Spanethosomes
A novel drug delivery system

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Vesicular system

- Vesicular drug delivery system can be defined as highly ordered assemblies CONSISTING of one or more concentric bilayers formed as a result of self-assembling of amphiphilic building blocks in presence of water (1)

- Drugs that are hydrophilic and lipophilic can be trapped by vesicles in the lipid bilayer or the aqueous compartment. They are able to deliver medications to the intended site of action and lowering their concentration at other regions of the body. They can lessen the risk of drug toxicity. Moreover, drug retention in vesicles lengthens the duration that medications remain in systemic circulation. Approaches have been used to alter skin to enhance the transport of therapeutic agents such as using penetration enhancers , iontophoresis , microneedles, and lipid vesicle carriers 2

Table (1-1):Vesicular structur with their composition

Vesicular carrier	Main composition	Additives
Liposome	Phospholipids	
Niosome	Non-ionic surfactants	Cholesterol
Transferosome	Phospholipids	Edge activator
Ethosome	Phospholipids	Ethanol
Cubosome	Phospholipids	
Bilosome	Non-ionic surfactants and Bile salts	Cholesterol
Spanlatics	Non-ionic surfactants and edge activator	
Novasome	Non-ionic surfactants	Cholesterol+ Free fatty
Trepesome	Phospholipids and terpene	
Cerosome	Phospholipids and ceramide	

liposomes

- . Liposomes are defined as phospholipid vesicles consisting of one or more concentric lipid bilayers enclosing discrete aqueous spaces. The unique ability of liposomal systems to entrap both lipophilic and hydrophilic compounds enables a diverse range of drugs to be encapsulated by these vesicles. Hydrophobic molecules are inserted into the bilayer membrane, and hydrophilic molecules can be entrapped in the aqueous center [3]

