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

Open access Commentary

Design of Liposomes as Drug Delivery System for Therapeutic Applications

Diana Guimaraes*

Department of Biological Engineering, University of Minho, Portugal

DESCRIPTION

Liposomes are spherical vesicles composed of one or more phospholipid bilayers, closely resembling the structure of natural cell membranes. Since their discovery in the 1960s, liposomes have gained considerable attention in scientific and medical fields, especially in the realm of drug delivery systems. These versatile nanocarriers provide a powerful means to transport therapeutic agents, ensuring targeted delivery, reduced toxicity, and controlled release, which has revolutionized the field of medicine. Liposomes are primarily composed of phospholipids, amphiphilic molecules that have hydrophilic (water-attracting) heads and hydrophobic (water-repelling) tails. When phospholipids are placed in an aqueous solution, they spontaneously form a bilayer to shield the hydrophobic tails from water while exposing the hydrophilic heads. This arrangement forms a spherical vesicle that can encapsulate water-soluble drugs in its aqueous core and lipid-soluble drugs within the bilayer. Cholesterol is commonly incorporated into the liposomal bilayer to enhance stability, making the structure more rigid and reducing permeability. These modifications ensure that liposomes can protect sensitive drugs from degradation in the body, prolonging their circulation time. Targeted liposomes are modified with ligands such as antibodies or peptides that bind to specific receptors on target cells, allowing for selective delivery of drugs to diseased tissues. Liposomes have become an invaluable tool in drug delivery due to several key advantages. They can encapsulate both hydrophilic and hydrophobic drugs, allowing for versatile therapeutic applications. Their biocompatibility and biodegradability make them suitable for various medical applications without causing adverse immune reactions. Moreover, liposomes can be engineered to deliver drugs to specific sites in the body, minimizing off-target effects and reducing toxicity. One of the most well-known applications of liposomal technology is in cancer therapy. Drugs like doxorubicin, a potent chemotherapeutic agent, have been encapsulated within liposomes to enhance efficacy and reduce side effects such as cardiotoxicity. Liposomal formulations deliver the drug directly to tumor cells while sparing healthy tissues. Liposomes have also played a vital role in the development of vaccines, notably in delivering mRNA vaccines for COVID-19, such as those produced. In this case, liposomes protect the fragile mRNA molecules and facilitate their entry into cells, where they elicit an immune response. Moreover, liposomes are being explored in gene therapy to deliver nucleic acids such as DNA or RNA into cells. Their ability to encapsulate genetic material and deliver it efficiently to target cells makes them a promising vehicle for treating genetic disorders. Despite their numerous advantages, liposomes face challenges in clinical use.

CONCLUSION

Liposomes have transformed drug delivery by providing a versatile, biocompatible, and efficient means of transporting therapeutic agents. Their use in treating diseases like cancer, their role in vaccine development, and their potential in gene therapy underscore their importance in modern medicine. While challenges remain, continued innovation in liposomal research offers a promising future for this nanotechnology, with the potential to improve therapeutic outcomes across a broad spectrum of diseases. However, ongoing research is addressing these issues by improving liposomal formulations and exploring new methods for large-scale production. Advances in liposome engineering, including the development of multifunctional liposomes capable of combining therapeutic and diagnostic functions, hold promise for the future.

ACKNOWLEDGEMENT

None.

CONFLICT OF INTEREST

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

Received:	02-September-2024	**Manuscript No:**	IPAAD-24-21714
Editor assigned:	04-September-2024	**PreQC No:**	IPAAD-24-21714 (PQ)
Reviewed:	18-September-2024	**QC No:**	IPAAD-24-21714
Revised:	23-September-4202	**Manuscript No:**	IPAAD-24-21714 (R)
Published:	30-September-2024	**DOI:**	110.36648/2321-547X.12.3.25

Corresponding author Diana Guimaraes, Department of Biological Engineering, University of Minho, Portugal, E-mail: diana.f.guimaraes@inesctec.pt

Citation Guimaraes D (2024) Design of Liposomes as Drug Delivery System for Therapeutic Applications. Am J Adv Drug Deliv. 12:25.

Copyright © 2024 Guimaraes D. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.