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# Silk Fibroin Nanoparticles for Drug Delivery purposes: Stabilization, Incorporation and Release Design

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## Abstract

Silk Fibroin (SF) has been extensively studied for various applications due to its impressive mechanical properties and biocompatibility. Recently, SF based-particles have been proposed as controlled drug delivery systems.

A new and efficient method was developed to prepare SF nanoparticles (SF-NPs) by high pressure homogenization (HPH) emulsification, in oil-in-water emulsions (o/w). During the NPs production by HPH emulsification process, the secondary SF structure changed from random-coil conformation to a more stable structure, β-sheets. To improve even more the NPs stability over time the effect of various surfactants was studied, namely poloxamer 407, transcutol, tween 80 and sodium dodecyl sulfate, in which SF nanoemulsions with 1% of transcutol demonstrated lower diameters and better polydispersity values during the 4 weeks of evaluation.

The drug incorporation efficiency and release of SF-NPs was assessed using orange IV dye as model-drug. The influence of a human protease (human neutrophil elastase) on orange IV release profile was also evaluated. The encapsulation of orange IV effectively stabilized the size and size distribution of the SF-NPs over time, being evident the conformational change to β-sheets. SF-NPs encapsulated with orange IV had a formation and encapsulation efficiency of 67% and 91%, respectively, with a controlled release over time.

The stability and release profile induced by the SF-NPs enhances its potential for various applications, including biomedical.