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# A Systematic Review on Non- Invasive Drug Delivery on Spanlastics

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## Abstract:

Several obstacles prevent drugs from being delivered to their intended locations. The traditional drug administration methods—such as tablets, capsules, suspensions, emulsions, elixirs, lotions, etc. face a variety of problems, including low bioavailability, short drug shelf life, incompatibilities between drug excipients, and non-adherence by the patient. The particles known as nanoparticles include therefore increasingly showing to hold the position of better choice, especially with the creation of novel medication delivery methods systems similar to Liposomes. Spanlastic materials, a novel system having less adverse effect, it was made available in 2011 in keeping with the development of the medication delivery system. These are fully contained, elastic, deformable nanogels based on surfactants and aqueous solute solutions. Their chemical stability is demonstrated to be higher. Their responses to some of these issues with the conventional dosage form and offer targeted and regulated release of natural pharmaceutical components. The practicality of spandex, penetration system, various preparation techniques, their assessment characteristics, and uses are highlighted within the current review.

**Keywords:** Spanlastics, Surfactant, Glaucoma, Antifungal, Edge activators.

## Introduction:

Since traditional vaccination methods are risky and have many drawbacks, public health organizations place a high premium on non-invasive drug delivery. Due to the many drawbacks of the traditional immunization approach, deliveries that are non-invasive or needle -free are now a top priority worldwide [1].

Spanlastics are a unique medication administration device which traps the drug as a bilayer in a core cavity. The phrase "Spanlastic" (Span + Elastic) was initially used in 2011. A distinct class of vesicular transporters known as spanlastic serves as a medication delivery methods customized to a site mechanism for the topical, nasal, ocular, and transdermal application of medications [2].

Strategies of Non- Invasive Drug Delivery:

Oral Delivery: Oral intake generally results in good patient compliance; it is the most chosen method of administration. In addition, oral dosage forms are less expensive than parent dose forms. However, as previously mentioned in the previous sections, there are a number of obstacles that make the creation of oral formulations for protein therapeutics challenging. These include the enormous molecular weight, dimensions, enzymatic breakdown, physiochemical instability, and low membrane permeability. As a result, parenteral formulations of the majority of protein medications on the pharmaceutical market are accessible, with oral versions of very few

[3]. Eg: Lacidipine- When taken orally, calcium channel antagonist lacidipine is poorly soluble and extremely lipophilic in water (a BCS Class II medication), is extensively metabolized by Cytochrome P450 3A4 (CYP3A4) within liver. This leads to a low bioavailability of approximately 10% it presents a problem for the treatment of hypertension[4].

Nasal Delivery: Nasal is highly vascularized, non-invasive, and easily accessible as a result of a permeable, thin epithelial barrier, the nasal administration route is excellent for medication delivery. It also has a quick start of action, a low level of proteolytic enzyme activity, and the ability to avoid the hepatic first-pass metabolism. In addition, it is patient-friendly and efficient for self-medication [3]. Eg: Zolmitriptan- A powerful second-generation triptan called zolmitriptan is given to treat migraine episodes. When taken orally, it has a 40% low bioavailability because to the hepatic first-pass metabolism. Within 30 minutes, 70% of the zolmitriptan had penetrated the nasal membrane; after two hours, it had done so fully and at a steady-state flux that was noticeably higher than that of ordinary gel. An effective and potentially useful intranasal formulation that is appropriate to additional brain delivery investigation was presented in this study [5].

Transdermal Delivery: The administration of medication via the skin presents several benefits, such as lower dosage frequency combined with prolonged medication release, avoiding a first-pass hepatic metabolism, affordability, excellent patient adherence. Transdermal administration, in particular, can stop the enzymatic and chemical instability of protein medications within the hostile GI environment, especially when compared to oral delivery [3]. Eg: Glimepiride-A third-generation sulphonylurea glimiperide is used to treat type 2 Diabetes. However, taking it orally has been linked to serious stomach problems, including heartburn, nausea, vomiting and anorexia, and hemolytic anaemia. Consequently, the transdermal application might be a potential good substitute. The work's objective is to determine whether a innovative medication delivery system is suitable for transdermal delivery [6].

