



Pharmaceutics

an Open Access Journal by MDPI

CiteScore: 10.0

Indexed in PubMed

Impact Factor: 5.5

Special Issue Reprint

Nanoparticle-Mediated Targeted Drug Delivery Systems

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In drug research and development, delivering drugs to the target sites is crucial to avoid serious off-target side effects and ensure effective medical treatment. Specifically, certain anti-cancer drugs exhibit their activity not only on cancer cells but also on normal cells, causing side effects such as nausea, skin disorders, or hair loss. Central nervous system drug candidates face challenges in penetrating the brain due to the blood-brain barrier. Furthermore, incorrect drug distribution can often lead to adverse events in terms of other diseases. Therefore, precision drug delivery should be enhanced and eventually established. The modification of nanoparticles is relatively straightforward. Consequently, a variety of useful nanoparticles can be produced for drug-controlled release, barrier permeation, including cell membranes, and/or targeting. Additionally, nanoparticles protect their cargos from degradation by enzymes and inhibit their unsuitable activity expression, reducing the risk of off-target side effects. Multiple strategies can be integrated into nanoparticles. Currently, pharmaceutical researchers and healthcare workers are increasingly interested in nanoparticle-mediated targeted drug delivery systems. Drug-loaded nanoparticles are employed differently based on the purpose and target area. Drug delivery systems utilizing nanoparticles as carriers represent promising strategies for achieving intelligent drug distribution.