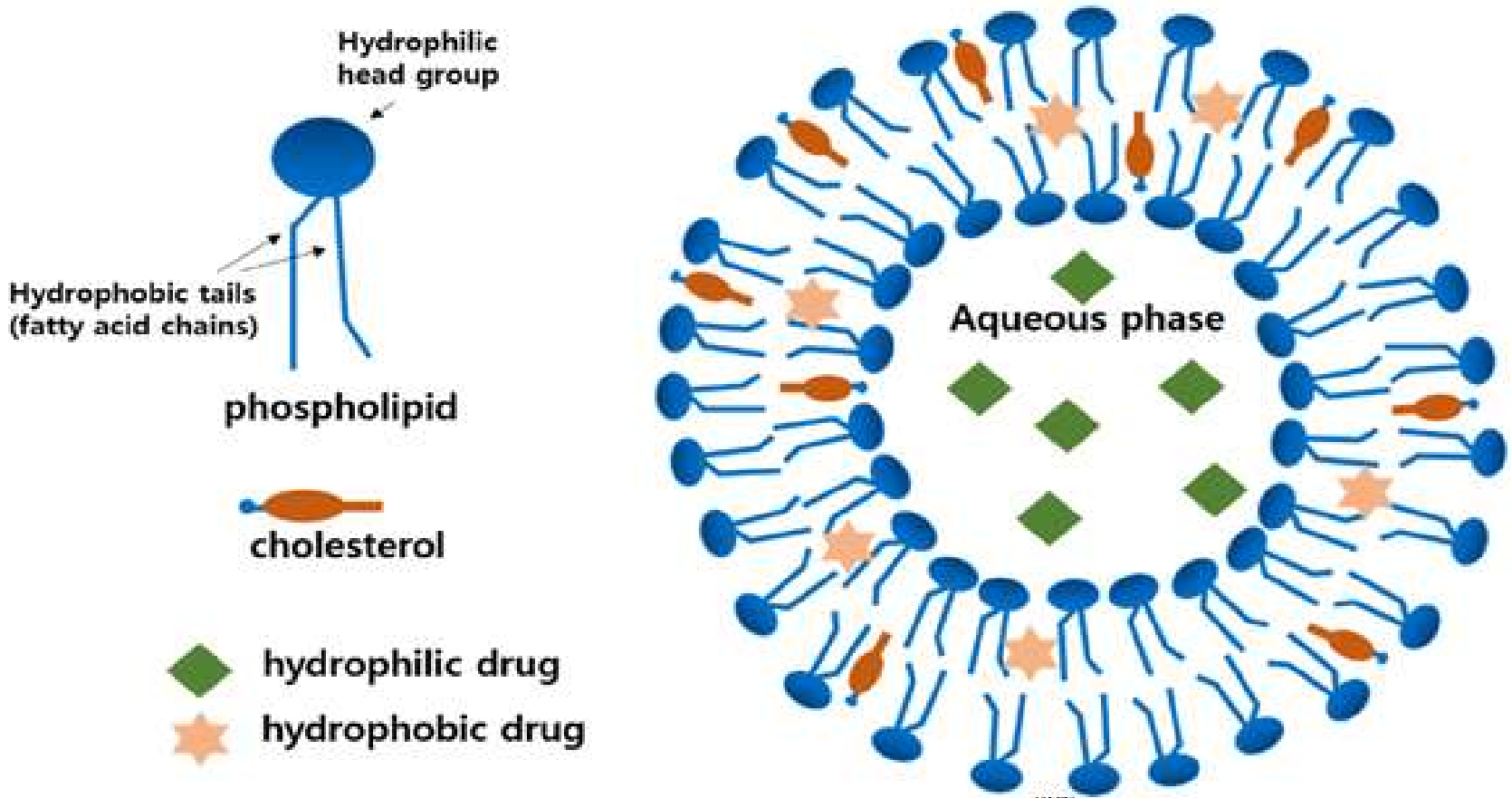
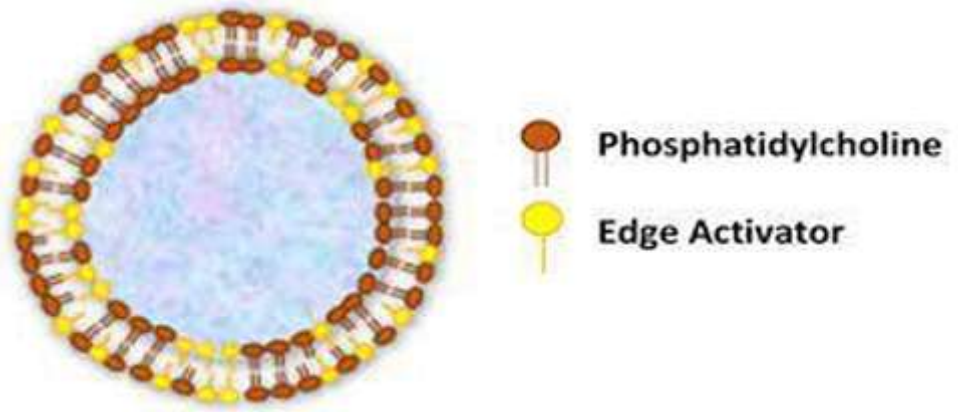


Figure (1-1): Liposome structure[27]

transferosomes

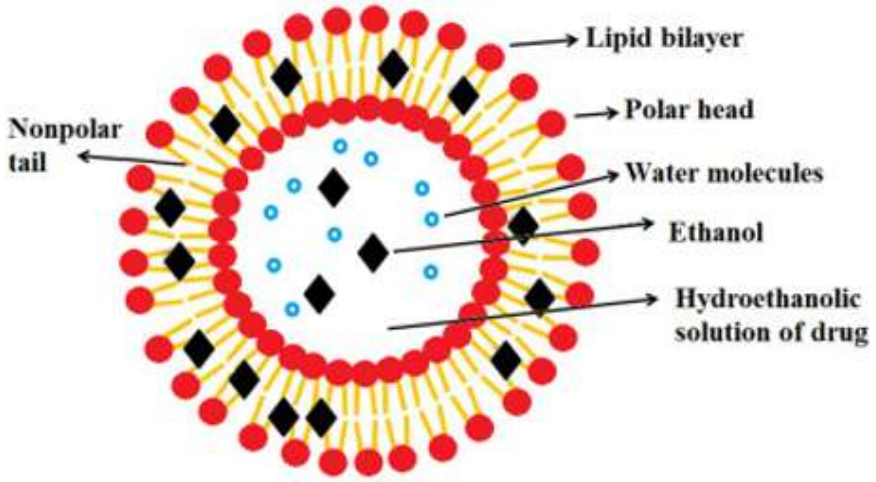
Transferosomes is one of a kind of liposome that contain combination of phosphatidylcholine and an edge activator.

