Internalization of nano crosslinked protein aggregates by HeLa cells

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Abstract

While many proteins pose as potential therapeutically active ingredients, the drug delivery process is challenging due to a number of factors including fast elimination by enzymatic degradation, renal filtration, and low cell uptake efficiency and specificity.

Nano crosslinked protein aggregates (nano-CLPA) were prepared as hydrolytically stable, easily processed material to target a broad range of applications such as drug delivery carriers or active pharmaceutical ingredient of a drug delivery formulation. The enhanced stability and biofunctionality of these materials have been demonstrated elsewhere.

This preliminary study was undertaken to confirm internalization of nano-particles within a cell. Hen egg lysozyme (HEL) and bovine serum albumin (BSA) were chosen as model proteins due to their basic and acidic pI values, respectively. Being heterogeneous in size, the crosslinked, nanonized CLPAs were modified with dansyl chloride for easy identification purposes. These were incubated with a HeLa cell culture and the uptake of nanoparticles was monitored using a fluorescence microscopy apparatus. A more rapid HEL-CLPA uptake as compared to BSA-CLPA was observed, corresponding to the expected migratory aptitude of positively charged nano-particles[2]. Serum-free-medium-induced starvation appeared to improve the particle internalization efficiency, as evidenced by increased fluorescence intensity. Further research is being conducted to improve the understanding of nano-particle uptake mechanism.

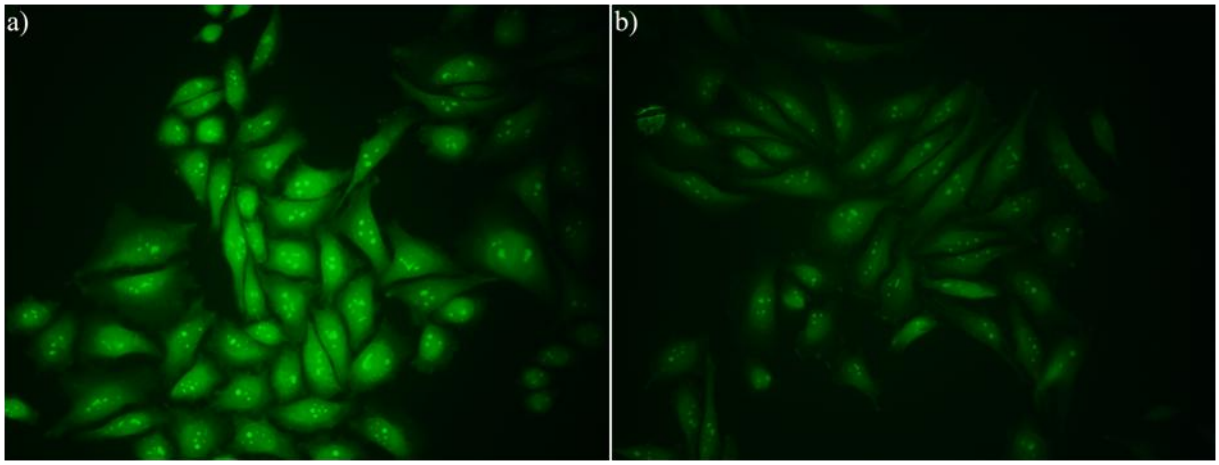

Figure 1: Fluorescent microscopic images of HeLa cell culture incubated with a) HEL- b) BSA-nano-CLPA suspension for 2h in serum free medium. 40x magnification.

[1] A.Taralp, Patent Appl. PCT/IB2010/053104
[2] A. Verma, F. Stellacci, Small 2010, 6, 12