation of Proniosomal Gel.[34]**

| Sr. No. | Surfactant | Synonyms | Properties |
|---|---|---|---|
| **1.** | Sorbitan monolaurate | Span 20, Sorbitan monododecanoate | Tc : 16ºC<br>Density: 1.032 g/mL at 25°C (lit.) Flash point:>230°F<br>HLB value: 8.6 |
| **2.** | Sorbitan monopalmitate | Span 40, | Tc : 42ºC<br>Flash point:113ºC Melting point: 46-47ºC HLB value: 6.7 |
| **3.** | Sorbitan monostearate | Span 60, Sorbitan mono-octadecanoate | Tc : 53ºC<br>Flash point: >110ºC Melting point: 54-57ºC HLB value: 4.7 |
| **4.** | Sorbitan monooleate | Span 80, Sorbitan (Z)-mono-9- | Tc : -12ºC<br>Flash point: >110ºC |

| | | | |
|---|---|---|---|
| | | octadecenoate | Density: 0.986 HLB value:4.3 |
| **5.** | Polyoxymethylene (20) sorbitan monolaurate | Tween 20 | Density: 1.106<br>Aq. solubility: 100 g/L Boiling point: 100 ºC HLB value: 16.7 |
| **6.** | polyoxymethylene (20) sorbitan monopalmitate | Tween 40 | Density: 1.05<br>Aq. solubility: 100 g/L Boiling point: 0.1 ºC HLB value: 15.6 |
| **7.** | Polyoxyethylene (20) sorbitan monostearate | Tween 60 | Density: 1.081<br>Aq. solubility: 100 g/L<br>HLB value: 14.9 |
| **8.** | Polyoxyethylene (20) sorbitan monooleate | Tween 80 | Density: 1.064<br>Aq. solubility: 5-10 g/100 mL at 23 ºC Flash point: >110 ºC<br>HLB value: 15.0 |

TC-Phase Transition Temperature
HLB- Hydrophilic Lipophilic balance

**2. Cholesterol**
It is an important component used in the design of proniosomes which gives stability and penetrability to the vesicles. Entrapment efficiency (EE) depends on the concentration of cholesterol used. Cholesterol may reinforce bilayer assembly; vesicles cannot be built without the addition of cholesterol, with higher concentrations of cholesterol decreasing the time required for noisome assembly. It prevents accumulation by the in clusion of molecules that stabilize the system against the formation of an aggregate by repulsive steric or electrostatic effects.

**3. Lecithin**
Mainly acts as membrane stabilizers mostly used two varieties, i.e., Soya lecithin and egg lecithin former one collected from the soya beans later from the egg yolk. Following materials were used.

- Soyalecithin.
- L-α-egg phosphatidylcholine.
- 1-2-dimyristoyl-snglycero-3-phosphocholine.
- 1-2-distearoyl-snglycero-3phosphocholine.
- Dipalmitoyl phosphatidylcholine.

**4. Solvent and aq. Phase**
Alcohol has shown a great effect on vesicle size and drug permeation rate of a proniosomal formulation. Different size of vesicles formed using different alcohols as they follow the order: Ethanol>propanol> butanol>isopropanol. Phosphate buffer7.4,0.1%glycerol, hot water is used as the aqueous phase in preparation of proniosomes.

**5. Carrier Material**
The use of maltodextrin based proniosomes preparation permitted flexibility in the ratio of surfactant and other components which can be incorporated. In addition to this; it increases the surface area and hence efficient loading. The carriers should be safe and non-toxic, free-flowing, poor solubility in the loaded mixture solution and good water solubility for ease of hydration. Commonly used carriers are listed, they are sorbitol, mannitol, glucose, lactose, and sucrose stearate; habitually used carriers are listed below.
a. Maltodextrin.
b. Sorbitol.
c. Spray dried lactose.
d. Glucosemonohydrate.
e. Lactose monohydrate.
f. Sucrose stearate.

**6. Pharmaceutical API**
The drug selection criteria could be based on the following assumptions.
1. The low aqueous solubility of drugs.
2. High dosage frequency of drugs.
3. Short half-life.
4. Controlled drug delivery suitable drugs.
5. Drugs are having more adverse effects.

**CHARACTERIZATION PARAMETER OF PRONIOSOMES[29]**

| **PARAMETER** | **INSTRUMENT/METHOD USED** |
|---|---|
| Vesicle morphology | Scanning electron microscopy, Laser microscopy. |
| Shape and surface Morphology | Optical microscopy, Scanning Microscopy, Transmission microscopy. |
| Angle of repose | Funnel method |
| Encapsulation efficiency | Centrifugation method, Dialysis method. |
| Drug release kinetic data analysis | Higuchi's model, Peppa's model. |
| In-vitro methods for assessment drug release from Proniosomes | Dialysis tubing, Reverse dialysis, Franz diffusion cell. |
| *In-vitro* permeation study | Franz diffusion cell, Keshary chien diffusion cell |
| *Spontaneity* | Using Neubarer's Chamber |
| *Aerodynamic behavior* | Tween-stage Impinger |

## EVALUATION PARAMETERS OF PRONIOSOMES

### 1. Physical appearance of proniosomal gel[37]

The prepared gel was viewed through naked eye to characterize color and physical state of gel. Proniosomal gel was also viewed by optical microscope at 40 X magnification, to observe crystal characteristics of gel by spreading as a thin layer on a slide and placing the cover slip on it. The appearance of each formulation was checked for its color, consistency and fluidity.