They are flexible and soft vesicles designed to improve the transportation of active ingredients



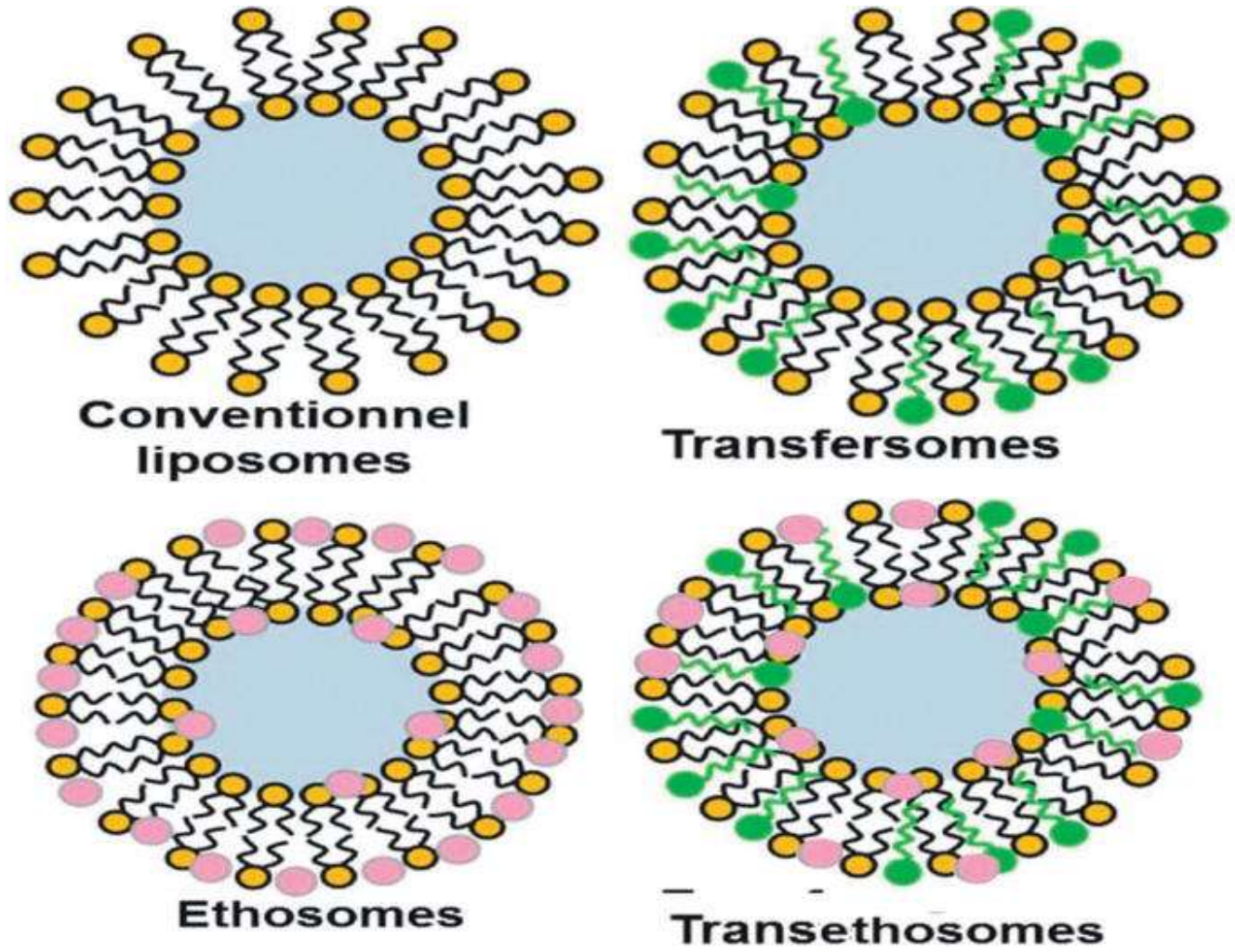
ethosomes

Recently, a developed lipid vesicular structure which has a `reasonably high concentration of ethanol inside of it is called an etherosome. This ethanolic vesicular system was firstly emerged by Touitou(49). The primary elements found in ethosomes include phospholipid, water, ethanol, and active pharmaceutical ingredients (API).