Pulmonary Delivery: The lung's enormous surface area (between 80 to140 $m^2$), thin (0.1 to 0.5 mm) Alveolar epithelium, and abundant blood flow enable fast and elevated medication absorption. Because pulmonary drug delivery circumvents the non-invasive hepatic first pass effect, effective at a reduced dosages, and suitable to either systemic or local distribution, it is favorable [3]. Eg: Salbutamol sulphate- Spherical niosomes measuring 400-451nm were found in results, and they were able to ensure 66.19% of the sample solution. 76.54± 0.132% sample solution released by niosomes over the course of eight hours with a regulated release profile. The maximum amount of puffs/ canister was 200, the maximum leakage test was 4mg/ 3d, the dose delivered each puff was 0.1mg and the niosomal aerosol size was 0.64-4.5µm [7].

Ocular Delivery: Several issues arise when topical ocular medication is administered using traditional dose forms, such as solutions and suspensions, including nasolacrimal drainage, tear turnover, drug loss on the eyelids, and low bioavailability. Gels and ointments that have a high viscosity on the skin cause patients discomfort and blurred vision [3]. Eg: Cyclosporine- Immunosuppressive peptide cyclosporine A (CsA) has been shown to be beneficial for people with ocular diseases, such as dry eye condition, uveitis, corneal healing and various forms of keratoconjunctivitis. It also helps avoid corneal graft rejection. Its enormous of 1202.6% molecular weight and cyclic undecapeptide structure result in poor water solubility. Consequently, the development of medicine delivery is crucial devices to demonstrate the medication's solubility. For the administration of CsA, micelle-based solutions and oil-in-water emulsions have been produced over many years [8].

Rectal Delivery: The ability to avoid the hepatic first-pass impact and the relatively colon mucosa's study enzymatic and physicochemical environment have made rectal drug administration an extended-standing medical treatment for the therapy both regional and systemic disorders [3]. Eg: Duloxetine HCL- Major depressive disorder is treated with serotonin and nor epinephrine reuptake inhibitor Duloxetine HCL (DXH). Because of it significant hepatic metabolism, DXH has 40% oral bioavailability, acid-labile nature, and limited water soluble. To overcome such obstacles, the rectal pathway has been proposed has an additional administration pathway. The objective of the present investigation aimed to prepare an *in-situ* gel loaded within DXH-glycerosomal (DXH-GLYS) for the administration of the rectal in order to boost increase the bioavailability of DXH and its permeability [9].

**SPANLASTICS AS OCULAR DRUG DELIVERY :**

Within the medical therapy for glaucoma Oral Carbonic Anhydrase Inhibitors (CAIs) is typically utilized when topical agents fail to sufficiently regulate intraocular pressure (IOP). However, systemic unpleasant effects, such as paresthesias, +tinnitus, nausea, anorexia, and gastrointestinal problems, contribute to poor patient acceptance of oral CAIs. When treating glaucoma and ocular hypertension medically, a topical CAI that has significant ocular hypotensive without oral medication's systemic adverse effect medicines would be a significant breakthrough [10].

Ocular circulation and carbon dioxide levels are tightly associated. Increased blood carbon dioxide levels are linked to increased blood flow to the retina. The highly active and widely distributed enzyme carbonic anhydrase is in charge of metabolism and the transport of carbon dioxide. Dorzolamide's ability to generate more than 99% enzyme inhibition at the level within the position of aqueous fluid within the ciliary body formation, is what allows it to lower intraocular pressure. Therefore, any ocular hypotensive action requires a significant amount of drug penetration into the eyes and a prolonged tissue concentration of the medication [11].

