

Mitochondria Targeting Photosensitizer for Photodynamic Therapy

Tech ID: 33159 / UC Case 2021-630-0

ABSTRACT

Researchers at the University of California, Davis have developed a self-assembling, fibrous photosensitizer that targets mitochondria in tumor cells for destruction via photodynamic therapy with enhanced localization and potency.

FULL DESCRIPTION

Photodynamic therapy (PDT) is used to treat a variety of conditions - including severe acne and other skin conditions, ophthalmic diseases, blood-borne viruses in blood plasma, and cancerous tumors - by inducing targeted cell death. Cells are injected with small molecule photosensitizers and then irradiated with light in order to create reactive oxygen species (ROS) that ultimately destroy the cell. This procedure's non-invasive nature offers several advantages over competing treatment options, and there are generally fewer complications in patient recovery. However, PDT has several drawbacks, usually involved with the use of existing photosensitizers. These compounds suffer from non-specific localization and poor long-term retention in tumor sites, limiting their effectiveness as treatments against deep tissue tumors.

Researchers at the University of California Davis have developed a fiber-forming nanophotosensitizer, known as PQC NF, that provides enhanced cellular targeting and photosensitizer accumulation in PDT cancer treatments. The PQC NF is a self-assembling nanostructure composed of mitochondria-targeting small molecules. With administration directly to the mitochondria of malignant tumor cells, the quantity of ROS generation is greatly improved, resulting in higher cytotoxicity of targeted cells. Furthermore, the fiber structure of PQC NF improves long term photosensitizer retention at tumor sites which allows for comprehensive treatment with a smaller required dose. This new chemical entity has shown impressive results with a 100% cure rate in both subcutaneous and orthotopic oral cancer models with a single administered dose.

APPLICATIONS

- ▶ Photosensitizer in photodynamic therapy
- ▶ Drug administration targeted directly to mitochondria

FEATURES/BENEFITS

- ▶ Up to 110x higher ROS concentration and 50x higher anticancer potency compared to existing photosensitizers
- ▶ Potent treatment with smaller required dose
- ▶ Targeted localization results in fewer complications and side effects

PATENT STATUS

Patent Pending

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OTHER INFORMATION

KEYWORDS

new-chemical entity,
 small molecule,
 mitochondria targeting,
 self-assembly,
 nanomedicine, prodrug
 modification,
 photodynamic therapy,
 PDT, cancer

CATEGORIZED AS

- ▶ **Materials & Chemicals**
 - ▶ Biological
 - ▶ Nanomaterials
- ▶ **Medical**
 - ▶ Delivery Systems
 - ▶ Disease: Cancer
 - ▶ New Chemical Entities, Drug Leads

▶ Therapeutics

▶ **Nanotechnology**

▶ NanoBio

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2021-630-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- ▶ Multifunctional Porphyrin-Based Nanomedicine Platform
- ▶ Sequential Targeting and Crosslinking Nanoparticles for Tackling the Multiple Barriers to Treat Brain Tumors
- ▶ PVA Nanocarrier System for Controlled Drug Delivery
- ▶ Active Nanoplatfrom with High Drug Loading Capacity for the Diagnosis and Treatment of Cancer

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