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## **Chapter - 7**

### **Lipid-Based Nanocarriers: Recent Advances and Clinical Prospects**

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## **Chapter - 7**

### **Lipid-Based Nanocarriers: Recent Advances and Clinical Prospects**

**Mukesh Kr. Singh, Vidhan Chand Bala, Lokesh Kumar, Amrendra Pratap Yadav, Sunil Kr. Tiwari and Amit Kumar**

#### **Abstract**

Lipid-based nanocarriers have turned out to be a flexible and biocompatible ionomeric drug delivery frameworks that offer notable benefits over traditional ones. Such nanoscale structures, between 10 and 1000 nm, are liposomes, solid lipid nanoparticles (SLNs), nanostructured lipid carriers (NLCs), and lipid nanoemulsions. The fact that they can entrap hydrophilic and hydrophobic drugs, improve solubility and bioavailability, and facilitate sensitive cargo delivery has resulted in a lot of research in this area. The adherence of nucleic acid by ionizable lipid nanoparticles (LNPs), which is the latest development, has expanded their therapeutic spectrum further. The clinical relevance and scalability of these systems have been verified by the success of LNP-based mRNA vaccines against COVID-19. Continued work is carried out on the optimization of formulations, surface engineering to target, and controlled release, as well as new applications in gene editing and combination therapies. But there are problems of scale-up production, batch-to-batch reproducibility, and harmonization of regulation. With the accelerated pace of development due to computational approaches and AI-aided design, lipid-based nanocarriers will make it possible to offer personalized and precision therapy to a broad spectrum of diseases in the near future. The review gives an overall history, type, composition, and major properties of lipid-based nanocarriers, their pharmacokinetics, safety and regulatory approvals, and recent developments, clinical use and future developments of this fast-developing field.

**Keywords:** Lipid-based nanocarriers, targeted drug delivery systems, Nanomedicine and precision therapy