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Chapter 21

Block copolymer micelles as long-circulating drug delivery vehicles

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21.1 Introduction

Medical applications of nanotechnology have attracted growing interest in recent years, particularly in the field of drug delivery, because of nanotechnology's ability to overcome the limitations of existing treatment modalities, including nonselective systemic activity, poor drug solubility, hepatic bio-degradation, dose-limiting toxicity, and damage to healthy cells [1,2]. Smart drug delivery systems (SDDSs) are nanoplatforms with unique characteristics and biofunctions that make them ideal for the remote delivery of drugs to targeted sites under controlled release conditions. A variety of SDDSs have been developed, including carbon nanotubes, quantum dots, metalorganic frameworks, micelles, and liposomes. Ideally, SDDSs should remain stable while circulating in the bloodstream of a patient, avoid unspecific interactions with blood components and the reticuloendothelial system (RES), and selectively extravasate at the diseased site [3].

Among the myriad SDDSs, micelles are notable nanocarriers that have gained immense popularity as drug delivery vehicles. Micellar systems have demonstrated unique advantages, such as their adaptability to a wide range of applications, increased drug bioavailability, and tunability of payload release kinetics. Moreover, micelles have high drug-loading and encapsulation capacities and enhanced capabilities of intracellular accumulation that allow for localized delivery to specific anatomical sites [1,3].

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