## Additives in spanlastic Formulations

Surfactants, Edge Activators, Solvents, Buffer, Anti-microbials and Electrolytes

**Surfactants:** Surface active agents, also known as surfactants, work to reduce the strain across the interface between the oily and aqueous phases are two liquids. Non-ionic surfactant molecules do not have a charged group within their heads, and the arrangement of these groups forms the vesicular structure of spanlastics of these substances as concentric bilayers. The different kind of Spans, such as Span 20 (monolaurate), Span 40 (monopalmitate), Span 60 (monostearate), and Span 80 (monooleate), vary based on a kind that of fatty bonded to the molecule's polyoxyethylene sorbitan portion. These types of Spans is important because they can predict the vesicular formulation's stability; vesicles based on Span 40 and Span 80 exhibit a greater level of instability, combination and disruption[2].

**Edge Activators:** These surfactants belong to a unique class that has a high hydrophilicity or HLB value. These are destabilizing particles, single-chain surfactants, and by reducing their interfacial tension, raise the bilayer vesicles' deformability. As a result, they give these vesicles' lipid bilayer membranes flexibility. EAs typically form more spherical vesicles, which result in lower particle sizes. By adding an edge activator (Tween 80), the vesicles' elastic properties would be amplified, enabling them to momentarily expand the biological membranes' pore size. This would enable somewhat larger vesicles to enter and improve drug penetration. Moreover, these hydrophilic surfactants have the power to increase the deformability and instability of vesicular membranes and produce frameworks with varying degrees of disruption in packaging [2].

**Ethanol:** Ethanol enhances the characteristics of these nanovesicular transporters. This helps to make the drug dividing up better, become trapped inside spheres. The potential of ethanol to condense membranes produces a reduction in the vesicular membrane's thickness, which in turn reduces vesicular size. Ultimately, this modifies the system's net charge with respect to zeta potential that is negative, leading to a certain level of steric stability [2].

**Table 1. Different drug Approaches for Ocular Delivery[12]**

| DRUG | POLYMER | FORMULATION | RESULT | REFERENCE |
|---|---|---|---|---|
| Acetazolamide | Span 60 | Niosomes | The amount of medicines in the aqueous humor increased in both permeability and concentration | (47) |
| Dorzolamide HCL and Pramipexole HCL | Chitosan | Nanoparticles | Shows good mucoadhesion and *in-vitro* release | (48) |
| Ciprofloxacin | Lipid | Liposomes | Controlled release of drugs | (49) |
| Timolol maleate | Non-ionic surfactant | Niosomes | Peak drug concentration in aqueous humor was 2.34 times higher than TMS and AUC was 1.7 times higher than in pure timolol maleate solution. | (50) |
| Diclofenac | Lipid | Surface modified liposomes | Retina choroid concentration was 1.8 times higher than the unchanged solution of Diclofenac. | (51) |
| Tacrolimus | Bile salts + lipids | Liposomes | Cellular absorption that is 3-5 times greater than that of traditional liposomes prolonged. | (52) |
| Melatonin | PLGA | Nanoparticles | Caused a significant drop in IOP | (53) |

