Microfluidics technology for the production of solid lipid nanoparticles

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Solid lipid nanoparticles (SLNs) have been explored as alternative to colloidal drug delivery systems, such as lipid emulsions, liposomes and polymeric nanoparticles. They have many advantages over traditional drug delivery systems such as: low toxicity, high stability and loading capacity for both hydrophilic and hydrophobic drugs, other therapeutic molecules for instance peptides and nucleic acids and even small nanoparticles (SPIONs and QDs). Despite their great potential, translation from the preclinical formulation to the industrial scale-up production might have limitations.
In recent years, microfluidic nanoparticle production 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 [1].
Recently, we developed the first set-up to produce SLNs by microfluidics (Figure 1)[2].
SLNs have been produced using the glass-capillary microfluidic device, through a systematic optimisation process, opening a new avenue for future standardisation and scale-up of the production of such nanocarriers.
The achievement of a continuous and reproducible method producing SLNs has encouraged us to explore devices of different material and geometry to offer a versatile platform for engineering SLNs and encapsulating bioactive molecules.

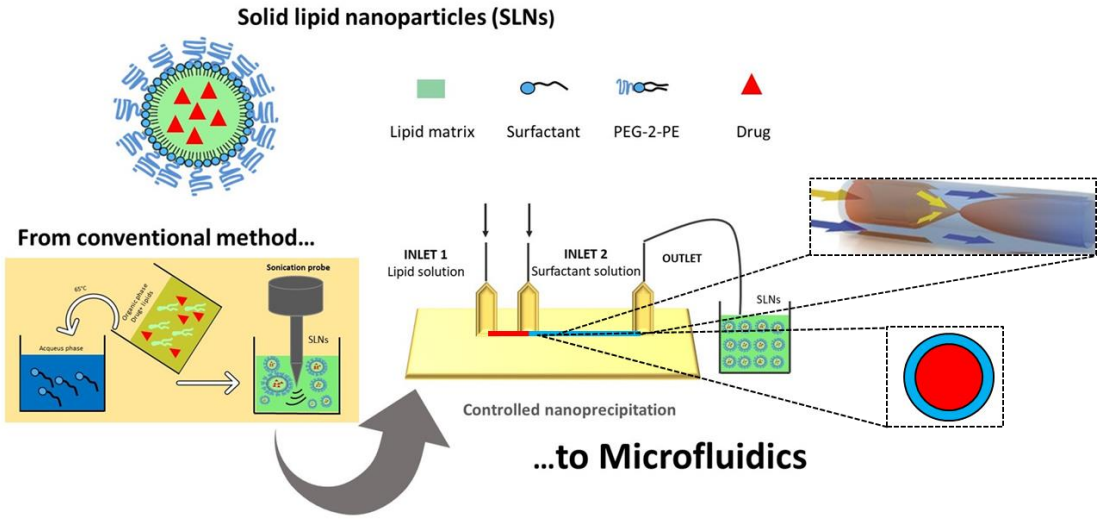

Figure 1: 3D glass capillary co-flow microfluidic nanoprecipitation platform for the production of SLNs

References

[1] Liu, D., et al., Advanced Materials, 27(14) (2015) 2298-2304
[2] Arduino, I., et al, Acta Biomater, 121 (2021) 566-78