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

Open access Commentary

# Polyesters and Polyester Nano and Microcarriers for Drug Delivery

**Stanislaw Slomkowski***

*Department of Functional Polymers and Polymer Materials, Polish Academy of Sciences, Poland*

## DESCRIPTION

Nanocarriers are increasingly significant in drug delivery due to their potential to improve therapeutic efficacy and reduce side effects. This article provides an overview of inorganic, lipid, and polymeric nanocarriers, with a focus on liposomes and nanoemulsions, which are essential in modern nanomedicine. Inorganic nanocarriers such as gold, silver, silica, and iron oxide nanoparticles have attracted attention in drug delivery, imaging, and diagnostics due to their unique physical and chemical properties. Gold nanoparticles, for instance, can be functionalized with various biomolecules and have the ability to enhance imaging contrast in cancer detection. Silica nanoparticles, due to their porous structure, allow for high drug-loading capacities. These inorganic carriers offer high stability and controlled release but can face biocompatibility and clearance challenges, requiring careful modification to reduce toxicity. Their development continues in cancer therapy, particularly in hyperthermia-based treatments, where they are heated to selectively destroy tumor tissues. Lipid nanocarriers include liposomes, Solid Lipid Nanoparticles (SLNs), and Nanostructured Lipid Carriers (NLCs). These systems mimic the natural lipid bilayers of cells, allowing biocompatibility and targeted drug delivery. Liposomes are spherical vesicles composed of one or more phospholipid bilayers that encapsulate both hydrophilic and hydrophobic drugs. PEGylated liposomes (stealth liposomes) evade the immune system, prolonging their half-life. Liposomal formulations, such as Doxil (doxorubicin), have been approved for cancer therapy, demonstrating their effectiveness in improving drug delivery and reducing side effects. Despite their advantages, liposomes face challenges such as limited stability, potential for leakage of encapsulated drugs, and the high cost of production. Polymeric nanocarriers, composed of biocompatible and biodegradable polymers, provide sustained drug release, making them ideal for long-term treatments. Polymers such as poly lactic-co-glycolic acid, polycaprolactone, and chitosan are commonly used in the synthesis of these nanocarriers. The advantages of polymeric nanocarriers include high stability, controlled release, and versatility in carrying both hydrophilic and hydrophobic drugs. However, they may require precise control over degradation rates and may cause immune responses if not designed properly. Nanoemulsions are thermodynamically stable mixtures of oil, water, and surfactants, with droplet sizes ranging between 20 and 200 nm. Due to their small size, nanoemulsions enhance the solubility of poorly water-soluble drugs, leading to improved bioavailability. These systems are commonly used in topical, oral, and intravenous drug delivery. Nanoemulsions protect the drug from degradation and allow controlled release. Additionally, their formulation process is relatively simple, and they are highly scalable. Nanoemulsions have found applications in cancer therapy, where they are used to encapsulate and deliver chemotherapeutic agents with minimal toxicity. However, they are sensitive to environmental factors like temperature and pH, which may affect their stability. The development of robust formulations that can withstand these changes is a critical area of ongoing research.

## CONCLUSION

Inorganic, lipid, and polymeric nanocarriers, along with liposomes and nanoemulsions, represent the forefront of nanomedicine. Their versatility in drug delivery, targeting, and imaging offers promising solutions for treating diseases like cancer, infectious diseases, and neurological disorders. Despite the challenges in biocompatibility, stability, and large-scale production, ongoing research continues to improve their performance, making them crucial tools in future therapeutic strategies.

## ACKNOWLEDGEMENT

None.

## CONFLICT OF INTEREST

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

| | | | |
|---|---|---|---|
| **Received:** | 02-September-2024 | **Manuscript No:** | IPAAD-24-21713 |
| **Editor assigned:** | 04-September-2024 | **PreQC No:** | IPAAD-24-21713 (PQ) |
| **Reviewed:** | 18-September-2024 | **QC No:** | IPAAD-24-21713 |
| **Revised:** | 23-September-4202 | **Manuscript No:** | IPAAD-24-21713 (R) |
| **Published:** | 30-September-2024 | **DOI:** | 110.36648/2321-547X.12.3.24 |

**Corresponding author** Stanislaw Slomkowski, Department of Functional Polymers and Polymer Materials, Polish Academy of Sciences, Poland, E-mail: staslomk@gmail.com

**Citation** Slomkowski S (2024) Polyesters and Polyester Nano and Microcarriers for Drug Delivery. Am J Adv Drug Deliv. 12:24.