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Layered double hydroxide (LDH) nanoparticles are developed as highly efficient siRNAs carriers

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RNA interference (RNAi) is mediated by small RNAs including small interfering RNAs (siRNAs) that direct the sequence-specific degradation of the target mRNA, making it a powerful tool for the treatment of various genetic disorders, viral infections and cancers. One of the major impediments to the clinical application of RNAi-based therapy is the need to deliver these molecules into targeted cells. Although a variety of packaging particles are currently under development as siRNA delivery systems, application of these technologies has been hindered by their high cytotoxicity, low drug loading capacity, inefficient release in cells and poor ability to penetrate cell membranes. Layered double hydroxide (LDH) nanoparticles, a family of anionic clay materials are now emerging as a potential new gene delivery system as they exhibit low cytotoxicity and high biocompatibility. In this study, we prepared LDH nanoparticles with the average particle size of 110 nm and investigated the loading capacity of oligo dsDNA (a mimic of siRNA) by LDH nanoparticles at the dsDNA:LDH mass ratios from 1:1 to 1:40. We further examined the LDH-mediated siRNA delivery to nasopharyngeal cancer cell line CNE2. In particular, we showed the effect of the dsDNA:LDH mass ratio on the dsDNA delivery efficiency to the cells. We found that the cell line took up the most dsDNA via the LDH nanoparticles at the dsDNA:LDH mass ratio between 1:10 and 1:30. The optimized mass ratio is probably resulted from the tradeoff between the loading amount and the carrier dose effect. We finally demonstrated that the use of the optimized ratio to deliver functional siRNA to treat cancer cells (CNE2) was highly efficient. This work proves convincing evidence that LDH nanoparticles can be used as an efficient siRNA delivery vector.

Biography

Yanheng Wu is a recipient of UQ international PhD scholarship at the Australian Institute of Bioengineering and Nanotechnology of the The University of Queensland.

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