

# Nanoplatfom for Cancer Therapy

Tech ID: 34360 / UC Case 2018-802-0

## ABSTRACT

Researchers at the University of California, Davis have developed a nanoparticle system combining photothermal therapy and chemotherapy for enhanced cancer treatment.

## FULL DESCRIPTION

Amphiphilic hybrid telodendrimers comprised of PEG, cholic acid and indocyanine green derivative (PCI) can self-assemble to form stable micelles, with excellent photothermal properties as well as high loading of cytotoxic agents and immunomodulatory agents. Introduction of a related cysteine containing telodendrimer allows co-assembly with PCI to form a biocompatible and stable disulfide-crosslinked PCI nanoparticle (CPCI-NPs). CPCI-NPs possess fast heating capability and superior photothermal conversion efficiency, when compared to small-molecule photothermal agents or gold nanorods. Combination photothermal-/chemotherapy with doxorubicin-loaded CPCI-NPs resulted in highly synergistic anti-tumor response in orthotopic OSC-3 oral cancer xenograft model. Similarly, CPCI loaded with imiquimod, an immunostimulant, was found to be highly effective in 4T1 syngeneic murine breast cancer model, particularly when photothermal-/immuno-therapy was given in combination with PD-1 checkpoint blockade antibody. Such triple therapy not only eradicated the light-irradiated primary tumors, but also dramatically inhibited the light-untreated distant tumors via activating the innate and adaptive immune systems in the tumor microenvironment. This versatile photothermal nanoplatfom has great potential for clinical translation.

## APPLICATIONS

- ▶ Cancer therapy, specifically for treating tumors accessible to light irradiation and potentially for systemic treatment when combined with immunotherapy.
- ▶ Photothermal ablation of localized tumors.
- ▶ Controlled drug delivery systems for chemotherapeutic agents.
- ▶ Diagnostic imaging through near-infrared fluorescence capabilities.

## FEATURES/BENEFITS

- ▶ High photothermal conversion efficiency for effective tumor ablation.
- ▶ Stable and controlled drug release mechanism, enhancing chemotherapy efficacy.
- ▶ Excellent biocompatibility and low systemic toxicity.
- ▶ Enhanced tumor targeting and penetration, maximizing therapeutic outcomes.
- ▶ Ability to combine photothermal therapy and chemotherapy, offering a synergistic therapeutic effect.
- ▶ Overcomes limitations of poor drug solubility and systemic toxicity in chemotherapy.
- ▶ Addresses the challenge of achieving targeted and controlled delivery of therapeutic agents to tumor sites.

## CONTACT

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## INVENTORS

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## OTHER INFORMATION

### KEYWORDS

biocompatibility, cancer therapy, immunotherapy, nanoparticle, near-infrared, photothermal conversion, photothermal therapy (PTT), polyethylene glycol (PEG), synergistic effects, target selectivity

### CATEGORIZED AS

- ▶ **Optics and Photonics**
  - ▶ All Optics and Photonics
- ▶ **Biotechnology**
  - ▶ Health
  - ▶ Other

▶ Solves the issue of rapid clearance and low photothermal conversion efficiency seen in other photothermal agents.

## PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	12,527,880	01/20/2026	2018-802

Additional Patent Pending

▶ Proteomics

### ▶ Imaging

▶ Medical

▶ Molecular

### ▶ Materials &

### Chemicals

▶ Nanomaterials

▶ Polymers

### ▶ Medical

▶ Delivery Systems

▶ Disease: Cancer

▶ Imaging

▶ Research Tools

▶ Therapeutics

### ▶ Nanotechnology

▶ NanoBio

### ▶ Sensors &

### Instrumentation

▶ Medical

## RELATED CASES

2018-802-0

## ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

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- ▶ Nuclear Magnetic Resonance System for Determining Oil and Water Compositions in Drilling Mud
- ▶ Affinity Peptides for Diagnosis and Treatment of Severe Acute Respiratory Syndrome Coronavirus 2 and Zika Virus Infections
- ▶ Nanoparticles for Drug Delivery, Tissue Targeting and Imaging Analysis
- ▶ Conjugates That Combine HDAC Inhibitors and Retinoids into Disease Preventatives/Treatments
- ▶ A Novel RGD-Containing Cyclic Peptide for use in Cancer Imaging and as a Targeted-Therapy Ligand
- ▶ Site-Specific Ligation and Compound Conjugation to Existing Antibodies
- ▶ Functional Illumination in Living Cells
- ▶ Multifunctional Porphyrin-Based Nanomedicine Platform
- ▶ A Two-step Drug Delivery System Based on Click Chemistry
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