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Delivery of quantum dot- siRNA nanoparticles in SK-N-SH cells for BACE1 gene silencing and intracellular imaging

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Abstract

The fluorescent quantum dots (QDs) delivered small interfering RNAs (siRNAs) targeting β-secretase (BACE1) to achieve high transfection efficiency of siRNAs and reduction of β-amyloid (Aβ) in nerve cells. The CdSe/ZnS QDs with the conjugation of amino-polyethylene glycol (PEG) were synthesized. Negatively charged siRNAs were electrostatically adsorbed to the surface of QDs to develop QD-PEG/siRNA nanoplexes. The QD-PEG/siRNAs nanoplexes significantly promote the transfection efficiency of siRNA, and the siRNAs from non-packaged nanoplexes were widely distributed in cell bodies and processes and efficiently silenced BACE1 gene, leading to the reduction of Aβ. The biodegradable PEG polymer coating could protect QDs from being exposed to the intracellular environment and restrained the release of toxic Cd2+. Therefore, the QD-PEG/siRNA nanoplexes reported here might serve as ideal carriers for siRNAs. We developed a novel method of siRNA delivery into nerve cells. We first reported that the QD-PEG/siRNA nanoplexes were generated by the electrostatic interaction and inhibited the Alzheimer's disease-associated BACE1 gene. We also first revealed the dynamics of QD-PEG/siRNAs within nerve cells via confocal microscopy and the ultrastructural evidences under transmission electron microscopy (TEM). This technology might hold promise for the treatment of neurodegenerative diseases such as Alzheimer's disease.

Biography

Feng Li is currently a professor and PhD mentor in Sun Yat-sen University, Zhongshan School of Medicine, China, also as peer reviewer of National Natural Science Foundation of China (NSFC). Li's researches mainly focus on the neurodegenerative diseases such as Alzheimer's disease. She has chemically synthesized many small molecule drugs and nanoparticles conjugated with siRNA to inhibit the expression of specific genes. Li's research has been supported by multiple grants such as NSFC, etc. She has published numerous articles in peer-reviewed journals and obtained several research awards such as National Science and Technology award, Natural Science award, etc.