transethosomes

- Transethosomes are novel nano-carriers made up of lipid, edge activator, and an alcohol that function in the vesicular system. Recently, the name “trans-ethosomes” was given to lipid-based nano-vesicles that contain an edge activator and ethanol. The benefits of ethosomes and transfersomes are combined in transethosomes. Transethosomes provide a number of advantages over other drug delivery methods because of the inclusion of these components. Ethanol improves drug penetration through the minute holes created in the stratum corneum as a result of fluidization by increasing the fluidity of lipids and decreasing the density of the lipid bilayer[3]

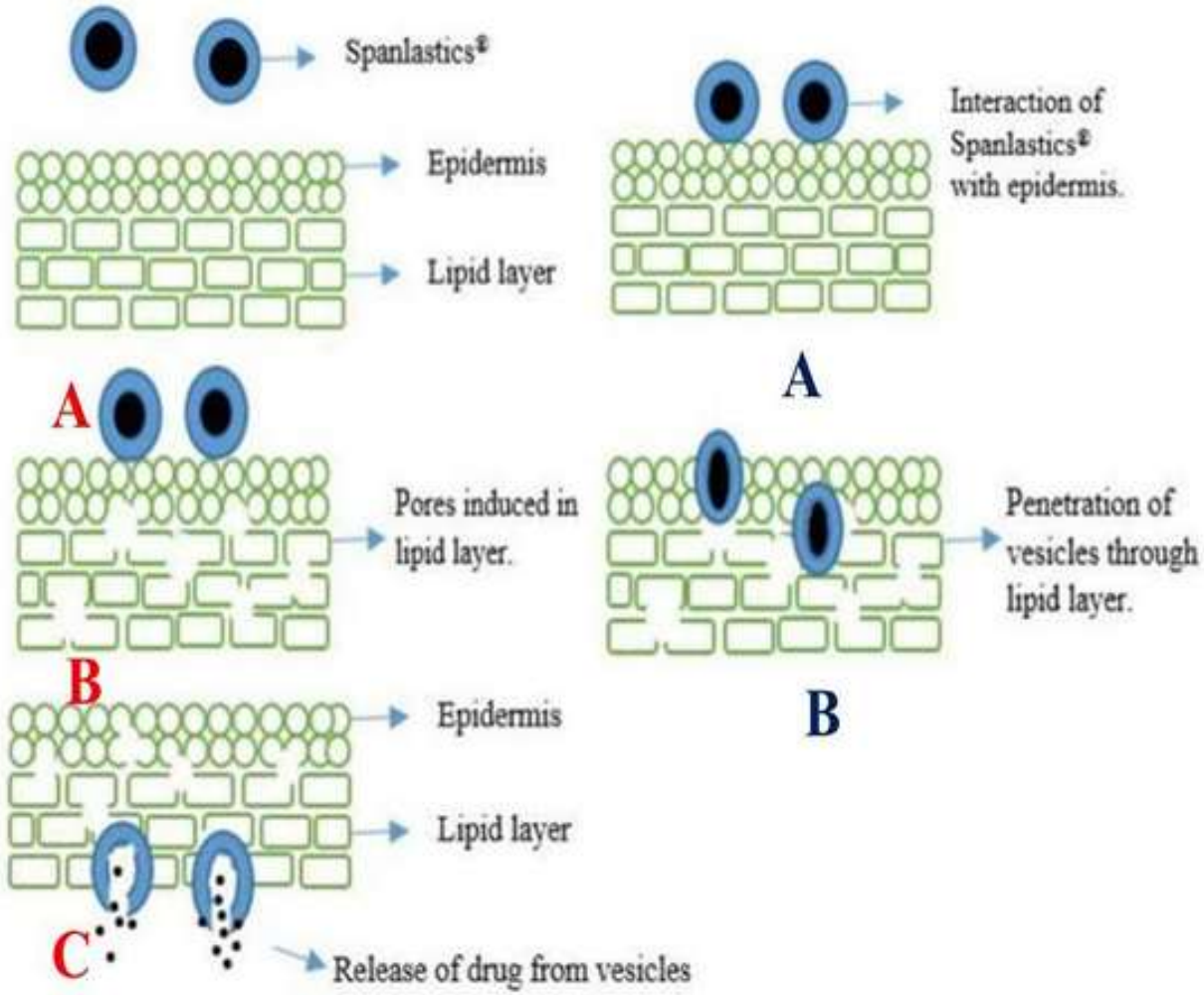

Conventionnel liposomes
Transfersomes
Ethosomes
Transethosomes
Ethanol
Phospholipid
Single chain surfactant (edge activator)
Surfactant (double or single chain)

