# Targeted Drug Delivery: A Comprehensive Review

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**Abstract: Targeted drug delivery system is one of the novel approaches in drug delivery system. This type of delivery system is widely using in this modern era due to its efficient, safe, targeted and control release of drugs or therapeutic agents to targeted sites rather than the off -target sites. So this targeted delivery of drug enhances bioavailability and reduces toxic effects of drugs. This targeted drug delivery uses key strategies such as ligands, carriers, antibodies, nanoparticles, niosome which enhances selectivity to specific target site. Hence this targeted delivery system is highly beneficial for treating highly complex and challenging diseases mainly Diabetes, cancer, cardiovascular diseases and nervous disorders. This article exclusively focusing on approaches for targeted drug delivery and vehicles which are used for targeted drug delivery.**

**Keywords: conventional dosage form, liposomes, niosomes, nanoparticles**

## INTRODUCTION

Targeted drug delivery system is considered as the finest system compared to conventional dosage form because in targeted drug delivery the drug is delivered only to the site of action and not to the non targeted organs or tissues or cells. This system also delivers a specific quantity of a drug to the targeted diseased area for a prolonged period of time [control release] so this improves the safety and efficacy and also prevents damage to healthy cells or organs or tissues due to the drug. In conventional drug delivery a large amount of drug is being absorbed during first pass metabolism which reduces the bioavailability of drug in conventional type the drug delivery is non specific, uncontrolled, poor absorption, shorter half life and usually requires high doses which leads to toxic effects. Paul Ehrlich [a microbiologist] gave the concept of designing target delivery system and proposed the idea of delivering drug in the form of magic bullet.

Approaches to targeted drug delivery systems:

- Active Targeting and passive targeting
- Dual targeting
- Double targeting
- combination targeting


1. Active Targeting and passive targeting: Passive targeting uses the physical properties of drug and it refers to accumulation of drug of drug carrier system at a specific site such as anti cancer drug whose action depends on physicochemical or pharmacological factors of the disease.

Active targeting system bearing drug reaches to specific site on the basis of modification made on its surface rather than natural uptake by Rough endoplasmic reticulum.

2. Dual targeting: In this targeting method the carrier molecule itself have therapeutic activity and thus increase the therapeutic effect of drug.

For example an carrier molecule having its own antiviral activity can be loaded with antiviral drug and the net synergistic effect of drug conjugate was observed.

3. Double targeting: When temporal and spatial methodologies are combined to target a carrier system, then targeting may be called double targeting. Spatial placement relates to targeting drugs to specific organ tissues or cells. Where as temporal delivery refers to controlling the rate of drug delivery to target site.

4. Combination targeting: These targeting systems are equipped with carriers, polymers of molecular specificity that could provide a direct approach to target site.

Drug delivery vehicles:

These are also known as drug carriers or vectors. These are transporters which are essential for successful transportation of loaded drug.

The hearts of this targeted drug delivery system are carriers such as liposomes, nanosomes, nanoparticles and microspheres. This method encapsulate drug and delivers the drug to selective targeted sites.

Ideal drug vehicle characteristics:

- Should be non toxic and non immunogenic.
- Should be capable of specific targeting.
- Vehicle should allow modifications on surface with certain ligands
- It should be stable physically and chemically.
- Should be able for high amount of drug encapsulation and should show control release

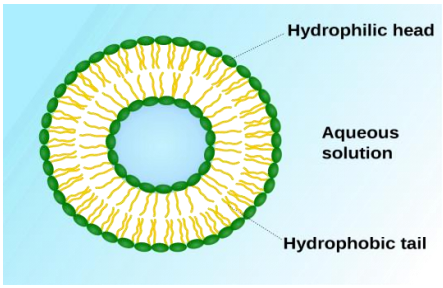
Liposomes:

In Greek words ‘lipos’ means fat and ‘soma’ means body , that both are combined to form spherical concentric rings .in this concentric bilayered vesicles an aqueous phase is entirely enclosed by a membranous lipid bilayer. This lipid bilayer is mainly composed of natural or synthetic phospholipids.

Composition: Liposomes have been composed of two components

1. Phospholipids 2. Cholesterol

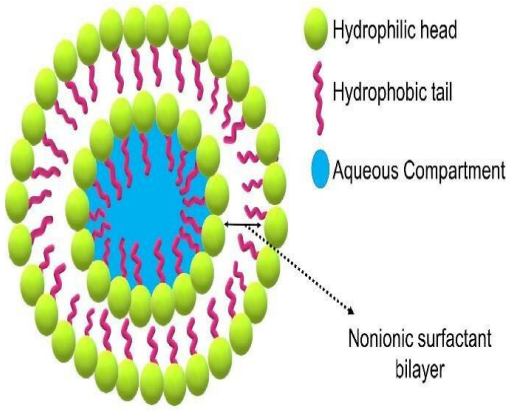
1) Phospholipids: These molecules are building blocks of liposomes. The word phospholipids means loves both water and lipids = amphiphilic in nature. This molecules have hydrophobic tail and hydrophilic polar head this hydrophilic tail is composed of hydro carbons
2) Cholesterol: This cholesterol increases liposomes stability, structural integrity and fluidity. Without this cholesterol liposomes membrane may easily disrupted.




Niosomes:

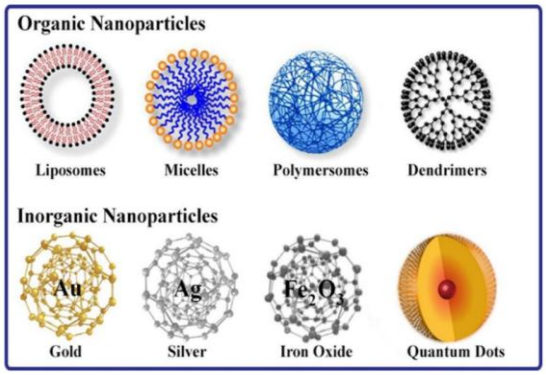
They are also used for vesicular drug delivery system used for sustained, controlled and targeted delivery of drugs. Liposomes are the first vesicular drug delivery system however they have several disadvantages such as toxicity, high cost , stability issues so niosomes are developed.

Niosomes are non ionic surfactant based unicellular or multicellular bilayer vesicles this are formed upon hydration of non ionic surfactants with or without incorporation of cholesterol.




Nanoparticles:

In Nanoparticles the word ‘nano’ means very small or microscopic level. Nanoparticles are wide class of materials that include particulate substances, which have 1 dimension less than 100nm.This nanoparticles cannot be seen with our naked eye and more than 500000 nanoparticles can sit on a cross section of human hair. This nanoparticle occurs naturally in the environment. Nanoparticles are classified into various types according to their size, shape and material properties. Nanotechnology provides a link between classical and quantum mechanics in a grey area called a mesoscopic.




## CONCLUSION

Compared to conventional dosage forms this targeted drug delivery is a gem type cause it shows less side effects, targeted release and control release. Continued research and innovation in this field holds the promise of health care by providing personalized, efficient, and safer therapeutic effects.

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