American Journal of Advanced Drug Delivery
ISSN: 2321-547X

Open access Commentary

Liposome Drug Targeting: A Revolutionary Approach in Modern Medicine

Natalya Rapoport*

Department of Chemical Engineering, University of Birmingham, UK

DESCRIPTION

Liposomes, spherical vesicles composed of phospholipid bilayers, have emerged as a versatile and efficient tool for drug delivery and targeting. These microscopic carriers, ranging in size from nanometers to micrometers, have transformed the field of pharmacology by enabling site-specific drug delivery, minimizing systemic side effects, and improving therapeutic outcomes. This article explores the science behind liposome-based drug targeting, its advantages, and its applications in contemporary medicine. Liposomes were first described in the 1960s and have since been extensively studied for their potential in drug delivery systems. Structurally, liposomes are akin to cell membranes, consisting of an aqueous core enclosed by one or more phospholipid bilayers. This unique structure allows them to encapsulate both hydrophilic drugs (in the aqueous core) and hydrophobic drugs (within the lipid bilayers). The composition of liposomes can be tailored to suit specific drug delivery needs by modifying their size, charge, and lipid content. Liposomes achieve targeted drug delivery through two primary mechanisms: passive and active targeting. This mechanism exploits the enhanced permeability and retention (EPR) effect observed in tumors and inflamed tissues. Due to their leaky vasculature and poor lymphatic drainage, these sites allow liposomes to accumulate preferentially, delivering the encapsulated drug directly to the desired location. Active targeting involves functionalizing the surface of liposomes with ligands such as antibodies, peptides, or small molecules. These ligands bind specifically to receptors overexpressed on target cells, ensuring precise drug delivery. For instance, liposomes functionalized with folic acid can selectively target cancer cells that overexpress folate receptors. Liposome drug targeting offers numerous advantages over conventional drug delivery systems. By delivering drugs directly to the target site, liposomes increase drug concentration at the site of action, improving therapeutic efficacy. Encapsulation of drugs within liposomes reduces their systemic exposure, minimizing off-target effects and toxicity. Liposomes can be engineered to release drugs in a controlled manner, maintaining therapeutic drug levels over extended periods. Liposomes can encapsulate a wide range of drugs, including small molecules, peptides, proteins, and nucleic acids. Composed of naturally occurring lipids, liposomes are generally biocompatible and biodegradable. Liposome-based drug delivery systems have found applications in various fields of medicine, including oncology, infectious diseases, and gene therapy. Liposomes are extensively used in oncology to deliver chemotherapeutic agents directly to tumor sites, reducing systemic toxicity. Doxil, a liposomal formulation of doxorubicin, is a prime example of liposome-based cancer therapy. Liposomal formulations of antibiotics and antifungals, such as AmBisome (liposomal amphotericin B), are used to treat severe infections while reducing nephrotoxicity. Liposomes serve as carriers for nucleic acids, such as DNA, RNA, and siRNA, enabling gene delivery for therapeutic purposes. Lipid nanoparticles (a type of liposome) were pivotal in delivering mRNA in COVID-19 vaccines.

CONCLUSION

Liposome drug targeting represents a ground-breaking approach in modern medicine, offering a solution to many limitations of traditional drug delivery methods. By improving drug efficacy, reducing toxicity, and enabling precise targeting, liposomes have the potential to transform patient care across various medical disciplines.

ACKNOWLEDGEMENT

None.

CONFLICT OF INTEREST

The author's declared that they have no conflict of interest.

Received	02-December-2024	**Manuscript No:**	IPAAD-25-22419
Editor assigned:	04-December-2024	**PreQC No:**	IPAAD-25-22419 (PQ)
Reviewed:	18-December-2024	**QC No:**	IPAAD-25-22419
Revised:	23-December-2024	**Manuscript No:**	IPAAD-25-22419 (R)
Published:	30-December-2024	**DOI:**	110.36648/2321-547X.12.4.39

Corresponding author Natalya Rapoport, Department of Chemical Engineering, University of Birmingham, UK, E-mail: rapoport56@gmail.com

Citation Rapoport N (2024) Liposome Drug Targeting: A Revolutionary Approach in Modern Medicine. Am J Adv Drug Deliv. 12:39.