NATIONAL CANCER INSTITUTE
Technology Transfer Center

Functionally-Interdependent Shape-Switching Nucleic Acid Nanoparticles

Summary

Researchers at the National Cancer Institute (NCI) have developed nucleic-acid-based nanoparticle that can be adapted for RNA interference (RNAi), molecular imaging, or a combination thereof. The invention nanoparticles can be used as therapeutics in the treatment of cancer, whichthe NCI seeks parties to license or co-develop.

NIH Reference Number

E-277-2016

Product Type

- Therapeutics

Keywords

- RNA interference, RNAi, Small-interfering RNA, siRNA, Cancer, Nanoparticle, Molecular Imaging, Drug Delivery

Collaboration Opportunity

This invention is available for licensing and co-development.

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Description of Technology

RNA interference (RNAi) is a naturally occurring post-transcriptional gene regulation process that represses the expression of specific genes. Exploiting endogenous RNAi by externally-delivered small-interfering RNA (siRNA) is a promising therapeutic for the treatment of various diseases representing several major unmet medical needs.

Researchers at the National Cancer Institute (NCI) have developed DNA- and RNA-based nanoparticles that can induce RNA interference (RNAi), molecular imaging, or a combination thereof. Two DNA- or RNA-based nanoparticles are required to induce RNAi: one nanoparticle comprising up to six (6) DNA or RNA strands and the other nanoparticle comprising the complementary DNA or RNA strands. Upon association of two complementary nanoparticles, conformational changes (or “shape switching”) occurs to both nanoparticles. Nucleic acid duplexes are released upon shape-switching, which

activates functional units capable of delivering siRNA and/or transcribable DNA templates.

The National Cancer Institute is seeking statements of capability or interest from parties interested in licensing or in collaborative research to co-develop RNAi-based nanoparticle therapeutics for cancer, viral infection, and genetic diseases.

Potential Commercial Applications

- Cancer, infectious disease, and genetic disease therapeutics
- Research tool to study cancer, viral infection, and other diseases
- Molecular imaging
- Drug delivery

Competitive Advantages

- Increased potency
- Low cytotoxicity
- Tunable stability
- Multiple functionalities and targets
- Controlled activation
- Dynamic interaction or “Shape-Switching”
- Activation from only two particles for simple delivery and functionality

Inventor(s)

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Development Stage

- Discovery (Lead Identification)

Publications

Kirill Afonin et al. [PMID 20802494]

Kirill Afonin et al. [PMID 24189588]

Wojciech Khisamutdinov et al. [PMID 259967062]

Patent Status

- **U.S. Patent Filed:** U.S. Patent Application Number 62/480,899, Filed 03 Apr 2017

Related Technologies

- E-059-2009 - In silico design of RNA nanoparticles
- E-038-2012

- E-039-2012 - Nanoparticles for the targeted treatment of infected cells
- E-223-2012 - Co-Transcriptional Assembly of Modified RNA Nanoparticles
- E-765-2013 - Multifunctional RNA Nanoparticles as Cancer and HIV Therapeutics
- E-156-2014 - Nucleic Acid Nanoparticles for Triggering RNA Interference

Therapeutic Area
- Cancer/Neoplasm
- Infectious Diseases

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