

Preparation of Cetyl Palmitate based-PEGylated Solid Lipid Nanoparticles by Microfluidic technique

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For the past years, research has been conducted to utilize solid lipid nanoparticles (SLNs) as alternative to colloidal drug delivery system, such as lipid emulsions, liposomes and polymeric nanoparticles. SLNs combine the advantages of different colloidal carriers and avoid some of their disadvantages.[1] Despite the numerous advantages of SLNs, translation from the preclinical formulation to the industrial scale-up is limited. In recent years, microfluidic nanoparticle synthesis strategies have been developed with the goal of providing a successful approach to scale-up the nanoparticle synthesis process in a reliable and reproducible manner. Microfluidic technique allows a good control and a continuous online synthesis of nanosystems compared to synthesis in bulk, leading to a narrow size distribution, high batch-to-batch reproducibility, as well as to the industrial scale-up feasibility.[2] Here, we described a single step continuous production of SLNs via glass capillary based microfluidic-chip. Comparing to the conventional bulk methods, which are usually restrained by multiple and complicated preparation steps, low production rate and poor reproducibility, the current synthesis method showed several advantages, including a continuous production with high yield, good reproducibility and precise control over the physical properties of SLNs, which are critical pre-conditions for its successful industrialization. The SLNs produced by microfluidics were characterized by complementary optical and morphological techniques and compared with those produced by bulk method. SLNs were loaded with paclitaxel and sorafenib, used as model drugs. The anti-cancer efficiency of the SLNs formulation was estimated with 2D and 3D tumour models of two different cell lines, and the cellular uptake was also established with fluorescence assisted.

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[2] Z. Liu, F. Fontana, A. Python, J. T. Hirvonen, H. A. Santos, *Small* 2020, 16, 1904673; J. P. Martins, G. Torrieri, H. Santos, *Expert Opinion on Drug Delivery* 2018, 15, 469.

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