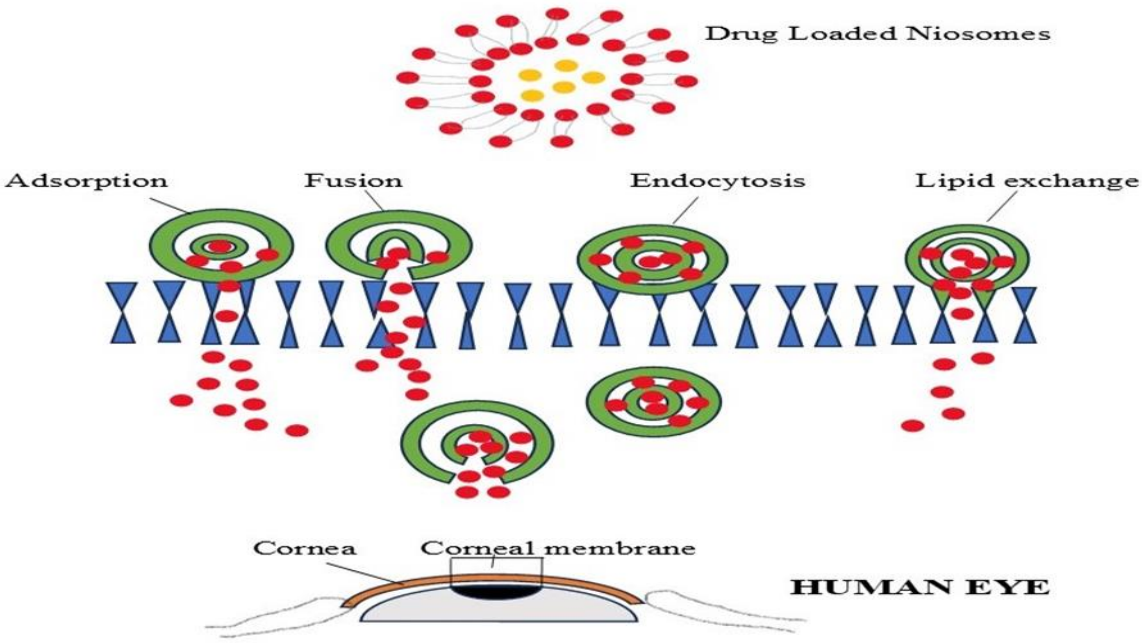
## Mode of penetration of Spanlastics [13]:

The effectiveness of edge activators increase the vesicles deformability by disrupting the lipid bilayers. The surfactant that these vesicle contain leads them to promote lysis (solubilization) in the higher concentration range and to create holes a lipid material, like membranes. Because of this, intercellular gaps can be filled by elastic vesicles in the presence of a water gradient, depending on a composition of the membranes bending energy.

There are two ways that drugs can penetrate the body.

1. The elastic vesicles alter the intercellular lipid lamellae by interacting serving as enhancers of penetration and interacting with the epithelial cell membrane.

2. The intact vesicles carrying the medicine can traverse the biological membrane and travel across intercellular gaps by acting as drug-transporting systems in the format of elastic vesicles [2].




## Method of Preparation:

**Ethanol injection method:** The injection procedure was used to make spanlastics using ethanol. Suitable tween 80 was weighed and dissolved in an appropriate volume of distilled water and heated to 80 °C. A suitable volume of ethanol was used to dissolve Spans 60, and the blend was subjected to five minutes of sonication at 50° C. A precise dosage of the medication was introduced to the tween solution. Then, using a 30-gauze syringe to agitate the tween solution at various rates 1 ml per minute as a fixed rate, prepared solution was dropped wisely. After 30 mins of stirring at 80°C, another 30 mins were spent stirring at ambient Temperature. Lastly, distilled water was used to re-create the formulation to the appropriate volume [14].

**Ether injection technique:** Applying this technique, a surfactant is injected gradually into a suitable quantity of ether through by using a 14-gauze needle, 25ml per minute into an appropriate volume of preheated phase of water that contains the medication, which is kept at 600° C. The solution of ether will be removed using a rotary evaporator. Single-layered vesicles are formed when the organic solvent evaporates [2].

**Sonication method:** This procedure involves preparing a portion of the drug, an aliquot placing it in the proper buffer and mixing it with the surfactant mixture in a glass vial that holds 10 ml. A titanium probe is used to sonicate the mixture [2].

**Handshaking method:** First, surfactants are mixed with an organic solvent (like chloroform, benzene or ether). Subsequently, using a vacuum evaporater, the solvent is evaporated in a circular bottom flask at a lower pressure. The layer is continuously shaken while being rehydrated using a medication solution in water, causing a surfactant layer to swell. Ultimately, swelling [2].