spanlastic

- Structurally similar to traditional liposomes but are more chemically stable.They are resemble transfersomes, which are very elastic and flexible liposomes. Non ionic surfactant(mainly span) and an edge activator which have the dual effect of improving the entrapment of the drug in the vesicle, increasing the drug stability by steric stabilization, make up the two essential components of spanlastic .Spanlastics is the name given to these vesicles since they are predominantly made of spans surfactants

Mechanism of Penetration of Spanlastics

- Some researchers clarified two mechanisms of penetration of spanlastics . First mechanism was suggested that the edge activators (EAs) would weaken the lipid bilayers, making the vesicles more flexible and squeezed through biological membrane.
- The Second mechanism is vesicles' surfactant may induce holes in skin membranes and other lipid membrane structures, as well as solubilized or (lysis) biological membrane component at greater concentrations. Accordingly, elastic vesicles can squeeze through intercellular spaces under the influence of the transepidermal water activity gradient


Spanlastics®
Epidermis
Lipid layer
Interaction of Spanlastics® with epidermis.
A
A
Pores induced in lipid layer.
B
Penetration of vesicles through lipid layer.
B
Epidermis
Lipid layer
C
Release of drug from vesicles

spanethosomes

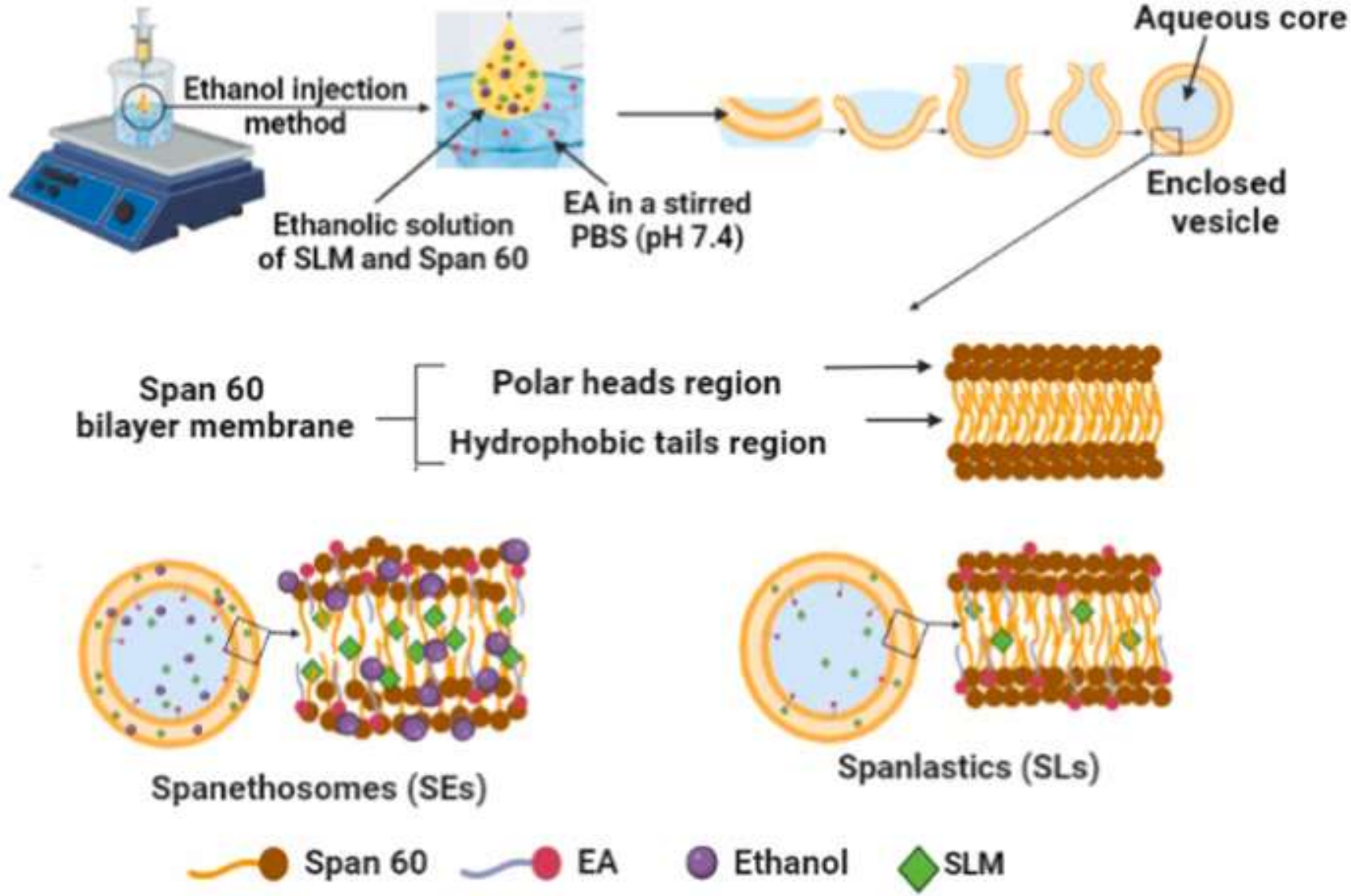
- spanethosomes, was developed by introducing ethanol within spanlastics, to combine both the skin penetration enhancing ability of spanlastics and the fluidizing effect of ethanol
- The nonionic surfactant, span, and edge activator (EA) are vital components of spanlastic, which promote vesicle entrapment effectiveness and establishment through steric stability.
- they enhance drug bioavailability through their ability to increase drug penetration across biological membranes accompanied by a sustained or controlled manner of drug release at a target site

