A Two-step Drug Delivery System Based on Click Chemistry

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CONTACT
Raj Gururajan
rgururajan@ucdavis.edu
tel: 530-754-7637.



ABSTRACT

Researchers at the University of California, Davis have developed a technology that introduces a TCTS (Two-component Two-step) drug delivery system designed to enhance cancer treatment efficacy while minimizing toxicity.

FULL DESCRIPTION

This invention presents a novel TCTS drug delivery strategy utilizing transformable nanoparticles and bioorthogonal click chemistry for targeted cancer therapy. It diverges from the conventional TCTS model employing antibody and protein nanoparticles by utilizing the combination of fibrillar transformable nanoplatform and small molecule drug conjugate.

In the traditional TCTS method, monoclonal antibodies (MAb) typically serve as the initial component for pre-targeting. In contrast, this innovative approach employs recently introduced transformable nanoparticles (TNP), which can self-assemble into micellar nanoparticles in aqueous condition, but transform into a nanofibrillar network with prolonged retention within the tumor microenvironment as the primary pre-targeting agent. The methyltetrazine-drug conjugate is then administered intravenously, which undergoes an in situ click reaction with the nanofibrillar network at the tumor sites. This approach promises enhanced therapeutic effectiveness and reduced side effects, offering a significant advancement in the treatment of cancers such as ovarian cancer.

APPLICATIONS

- Targeted chemotherapy for ovarian and other solid tumors.
- Delivery of immunomodulatory agents for cancer immunotherapy.
- Advanced drug delivery platforms for personalized medicine.
- Non-toxic nanoimmunotherapeutics for syngeneic breast cancer models.
- Enhanced photothermal and photodynamic therapy via targeted nanoplatforms.

FEATURES/BENEFITS

- Enhances targeting and retention in tumor microenvironment.
- Reduces toxicity in normal tissues.
- On-demand delivery of therapeutic payloads.
- Applicable for a variety of therapeutic agents including chemotherapeutics and immunomodulators.
- Highly specific bioorthogonal click chemistry for precise drug release.
- Addresses the need for more efficacious and less toxic therapies against advanced cancers

PATENT STATUS

Country	Type	Number	Dated	Case
Patent Cooperation Treaty	Published Application	2026/006506 A1	01/02/2026	2024-587

Additional Patent Pending

INVENTORS

- Huang, Ruiqi
- Lam, Kit S.
- Liu, Ruiwu

OTHER INFORMATION

KEYWORDS

Bioorthogonal Click Chemistry, cancer immunotherapy, cancer treatments, chemotherapy, drug delivery, drug targeting, nanofibers, nanoparticles, nanoplatform

CATEGORIZED AS

- **Medical**
  - Delivery Systems
  - Disease: Cancer
- **Nanotechnology**
  - NanoBio

RELATED CASES

2024-587-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Novel Solid Tumor Chemodrug LLS2
- 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
- Transformable Smart Peptides as Cancer Therapeutics
- Engineered Biomaterial to Prevent Endothelial Inflammation
- Programmable Peptide Nucleic Acid-Based Nanoplatform for Customizable Drug Delivery
- Systems and Methods of Single-Cell Segmentation and Spatial Multiomics Analyses
- Proteoglycan Mimetics For Enhanced Wound Healing Angiogenesis And Vascular Repair
- Nanoplatform for Cancer Therapy
- Ligands for Improved Angiogenesis and Endothelialization of Blood Contacting Devices

University of California, Davis
Technology Transfer Office
1 Shields Avenue, Mrak Hall 4th Floor,
Davis,CA 95616

Tel: 530.754.8649
techtransfer@ucdavis.edu
https://research.ucdavis.edu/technology-transfer/
Fax: 530.754.7620

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