Chapter 9

Intravenous Delivery of SLNs: A Nanocarrier Approach for Optimized Therapeutics

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Abstract

A promising nanocarrier system for the delivery of therapeutic agents, particularly through the intravenous (IV) route, is solid lipid nanoparticles (SLNs). They are a desirable platform for targeted and regulated drug delivery because of their distinct physicochemical characteristics, biocompatibility, and capacity to improve drug solubility and bioavailability. In addition to discussing formulation strategies and assessing their performance in preclinical and clinical studies, this review highlights the benefits of SLNs in IV drug administration. Issues pertaining to their growth and prospects for the future are also discussed.

Keywords: Administration, Bioavailability, Biocompatibility, Clinical studies, Distribution, Intravenous, Lipophilic, Nanoparticles, Physicochemical, Solubility, Solid lipid nanoparticles.

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1. INTRODUCTION

One of the fastest and most efficient ways to deliver drugs throughout the body is by intravenous administration. However, a number of therapeutic agents, especially hydrophobic medications, have serious problems, such as systemic toxicity, quick clearance, and poor solubility. By improving drug stability, offering controlled release [2], and facilitating targeted delivery, nanocarriers like solid lipid nanoparticles (SLNs) provide a flexible solution. SLNs are physiological lipid-based colloidal carriers that are submicron in size [1] and solid at body and room temperature. Their surfactant-stabilized surfaces can be further altered for particular biological interactions, and their structure enables them to encapsulate both hydrophilic and lipophilic drugs [3]. When administered intravenously, SLNs bypass the gastrointestinal tract and first-pass metabolism, allowing for rapid systemic distribution and precise targeting of diseased tissues. Their nano-scale size (typically 50–1000 nm) facilitates enhanced permeability and retention (EPR) in tumor tissues, while surface modifications (e.g., PEGylation or ligand attachment) can further improve site-specific delivery and circulation time.

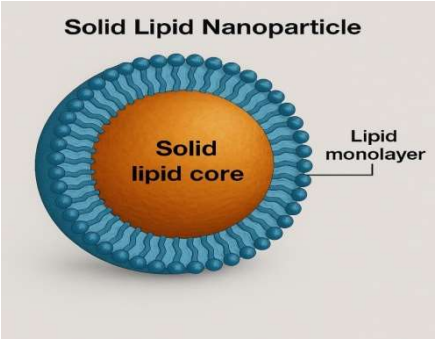

Figure 1: Solid lipid nano particle

2. ADVANTAGES OF SLNS FOR IV DRUG DELIVERY

An innovative drug delivery method called solid lipid nanoparticles (SLNs) was created to increase the therapeutic potential of active