**Extrusion method:** Using a rotational vacuum, a solution including surfactant and diacetyl phosphate is evaporated in this process, leaving a thin layer in the evaporator. To get a consistent outcome, after rehydrating the drug solution with an aqueous pharmaceutical solution, the mixture is pushed through a polycarbonate membrane with a mean pore size of 0.1 micron, which is maintained in series for up to eight passages [2].

**Microfluidization method:** This method involves the interaction of two streams that are fluidized; one contains a medication, and the other a surfactant —with extremely higher speed, within the interaction chamber's precisely specified microchannels, so ensure the system's energy supply remains within the range of spanlastic formulas. We refer to this as the subsurface jet theory. Improved homogeneity, reduced size, and reproducibility are the outcomes for the formulation [2].

## Evaluation Studies:

**pH-** A Thermo Orion StarTM Series, the pH of a solution was determined by pH meter (USA) chosen eye drop formulation at room temperature [15].

**Viscosity-**By using a thermo stated water bath set between 25-34ºC and a viscometer (Brookfield viscometer DV-I +, USA), the viscosity was measured [15].

**Surface tension-** Using a digital tensiometer K10, the De Nouy ring method was used to measure the formulation's surface tension four times in duplicate at 35 ºC [15].

**Stability studies-** Coalescence, phase separation, and colour change were noted during the thermodynamic stability investigation[14].

**Ocular irritancy test-** Rabbits were used to test the potential for ocular discomfort from a particular niosomal formulation and commercial formulation instillation [16].

## TOPICAL DELIVERY OF SPANLASTICS

In the present scenario, other traditional delivery methods are subordinated to a TDDS, a non-imposing, painless drug administration mechanism[17]. Topical route of the medicine eliminates first pass effect, gastrointestinal irritation, metabolic breakdown linked to oral administration, and is easier to remove from the skin due to its less greasy nature. Gel compositions has been proposed as a topical medication delivery system, strategy to get around these drawbacks [18].

The prevalence of fungal diseases has significantly increased in recent decades. It comes in many different forms, ranging from skin-related superficial infections to systemic infections that invade interior organs. The bulk of these common ailments are caused by the species of *Pneumocystis, Aspergillus, Cryptococcus, Candida*, that also cause Pneumocystis pneumonia, Aspergillosis, Candidiasis [19] Dermatophytes are some of the most common etiological agents of the skin mycoses [20].

A unique drug delivery technique called spanlastic holds the medication as a core cavity as a bilayer [21] . These deformable vesicular carrier system have higher permeability than drug solution. Because these vesicles structure contains edge activators is responsible for their elastic nature [22]. Spanlastic is a special class of the term- 'modified niosomes' refers to the vesicular carriers, which are defined as drug delivery systems that target specific areas such as the eyes, mouth, skin, nose, and transungual area by including an edge activator into their niosomal composition [23,24].

Transdermal medication administration is one of the many vesicle delivery methods that niosomes offers [25,26]. Niosomes used topically have the ability to prolong a drug's residence duration thereby lowering the medication's systemic absorption in stratum corneum and epidermis [27].

Econazole (ECN), also known as nitrate salt, is an antifungal imidazole which is used to treat fungal infection such as pityriasis versicolor and tinea pedis. It shares structural similarities with miconazole, another imidazole derivatives. Topical econazole is commercially available as cream and ointment [18,28].

## Antifungal Topical gel:

The most effective way to treat significant skin dermatophytes may be through topical application of antifungal medications, which guarantees direct entry and a greater retention percentage at the goal. In addition to preventing pre-systemic metabolism, topical administration helps to lower systemic toxicity [29].

## Composition of Spanlastics:

Non-ionic surfactant, Cholesterol, Edge Activators, Charged molecules, Hydration medium.

