Single Circulating Tumor Cell Isolation Using Laser Microdissection And A Polymer Enrichment Assay

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SUMMARY

UCLA researchers in the department of Molecular and Medical Pharmacology have developed a novel matrix polymer capture system of circulating tumor cells that preserves biomolecular integrity through laser microdissection for the early detection of metastatic cancer.

BACKGROUND

The most common causes of cancer related deaths occur through the metastases of solid tumors. While the mechanism underlying cancer metastases is still largely unexplored, it is widely recognized that tumor cells are shed from primary tumor sites at the early stages of malignant progression. These shed cancer cells, better known as circulating tumor cells (CTCs), navigate through the blood stream into other tissues creating new nests of cancer cells. The current standard for determining tumor progression into malignancy is through histopathology analysis. However, this invasive methodology relies on the identification of metastatic sites, which is not easily recognizable. This misidentification leads to disease progression and reduced patient care. Therefore, the use of CTCs to signal metastatic progression could lead to a better and more reliable method to determine metastatic cancer progression.

There is a significant impediment to the use of CTCs for cancer identification due to their low abundance in the blood. There has been a recent trend that looks to develop cell capture systems for CTCs, but many found in literature are non-specific and capture other cells, causing large uncertainty in data. Another large impediment to the adoption of these assay technologies is the use of instruments not common to hospitals. Therefore, the creation of a CTC capturing system that is specific and utilizes in-house technology could justify the use of this promising methodology for the identification of metastatic cancers.

INNOVATION

Dr. Tseng at UCLA has developed a novel cell-affinity assay using a polymer substrate that captures single CTCs. These isolated CTCs can then be fixed for analysis, preserving the biomolecular traits of these cells through laser microdissection. This device functions comparably to Velcro by adhering CTCs specifically to the polymer substrate. Negligible capture of other cells has led to a specific analysis of CTCs in media samples. This platform thus presents a novel and effective way toward molecular and functional analyses of CTCs. The discovered CTC-derived molecular signatures and functional readouts could provide valuable insight into tumor biology, providing an opportunity to make a therapeutic difference in cancer progression.

APPLICATIONS

- The early detection of metastatic cancer in patients

ADVANTAGES

- The only technology of its kind that can reliably capture CTCs without disturbing function or viability
- The use of common instruments in hospitals to visualize the abundance and function of captured CTCs

STATE OF DEVELOPMENT

The invention has been tested on capturing CTCs in patient derived samples and is currently being extended to a larger range of metastatic cancers.

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INVENTORS

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OTHER INFORMATION

KEYWORDS

microfluidics, nanoparticles, metastasis, screening assay, nanotechnology, diagnostic marker, biomarker, liquid biopsy, cell-affinity

CATEGORIZED AS

- **Biotechnology**
  - Health
- **Nanotechnology**
  - NanoBio
- **Research Tools**
  - Screening Assays

RELATED CASES

2012-807-0

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	10,634,587	04/28/2020	2012-807

RELATED MATERIALS

- Electrospun TiO2 Nanofiber-Based Cell Capture Assay for Detecting Circulating Tumor Cells from Colorectal and Gastric Cancer Patients - Zhang - 2012 - Advanced Materials - Wiley Online Library.

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- A Supramolecular Approach for Preparation of Size-Controllable Nanoparticles
- Capture And Stimulated Release Of Circulating Tumor Cells On Polymer Grafted Silicon Nanostructures
- Very-Small-Nuclear Circulating Tumor Cell (vsnCTC) as a Diagnostic Biomarker of Visceral Metastasis in Advanced Prostate Cancer
- Phenotypic Profiling Of Hepatocellular Carcinoma Circulating Tumor Cells For Treatment Selection

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