### 2. Vesicle Size Analysis[38]

Size and size distribution studies were done for niosomes obtained after hydration of proniosomal gel with agitation (shaking) and without agitation. Size analysis was done by adding 10ml of phosphate buffer of pH 6.5 containing 0.35% tween 20 to the proniosomal gel (100mg) in a small glass vial with occasional shaking for 10 min. After hydration, the dispersion of niosomes was observed under optical microscope at 40x magnification. The sizes of 100 vesicles were measured using a calibrated ocular and stage micrometre fitted in an optical microscope.

### 3. Vesicle morphology[39]

Shape and surface morphology of proniosomes was studied using scanning electron microscopy (SEM). The niosomes formed from the hydration of proniosomal gel were mounted on an aluminium stub with double-sided adhesive carbon tape. The vesicles were then sputter-coated with gold/palladium using a vacuum evaporator and examined with the scanning electron microscope equipped with a digital camera at 10kV accelerating voltage.

### 4. Clarity

All formulations were observed for their clarity by visual inspection under black and white background and it was graded as follows; turbid: +, clear: ++, very clear (glassy): +++.[40]

### 5. PH Determination

The pH of rosuvastatin gel formulation was determined by using digital pH meter standardized before with pH 4.0 and 7.0 using standard buffers. 1gram of gel was dissolved in 100ml of distilled water and then, average values of triplicate pH measurements were calculated.[40]

### 6. Homogeneity

The homogeneity of all formulations was determined by visual inspection after the gels have been stored in the container for their appearance and presence of any aggregate.[40]

### 7. Rheological Characterization[48]

The rheological studies of samples were carried out with Brookfield Digital viscometer (LV DV-E model) using S-18 spindle number. All developed formulations were poured into the small sample adaptor rotated with increased angular velocity unto 100 rpm.

### 8. Drug Content[41]

Content of drug calculated by calibration curve. proniosomes measured in a volumetric flask about 100 mg and add methanol and shaking for 15-20 minutes, again mix 100 mg methanol for dilute the solution after dilution take 10 ml part of this solution for dilution at certain pH with saline phosphate buffer. Take solution in cuvete to take of absorbance at any wavelength, then measured drug content through calibration curve.

### 9. Encapsulation efficiency[42]

To calculated % Encapsulation Efficiency used following formula

$$\%\text{Encapsulation Efficiency} = \frac{\text{Total drug - Free dug} \times 100}{\text{Total drug}}$$

First proniosomes converted into niosomes to add distilled water and worm water, then centrifuge the prepared dispersion system. A clear fraction takes and determined by spectroscopy of drug content.

### 10. Drug Entrapment Efficiency[43]

**Centrifugation**

The Niosomal suspension prepared by dispersing the proniosomal gel in phosphate buffer was centrifuged at 18000rpm in a cooling centrifuge at a temperature of $200^0$C for 30min to separate the drug entrapped in niosomes. The sediment vesicles were collected and resuspended in 1ml of 30% PEG-400, 1ml of 0.1% Triton x-100 solution. The resulting solution was filtered and diluted with phosphate buffer saline and analysed.[45]

$$\%\,Entrapment\ efficiency = \frac{Amount\ of\ entrapped\ drug}{Amount\ of\ total\ drug} \times 100$$

**Dialysis**

The prepared Niosomal suspension was dialysed in a dialysis tube using suitable dissolution medium and the samples were collected at suitable time intervals, centrifuged and analysed for the drug content in UV spectroscopy.

**Gel filtration**

The unentrapped drug is removed from the Niosomal suspension by using Sephadex-G-50 column by eluting with suitable mobile phase and analysed with suitable analytical Techniques.

### 11. In vitro drug release studies

It can be performed by using Franz Diffusion Cell. The dialysis cellophane Membrane was mounted between the donor and receptor compartments and the capacity of the receptor compartment was 30ml. The area of the donor compartment was 2.54$cm^2$. The weighed quantity of proniosomal gel was placed on one side of the dialysis membrane and phosphate saline of pH 7.4 is used as a receptor medium (Yasam Venkata Ramesh et al., 2014). The receptor compartment was surrounded by water jacket to maintain the temperature of $37\pm0.5^0$C. The heat was

maintained using thermostatic hot plate with a magnetic stirrer. The receptor fluid was stirred by using a Teflon coated magnetic bead fitted to the magnetic stirrer. At every sampling interval the withdrawn samples were replaced with equal amounts of fresh receptor liquid. The samples thus withdrawn were analysed spectrophotometrically. The maintenance of sink conditions is essential.

