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Stimulus-sensitive self-assembling amphiphilic dendrimers as siRNA delivery platform

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RNAi with synthetic siRNA holds great promise for therapeutic applications. However, safe and successful clinical translation essentially requires further advancement of developing efficient delivery systems. Among myriad nanocarriers, amphiphilic dendrimers, marrying the characteristic of dendrimers, self-assembly performance of amphiphilic molecules and the bio-mimicry of lipids, become particularly appealing as nanovectors for drug delivery in nanomedicine, for small interfering RNA (siRNA) therapeutics. Here, we reported a series of amphiphilic dendrimers which can self-assemble into adaptive supramolecular assemblies upon interaction with siRNA and effectively delivers siRNAs to various cell lines, including human primary and stem cells, thereby outperforming the currently available non-viral vectors. Furthermore, a fluorinated bola-amphiphilic dendrimer was constructed for on-demand delivery of siRNA based on specific response to reactive oxygen species (ROS). The siRNA/dendrimer complexes disassemble efficiently in ROS-rich cancer cells, followed by the effective siRNA delivery and potent gene silencing. Thanks to the fluorine atoms, the ROS-responsive siRNA delivery process can be tracked through ¹⁹F-NMR analysis. Our study demonstrates that the self-assembling amphiphilic dendrimers represent novel and versatile means for functional siRNA delivery, heralding a new age of dendrimer-based self-assembled drug delivery in biomedical applications.

Biography

Xiaoxuan Liu has received her PhD in 2010 from both Wuhan University in China and Aix-Marseille University in France. After her PhD, she joined the Cancer Research Center of Marseille and Interdisciplinary Center on Nanoscience of Marseille in France and performed research for five years. During this period, she got two Post-doctoral grants from The Association for Prostate Tumor Research and the French Association against Myopathies. In 2015, she was recruited as specially-appointed Professor by China Pharmaceutical University in China and in 2016 she was selected by the Thousand Youth Talents Plan. Her research interest focuses on developing multi-functional dendrimers as nanovectors for nucleic acid and drug delivery, which is interdisciplinary research program including chemistry, physics, biology and medicine. She has co-authored 28 publications.

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