

## Review Article

## An Overview of Transferosomes: A Transdermal Drug Delivery System

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**Abstract:** A lipid bilayer including phospholipids, an edge activator, and an ethanol/aqueous core makes up transferosomes, often referred to as transferosomes, which are ultra-deformable vesicles for transdermal applications. Compared to oral and needle-based methods, this approach has a number of benefits, including self-administration, non-invasiveness, significantly reduced hepatic clearance of the medication, and increased patient compliance. The primary reason for the development of various drug delivery systems was that due to the first pass metabolism, adverse and side effects, non-patient compliance and invasive procedures, the efficient therapeutic outcomes. The advantage of transferosomes is they are barely invasive without the first pass metabolism. Transferosomes also has several advantages than liposomes due to the active surfactant properties. Due to its penetration enhancer properties, it enables the drug molecule to penetrate into the skin via the stratum corneum than other formulations. So, more research works are encouraged with respect to transferosomes in order to formulate various new drugs in this type of drug delivery system.

**Keywords:** Transferosomes, Transdermal drug delivery system, Ethosomes, Invasomes and Barriers.

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### INTRODUCTION

A lipid bilayer including phospholipids, an edge activator, and an ethanol/aqueous core makes up transferosomes, often referred to as transferosomes, which are ultra-deformable vesicles for transdermal applications. Compared to oral and needle-based methods, this approach has a number of benefits, including self-administration, non-invasiveness, significantly reduced hepatic clearance of the medication, and increased patient compliance. In addition to being uncomfortable, needle-based procedures produce medical waste that, if improperly disposed of, could endanger public health. For instance, the spread of harmful illnesses like HIV through the

reuse of needles, particularly in developing nations [1]. The word transferome was first set as a brand by the IDEA, a German organization. The 'Transfer some' comes from the Latin word 'Transfere' which means 'to transfer'. In Greek, it means 'body'. Cevc & Blume was the first persons to identify this technology in 1991. They are also involved in the research and published several patents over 3 decades. The primary reason for the development of various drug delivery systems was that due to the first pass metabolism, adverse and side effects, non-patient compliance and invasive procedures, the efficient therapeutic outcomes. The advantage of transferosomes is they are barely invasive without the first pass metabolism [2, 3].

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### Advantages of Transferosomes

1. They can be used for systemic and topical drug delivery system.
2. As they are made from natural phospholipids similar to liposomes they are biocompatible and biodegradable.
3. They have been widely used as a carrier for various proteins, anti-cancer drugs, anti-fungal drugs, analgesics, anaesthetics, corticosteroids, sex hormone, insulin, albumin etc. for their excellent distribution property [4].

### Barriers

1. The high cost of raw ingredients and expensive manufacturing equipment has an impact on the cost of the final medication product. As a result, phosphatidylcholine is the most commonly used lipid component due to its low cost in the formulation of transferosomes [5].
2. The difficulty in getting pure natural phospholipids is another hurdle to using transferosomes as a drug delivery mechanism. As a result, synthetic phospholipids may be used as a replacement [6].
3. Transferosomes are assumed to be chemically unstable due to their proclivity for oxidative degradation. By storing a product at a low temperature and keeping it away from light, transferosome oxidation can be significantly decreased. Post-preparation processing such as freeze-drying and spray-drying can improve transferosome storage performance [7].

### Transferosomes VS Liposomes

1. Liposomes are bi-layered lipid vesicles whereas transferosomes are second generation elastic lipid vesicles which act as carriers [8, 9].
2. Liposomes contain phospholipids and cholesterol where transferosomes contains phospholipids and edge activator surfactant [10].
3. In cases of flexibility liposomes are rigid in nature whereas transferosomes have high deformability due to the surfactant [11].
4. In liposomes permeation mechanism involves diffusion, fusion and lipolysis and in transferosomes deformation of vesicles occur [12].
5. Liposomes are administered through oral, parenteral and transdermal whereas transferosomes are administered through topical and transdermal [13].
6. Liposomes cannot penetrate into the deeper skin whereas transferosomes are stable in gel form only as it causes irritation due to presence of surfactants [14, 15].

### Transferosomes under Clinical Trial

Several formulations based on transferosomes are presently undergoing evaluation at various phases of

clinical trials. For instance, a phase III clinical trial was conducted to examine the efficacy and safety of ketoprofen integrated in transferosomes (Diractin®) for the treatment of osteoarthritis in the knees. Over a six-week treatment period, it has been demonstrated that the medication encapsulated in transfersomal carriers demonstrates higher therapeutic effectiveness in treating knee osteoarthritis pain compared to a placebo and comparably fewer side effects [16]. Similarly, under early-stage clinical trials, the topical administration of insulin-loaded transferosomes (Transfersulin®) for hypoglycemic effects is being studied. In the preclinical investigation, it was discovered that Transfersulin® reduced blood glucose levels in rabbits with alloxan-induced diabetes [17]. A randomized controlled trial was conducted to evaluate the risk-benefit ratio of topical triamcinolone acetonide in transferosomes versus commercially available triamcinolone acetonide-containing cream and ointment. It has been determined that the risk-benefit ratio of topical triamcinolone acetonide may be considerably enhanced by transferosomes [18]. As a result, transferosomes are recognized as the most exceptional and revolutionary transdermal medication carrier available today [19].

### Birth of Ethosomes and Invasomes

By experimenting with vesicle compositions, ethosomes and invasomes were developed in response to the good findings observed with transferosomes. Ethosomes are vesicles that contain phospholipid, water, and a comparatively high percentage of ethanol (20–50%). Ethosomes have high quantities of ethanol, which changes the skin's lipid bilayer and improves the vesicles' capacity to penetrate the stratum corneum [20, 21]. Phospholipids, terpenes, and ethanol combine to form the elastic phospholipid-based vesicles known as invasomes. By breaking the stratum corneum's tight lipid packing, terpenes and ethanol have demonstrated the capacity to potentially enhance medication penetration [22, 23].

### Transferosomes for Susceptible Diseases

Transferosomes is used for the treatment of various susceptible diseases due to its formulation in the form of transdermal delivery system. It is used for the delivery of various drug such as insulin, anesthetics, NSAIDs, interferons, anti-cancer and herbal drugs. It is also used for the delivery of peptides and proteins. It is also used for the drugs with sustained release to improve the therapeutic efficacy of various drugs [24].

## CONCLUSION

It is concluded that the discovery of transferosomes have paved a way for the treatment of many conditions and diseases by formulating various drugs in the form of transferosomes. It also makes the patient comfortable with minimal invasive procedures and eliminating adverse effects, drug interactions and some other complications. Transferosomes also has several advantages than liposomes due to the active

surfactant properties. Due to its penetration enhancement properties, it enables the drug molecule to penetrate easily into the skin via the stratum corneum than other formulations. So, more research works are encouraged with respect to transfersomes in order to formulate various new drugs in this type of drug delivery system.

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