**Non-ionic surfactant** - Surfactants, or surface active substances, work to lessen the strain across the interface between two liquids (phases with oil and water). These molecules feature a non-polar tail and a polar head, making them amphiphilic. When forecasting the stability of vesicular formulation, the types of span are crucial.

Sorbitan alkyl esters (Spans), Span 20 (monolaurate) Span 40 (monopalmitate), Span 60 (monostearate), Span 80 (monooleate), polysorbate 80 (Tween 80), Lecithins [30,31].

**Cholesterol** -Despite not being a prerequisite for the creation of niosomes, the addition of cholesterol can significantly alter their characteristics. When Tween 60 was utilized as the a significant increase in cholesterol concentration from 22-40% did not affect the non- ionic surfactant, significantly affect particle size; nonetheless, particle size was significantly reduced as cholesterol levels rise while using Span 60 or Brij 72 [32].

**Edge Activators** - These surfactants belong to a unique class that has a high hydrophilicity or HLB value. EAs typically form more spherical vesicles, which result in lower particle sizes. By adding an edge activator (Tween 80), the vesicles' elastic properties would be amplified, enabling them to momentarily expand the biological membrane's pore size. This would enable somewhat larger vesicles to enter and improve drug penetration [33,34].

**Charged molecules** – In order to increase stability, these molecules are added to the mixture by preventing collisions through electrostatic repulsion. Phosphatidic acid and diethyl phosphate (DCP) are both negatively filled with charge substances. Similar to this, the well-known charged substances sterile pyridinium chloride and stearyl amine are utilized in the synthesis of niosomal production [35].

**Hydration reservoir** – The hydration reservoir is one of the most important elements in the formation of niosomes. An often used hydration medium is phosphate buffer. On the other hand, the solubility of the drug enclosed in the buffer dictates its pH [36].

## Methods of Preparation of Spanlastics:

**Ether injection method** – In this method, cholesterol, surfactant, and an organic solvent like diethyl ether are combined. The mixture is gradually added to the medication solution in water, keeping the degree of heat constant above 60 °C. The medication containing surfactant then forms vesicles in a single layer, increasing in size 50-1000µm when a solvent evaporates [37,38].

**Hand shaking method** - Using this technique, an aliquot of the medication is made in suitable buffer and combined with a glass surfactant mixture vial with 10 ml. A titanium probe is used to sonicate the mixture [21].

**Multiple membrane extrusion method** - This technique works well for regulating a niosomal formulation's size. Evaporation creates a thin layer from a combination of diacetyl phosphate, cholesterol and surfactant in chloroform. A medication solution in water is added to the resultant film, after that the polycarbonate membranes are used to extrude the suspension [21]

**Reverse phase evaporation method** - After mixing cholesterol and surfactants. The organic phase is mixed with an aqueous solution in an organic solvent. The organic phase is eliminated and the two-phase system is homogenized under negative pressure. Large monolayer vesicles can then be produced as a result [39].

**Thin-film hydration technique** – In round-bottom flask, surfactant, cholesterol, and other lipophilic materials are dissolved in an organic solvent. The organic solvent is removed by using rotational vacuum evaporator. Subsequently solvent-soluble organic molecules buildup as a thin, dry coating on the flask's inside surface. Water or an aqueous solvent containing the drug is added to a flask at a temperature higher than the transfer temperature, which is the temperature needed to hydrate the thin layer. Upon hydration, multilayer vesicles are created. Small-scale niosomes can be produced using high-pressure homogenizers or membranes that have been appropriately cut off in size [40,41,42].