- This synergistic mixture of Span, EA, and ethanol is expected to allow reorganization of the vesicular bilayer resulting in surface irregularity, better elasticity, and enhanced permeation pattern across the skin. Ethanol has been broadly reported as an effective penetration enhancer as it intercalates with the hydrophilic region of the intercellular lipid domains of SC resulting in the depression of lipid melting point, thus enhancing lipid fluidity as well as cell membrane permeability . Moreover, ethanol in UDVs causes the membrane bilayers to become less dense and highly malleable with consequent formation of more deformable and flexible vesicles that could easily squeeze through the tiny openings formed in the disturbed SC lipids

- They possess the ability to squeeze themselves throughout the intracellular spaces of the stratum corneum and the skin layers that follow, passing into the target dermal tissues
- Materials
- fluconazole
- Span 60
- Tween 80
- Ethanol
- The aim of this work is to formulate fluconazole loaded spanethosomes gel for deeper skin penetration to enhance antifungal activity and minimize the adverse side effects.

Preparation of fluconazole loaded SEs

- The ethanol injection method was attempted for the preparation of SEs . Briefly, an ethanolic solution of fluconazole 0.5% and Span 60 at different concentrations (0.5, 1, and 1.5% w/v) was injected slowly into a beaker containing D.W and 0.75% tween 80 using homogenizer 2000 rpm for 10 min then transport to stirring 1500 rpm for 30 min and using prob.sonicator 50in 10out 30% puls for 5min.


Ethanol injection method
Ethanolic solution of SLM and Span 60
EA in a stirred PBS (pH 7.4)
Aqueous core
Enclosed vesicle
Span 60 bilayer membrane
Polar heads region
Hydrophobic tails region
Spanethosomes (SEs)
Spanlastics (SLs)
Span 60
EA
Ethanol
SLM

- 1.Jain S, Jain V, Mahajan SC. Lipid based vesicular drug delivery systems. Advances in Pharmaceutics. 2014;2014(1):574673.
- 2. AL-MANSOORI MK, SABRI LA. Preparation and evaluation of transdermal gel loaded with spanlastics containing meloxicam. Journal of Research in Pharmacy. 2024 Jul 1;28(4).
- 3. Sercombe L, Veerati T, Moheimani F, Wu SY, Sood AK, Hua S. Advances and challenges of liposome assisted drug delivery. Frontiers in pharmacology. 2015 Dec 1;6:286.
- 3. Asghar Z, Jamshaid T, Sajid-ur-Rehman M, Jamshaid U, Gad HA. Novel Transethosomal Gel Containing Miconazole Nitrate; Development, Characterization, and Enhanced Antifungal Activity. Pharmaceutics. 2023 Oct 27;15(11):2537.