Optimising the Synthesis of Transferrin grafted Silica Nanoparticles for use as a Targeting Platform

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Abstract

The development of targeting systems that can discriminate between the tissues in the body so as to deliver drugs specifically or be used for imaging is of upmost importance and has recently been pursued by many research groups[1]. Transferrin as a targeting motif has shown potential as a non-immunogenic targeting vector and thus has potential in anti-cancer treatments since cancer cells typically over express the Tf receptor[2].

An in lab method for synthesising fluorescent silica nanoparticles with grafted Tf was developed and optimized for biological application. The particles were initially synthesised and surface activated by aminopropyltrimethoxysilane (APTMS) condensation by optimised protocols. There is an emphasis on the importance of the initial amine functionalized surface and its importance for the specific uptake of the final protein grafted particle.

Bifunctional linker molecules were used to conjugate Transferrin at the particle surface. Following extensive characterisation the biological functionality of the resultant particles was then investigated by testing on cancerous lung cells (A459) where the uptake and specific uptake are observed. To ensure high quality, reproducibility has been carefully considered for the presented syntheses. Results are presented as averages from those results and standard deviations are provided.

1. E. Mahon, A. Salvati, F. Baldelli Bombelli, I. Lynch and K. A. Dawson, *Journal of Controlled Release*, 2012.
2. M. F. Macedo and M. Sousa, *Inflammation & Allergy-Drug Targets*, 2008, **7**, 41-52.