**12. Stability studies**

Stability studies were performed to determine the ability of vesicles to retain the drug by placing the proniosomal gel at three different temperature conditions like Room temperature ($25\pm2^0$C), Refrigeration temperature ($4\text{-}8^0$C) and in oven ($45\pm2^0$C). During the stability studies the samples of proniosomal gels are to be placed in aluminium foil sealed glass vials. The samples were withdrawn at regular time intervals for a period of 6weeks and observed microscopically for the change in consistency, solid drug crystals and liquid crystalline structure. The samples were also analysed for particle size and percentage drug entrapment.

**13. Microscopical Examination[36]**

**1. Optical Microscope**

In a glass tube, 0.2g Proniosome gel was diluted with 10 ml of pH 7.4 phosphate buffer; a few drops of the formed niosomal dispersion were spread on a glass slide and examined for the presence of insoluble drug crystals using an ordinary light microscope with varied magnification powers (×10 and ×40). Photomicrographs were taken using a digital camera.

**2. Scanning Electron Microscopy (SEM)**

The shape, surface characteristics, and size of the proniosomes were observed by SEM. In an attempt to illustrate the role of cholesterol in vesicle formation, the morphological differences in shape and surface characteristics of the prepared proniosome derived noisome of formulae having different cholesterol contents were examined using a scanning electron microscope. In a glass tube, 0.2g proniosome gel was diluted with 10ml of pH 7.4 phosphate buffer; the dispersion was sprinkled and fixed on an SEM holder with double-sided adhesive tape and coated with a layer of gold of 150Å for 2 min using a Sputter Coater (Edwards,S-150A, England) working in a vacuum of ($3\times10^{-1}$atm) of Argon gas.[6]

**3. Differential Scanning Calorimetry (DSC)**

This method helps to study the possible interactions between drug and vesicle ingredients by taking thermal properties. Thermal properties of the pure drug and the formulation were evaluated by differential scanning colorimetry (DSC) using a diamond (DSC) (Mettler star w 8.10). The analysis was performed at a rate 50c min-1 to $200^O$c temperature range under an itro genflow of 25ml/min. Highest EE% was chosen, and samples of 4 mg of each drug, surfactants, empty and drug-loaded proniosomes-derived niosomes were submitted to DSC analysis. The weighed amount of sample was then held from room temperature to 300°C at a rate of 10°C/min.

**APPLICATIONS OF PRONIOSOMES[35-43]**

a. **As a drug carrier**- To overcome the problems associated with niosomes liposomes proniosomal gel advantages as good drug carrier compare to other conventional drug delivery. Problem associated with niosomes stability aggregation, proniosomes does not these types occurs problems.[1]
b. **Transdermal drug delivery systems**- Proniosomes increase the mechanism of action of drugs through the skin. Cosmetics mainly used this proniosomal technology. In comparison to un-entrapped drug penetration increases by proniosomal gel, and also greatly work on weak immune system. Now proniosomal vaccine for Transdermal drug delivery also researched.
c. **Targeted drug delivery**- One of the best advantages of vesicular drug delivery is targeted effect on site of the action. Proniosomes produce targeted effect on reticulo endothelial system, reticulo endothelial system take up proniosomes vesicles. Circulating serum factor controlled the uptake of proniosomes that factor is opsonises that type utilization of drug targeted to metastasize tumours which was occurs in the animal liver, spleen.
d. **Ocular drug delivery** - In the ocular drug delivery of proniosomal gel, full fill the problems those are face in ocular drug delivery, maintain the drug activity. That solve metabolism problem and also save degradation of drug by metabolic enzyme which is available in tear and corneal epithelial surface and other advantage is increase contact time and retention of drug also improve. Proniosomal gel is good for bacterial conjunctivitis compared the conventional eye drop.
e. **Peptide drugs delivery** - In comparison to conventional peptide drug, that has drawback peptide proteins break down by passing enzyme, niosomes protected in gastrointestinal peptide breakdown drug which entrapped in vesicles so stability increase.
f. **Sustained drug release**- Proniosomal encapsulated drug delivery applied with low water solubility, prolong drug action in brimonidine tartrate based proniosomal gel improve ocular bioavailability of drug prolong residence time and improve ocular contact time in of drug and also provide sustained release of drug.

**CONCLUSION**

Proniosomes are promising carrier for the future with greater physical and chemical Stability & potentially scalable for commercial validity. Many types delivery id possible by Proniosomes such controlled, targeted, Transdermal, Ocular, sustained etc. In transdermal delivery advantage is this produce non toxicity and

penetration enhance. In ophthalmic drug delivery improve bioavailability of drug and increase residence time in epithelial surface and improve contact time. Dry proniosomes are convenient and easy to handle and can further make new dosage form make capsule, beads, tablets. Proniosomes drug delivery effective and intended therapy.

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