

Co-encapsulating solid lipid nanoparticles for multifunctional therapeutics : preparation and characterization.

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Rok wydania

2016

Czasopismo

Colloids and Surfaces A:
Physicochemical and
Engineering Aspects

Numer woluminu

510

Strony

11-21 + suppl. mat. 1-4

DOI

10.1016/j.colsurfa.2016.08.032

Kolekcja

Naukowa

Język

Angielski

Typ publikacji

Artykuł

Streszczenie

One of the most favored features of using nanoparticulate delivery systems such as solid lipid nanoparticles (SLNs) is their capability to encapsulate multi-agents of different chemical structures to achieve simultaneous delivery to the site of action. The present work has been carried out to elaborate a convenient methodology for the loading of the drug combination efficiently and with high drug content. Thus, two representatives of the naturally occurring flavonoids (FLs) with a broad spectrum of biological functions, i.e., fisetin (FIS) or myricetin (MYR), along with the indocyanine-type photosensitizer IR-780 were co-loaded in the cetyl palmitate (CP) matrix of the phosphatidylcholine-based solid lipid nanoparticles (SLNs) by means of the high pressure homogenization method (HPH). The HPH process – optimized in regard to different ratios of combination drugs, particle components content as well as variable parameters as pressure and number of homogenization cycles – provided physically stable and fairly monodisperse FL + IR-780-loaded SLN dispersions (with polydispersity indices below 0.3). The sizes of the studied nanosystems along with the size distribution were determined by dynamic light scattering (DLS), while shape and morphology – by atomic force microscopy (AFM). The physical state of the studied co-loaded SLNs was characterized by Fourier transform infrared (FT-IR) spectroscopy, differential scanning calorimetry (DSC) and thermogravimetric analysis (TG-DTA). Both FLs and IR-780 preserved their structural state and were thoroughly dispersed in the CP-matrix during the HPH procedure. Our synthetic methodology enabled to perform remote loading of two drugs (FIS or MYR and IR-780) in the SLN – type nanocarriers having desirable chemical and colloidal stability, making them useful for therapeutic and diagnostic applications or combination therapies.

Słowa kluczowe

Co-nanoencapsulation, High pressure homogenization, Fisetin, Myricetin, IR-780, Stability studies, Structural studies

Adres publiczny

<http://dx.doi.org/10.1016/j.colsurfa.2016.08.032>

Strona internetowa wydawcy

<http://www.elsevier.com>

Plik został wygenerowany dnia 2026-08-24 11:32:17

Adres w repozytorium <https://old.chem.uni.wroc.pl/pl/repozytorium/IWwWFPt>.