

## Nanoparticle-hydrogel Composite for Nucleic Acid Molecule Delivery

### Summary (1024-character limit)

The National Cancer Institute (NCI) seeks research a co-development partner and/or licensees for applications utilizing the nanoparticle platform technology for delivery of cancer-specific microRNAs, particularly for therapeutic uses in surface cancers, such as mesothelioma.

### NIH Reference Number

E-080-2018

### Product Type

- Therapeutics

### Keywords

- nanoparticle, microRNA, Surface Cancer, Mesothelioma, Hydrogel, Schneider, Hoang

### Collaboration Opportunity

This invention is available for licensing and co-development.

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### Description of Technology

Mesothelioma is an aggressive cancer covering anatomic surfaces (e.g. lining of the lungs, heart, abdomen, etc.) that resists multi-modality therapies. Regional recurrence of mesothelioma from residual tumor cells prevents long-term benefits after surgical resection. Furthermore, there is no clinical consensus on intracavitary adjuvants that are effective in extending the tumor reduction effect of surgery.

Researchers at the National Cancer Institute (NCI) have developed a new technology which fulfills this unmet clinical need by providing a local regional therapeutic platform to shuttle cancer-specific microRNA, thereby circumventing systemic administration challenges. This technology showcases nanoparticles comprised of microRNA bound to disordered peptides that are embedded in a hydrogel engineered from self-assembling  $\beta$ -hairpin peptides. The nanoparticle hydrogel composition is a shear-thinning composite, capable of being syringe-injected or sprayed onto body cavities harboring mesothelioma xenografts. This biodegradable material can be fine-tuned by choice of self-assembling

peptides in the gel matrix, of disordered peptides, and of microRNA to produce an optimal anti-cancer effect with a time-released delivery profile. After administration of a single application, this hydrogel composite produced a durable pre-clinical response in multiple xenograft cancer models. In principle, this localized regional treatment strategy could be applied to other surface cancers.

### Potential Commercial Applications

- Platform for delivery of nucleic acid molecules
- Could be used for treatment of all surface tumors including, but not limited to, all anatomic locations of mesothelioma, metastatic tumors involving pleural surfaces (e.g. lung, breast, colon, renal, esophageal, thymic/ thymoma, etc), and/ or metastatic tumors involving peritoneal surfaces (e.g. ovarian cancer) Specific nucleic acids could be selected and loaded into the hydrogel for use in treating these diverse types of malignancies

### Competitive Advantages

- Biodegradable and biocompatible material that minimizes cytotoxic side effect in vitro and in vivo
- Can be fine-tuned by choice of self-assembling peptides in the gel matrix, of disordered peptides in the nanoparticles, and of nucleic acids to produce an optimal therapeutic effect with time-released delivery
- Both syringe-injectable and sprayable to effectively cover complex tissue surface topology
- Only needing a single administration should reduce clinical trial, manufacturing, and commercialization costs
- Only needing a single administration should improve patient compliance for future applications

### Inventor(s)

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### Development Stage

- Pre-clinical (in vivo)

### Publications

Research Festival Abstract

### Patent Status

- **U.S. Provisional:** U.S. Provisional Patent Application Number 62/628,961, Filed 10 Feb 2018
- **PCT:** PCT Application Number PCT/US2019/017354, Filed 08 Feb 2019

### Therapeutic Area

- Cancer/Neoplasm