**Table 2. Role of Niosomes as a potent nanocarrier for fungal diseases of the skin [23]**

| COMPOSITION OF NIOSOMES | DRUG | RESULT | REFERENCE |
|---|---|---|---|
| Oleic acid vesicles / Oleic acid, Methanol | Fluconazole | The accumulation of the drug-loaded oleic acid vesicles in the lower epidermis of the skin following topical administration was observed by confocal microscope examinations, confirming the efficacy of these vesicles for localized drug delivery. | (54) |
| Span 60, Cholesterol, Stearic acid | Nystatin | Comparing niosomal gel to standard nystatin a deposition in porcine skin and a decrease in rabbit topical irritation. | (55) |
| Span 60, Cholesterol, Ethanol | Itraconazole | When contrasted with an itraconazole topical formulation that is sold commercially, itraconazole-loaded niosomes demonstrated a larger inhibitory zone against candida albicans higher *in-vitro* skin penetration. | (56) |
| Span 60, Span 40, Tween 60, Cholesterol | Ketoconazole | Niosomes loaded with the medicine in a ratio of 1:0.2 with span 60 and cholesterol | (57) |

| | | | |
|---|---|---|---|
| | | demonstrated a longer-lasting impact that the formulation containing ketoconazole. | |
| Span 80, Cholesterol | Econazole | In niosomes, a ratio of 1:4 between cholesterol and Span 80 showed the greatest drug trapping and prolonged drug release for upto 24 hours, suggesting their effectiveness in treating fungal infections of the skin. | (58) |
| Oleic acid vesicles / Oleic acid, Methanol | Clotrimazole | Upto 5 days after application, clotrimazole can be released from oleic acid vesicles filled with drugs, according to an *in-vivo* research. | (59) |
| Span 60, Span 65, Tween 80, Sodium deoxycholate | Terbinafine hydrochloride | The enhanced formulation of Spanlastics effective *ex-vivo* nail penetration was observed by confocal laser scanning microscopy (CLSM). | (60) |

## Formulation of Niosomes:

The niosome was created using thin-film hydration technique. Cholesterol and surfactant were precisely weighed submerged in a 1:1 v/v chloroform- methanol mixture combination within 100 ml round-bottom flask. A solvent combination is mixed with the medication amount that has been weighed. Using flash evaporation at 60° C, At 150 rpm, the solvent mixture was taken out of the liquid phase, leaving a thin layer on the flask wall. Applying vacuum will guarantee that all remaining solvent has been removed. After the creation of niosomes, the lipid film, though dry, was wet for one hour at 60 ± 2°C, using pH 7.4 phosphate buffer saline of 5ml. The cholesterol to surfactant ratios in the formulation were 1:0.5, 1:1, and 1:1.5 [27].

## Niosomal gel:

The optimized formulation was combined with an appropriate gel foundation to create the gel formulation. The SCMC base-selected gel base for niosome inclusion.

Gel formulation with Sodium carboxy methyl cellulose base

Suspension of niosomes, Sodium carboxymethyl cellulose (SCMC), Glycerine, Distilled water

The necessary amount of gel was made, SCMC was employed as a gallant that was soaked in water, glycerin was utilized as a humectant, and water was added before adding niosomal suspension [44].

