

Modular plasmonic nanocarriers for efficient and targeted delivery of cancer-therapeutic siRNA.

Journal:	Nano Lett
Publication Year:	2014
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PubMed link:	24597503
Funding Grants:	Training Program in Stem Cell Biology and Engineering , The UCSB Laboratory for Stem Cell Biology and Engineering

Public Summary:

In this study, a new method for delivering payloads of nucleic acids into cells is described. Nanoparticles consisting of gold nanoshells and peptides were synthesized and used to package RNAs. These particles are taken up by the cells and then the contents are released via exposure to a short laser pulse. This new method will be useful in delivering RNAs to cells to control their behavior, and will be useful in gene therapy, stem cell therapy and studies of cancer biology.

Scientific Abstract:

We have combined a versatile and powerful route to deliver nucleic acids with peptide-based cell-specific targeting. siRNA targeting the polo-like kinase gene is in clinical trials for cancer treatment, and here we deliver this RNA selectively to cancer cells displaying the neuropilin-1 epitope using gold nanoshells. Release of the siRNA from the nanoparticles results from irradiation with a pulsed near-infrared laser, which also provides efficient endosomal escape within the cell. As a result, our approach requires 10-fold less material than standard nucleic acid transduction materials and is significantly more efficient than other particle-based methods. We also describe a particle-nucleic acid design that does not rely on modified RNA, thereby making the preparation of these materials more efficient and much less expensive. These improvements, when combined with control over when and where the siRNA is released, could provide the basis for diverse cell biological studies.

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