

Nanoparticles for the targeted treatment of infected cells

Summary

The National Cancer Institute seeks parties interested in collaborative research to license or co-develop and commercialize therapeutic RNA/DNA nanoparticles.

NIH Reference Number

E-039-2012

Product Type

- Therapeutics

Keywords

- Viral infections
- RNA nanoparticles
- siRNA

Collaboration Opportunity

This invention is available for licensing and co-development.

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Description of Technology

Current treatments for cancer and viral infection are limited remedies that often suppress cell or viral replication rather than eliminate diseased cells entirely from the body. A further limitation is that these therapies often compromise healthy cells as well, leaving problems of recurrence and side effects.

Researchers at developed a novel therapeutic nanoparticle (NP) system harboring therapeutic small siRNA that can significantly enhance effectiveness and specificity of treatments by killing diseased cells.

Nanoparticles attached to RNA/DNA hybrids encode recognition sites for target genes and partial siRNA sequences of human anti-apoptotic genes. Individually, each of the hybrids is functionally inactive and functional representation can only be activated by the re-association of at least two cognate hybrids simultaneously present in the same cell.

Overall, this novel approach allows each NP to have recognition sites for different target genes (e.g. viral genes in viral infection, abnormally regulated genes in cancer), providing versatile options for selecting cells to kill with far greater specificity. Besides therapeutic siRNA, RNA/DNA hybrids on NPs can encode fluorescent markers to specifically visualize the diseased cells.

Potential Commercial Applications

- Therapeutic siRNA for cancer and viral infections
- Diagnostic to visualize cancerous or virus-infected cells or track delivery and effectiveness of siRNA treatment.
- Research tool to study cancer, viral infection, or other diseases

Competitive Advantages

- Novel way for multiple functionality delivery and activation
- Enhanced chemical stability and pharmacokinetics due to the average size of nanoparticles exceeding 10nm
- Increased specificity for selecting cells of interest using more than one target gene

Inventor(s)

[Bruce Shapiro \(NCI\)](#)

Development Stage

- Pre-clinical (in vivo)

Publications

K.A. Afonin *et al.* [[PMID 23016824](#)]

W. Grabow *et al.* [[PMID 21229999](#)]

K.A. Afonin *et al.* [[PMID 22134126](#)]

Patent Status

- **U.S. Provisional:** U.S. Provisional Patent Application Number 61/561,257, Filed 17 Nov 2011
- **Foreign Filed:** - Patent Application PCT/US2012/06594, Filed 19 Nov 2012
- **U.S. Patent Issued:** U.S. Patent Number 9,631,192 , Issued 25 Apr 2017
- **U.S. Patent Issued:** U.S. Patent Number 6,093,775 , Issued 05 Feb 2017
- **Foreign Issued:** - Patent Number 2,780,455 , Issued 05 Jul 2017

Therapeutic Area

- Cancer/Neoplasm
- Infectious Diseases

Updated

Wednesday, January 25, 2023

Source URL: <https://techtransfer.cancer.gov/availabletechnologies/e-039-2012>