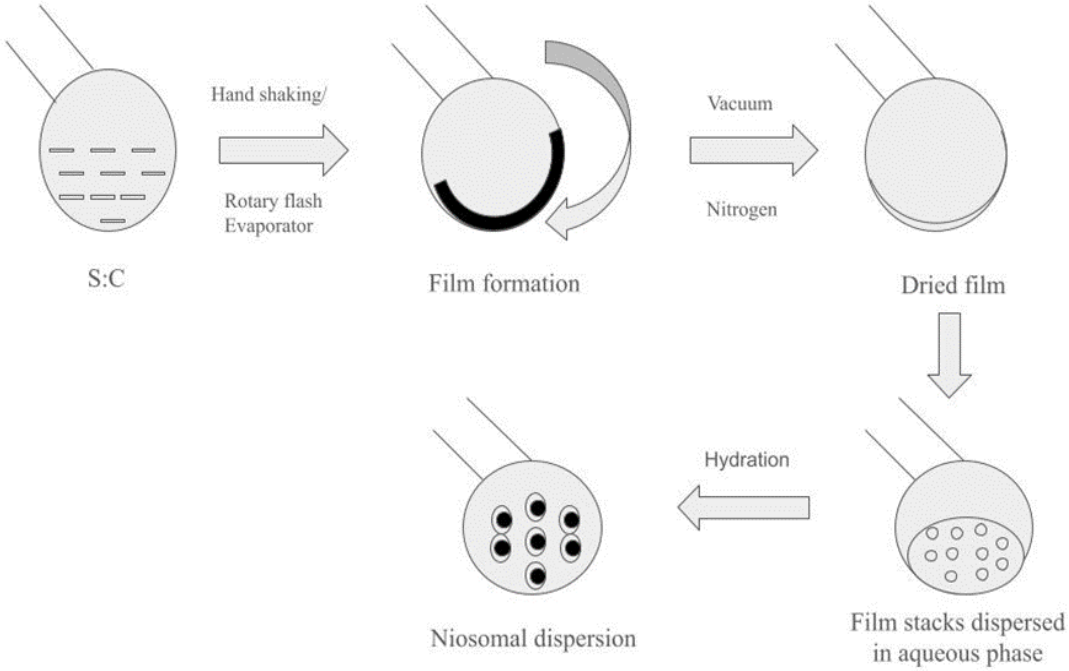



**Diagram showing the steps involved in making niosomes by hand-shaking thin films of hydration.**

## Evaluation Studies:

**Physical stability**: The characteristics of clarity, colour, homogeneity, and foreign particle presence were assessed in the prepared gel. After the gels were placed in the container, their appearance and the presence of any aggregate were visually inspected to ensure that all generated gels were homogeneous [18].

**Particle size analysis**: A niosomes average vesicle size was determined using a Malvern zetasizer after the niosomal suspension had been diluted and put into a cuvette with an appropriate blank [43].

**pH measurement**: The pH values of the 1% gel that made were measured using a pH meter aqueous solutions [18].

**Spreadability**: Gels must meet a number of critical requirements, one of which is good spreadability. The word "spreadability" refers to how easily a gel covers a given region of skin after being applied. The spreading value of a formulation affects its medicinal efficacy as well [43].

**Viscosity measurement**: The viscosity of the various gel compositions was measured at 25 $^{o}$ C using a cone and plate viscometer [18].

**Entrapment efficiency**: 1ml of the mixture, diluted to 10ml with distilled water, was subjected to a 60 minute 4 $^{o}$ C centrifugation at 15000 rpm using a high-speed cooling centrifuge to isolate niosomes from unentrapped medication and assess the entrapment efficiency of the formulation [43].

***In-vitro* drug release**: The *in-vitro* drug release pattern was observed using a dialysis membrane in the following study was investigated. Following the separation of the medication that was not entrapped, the niosomal preparation was put into an open-ended glass tube, one end of which was secured with the dialysis membrane. The open-ended tube was then placed into the beaker containing 100ml of phosphate buffered saline pH 7.4, which was used to fill the receptor compartment. A magnetic stirrer was used to agitate the liquid at 100 rpm in order to maintain the receptor's temperature at 37 ± 2$^{o}$ C. After gathering 5 ml of the sample at a prearranged time, the same volume of newly prepared PBS pH 7.4 buffer was immediately added. The entire experiment was conducted with the sink condition intact [43].

## Conclusion:

The creation of new Spanlastics surfactant-based vesicles offers a non-invasive technique for administrating medicine to the intended location without the need for continuous dosing. They address the problems of pharmaceutical inconsistency, limited biodegradability, insolubility and rapid degradation. Therefore, it may be said that the delivery of services could be revolutionised via spanlastic of drugs via nanovesicles. Both lipophilic and hydrophilic medications can have site-specific activity by taking advantage of these vesicular systems. Currently, medication delivery to the middle ear, nasal, transungual, oral, and ocular uses this technique.

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