Capture And Stimulated Release Of Circulating Tumor Cells On Polymer Grafted Silicon Nanostructures

Tech ID: 30033 / UC Case 2013-052-0

SUMMARY

UCLA researchers in the department of Molecular and Medical Pharmacology have developed a novel capture system of circulating tumor cells for the early detection of metastatic cancer.

BACKGROUND

The number of cancer related deaths in the U.S. is reported to continue growing in the next decade. A large proportion of these cases, begin as a local tumor but quickly spread through the body creating metastatic sites. This process of quick growth stems from Circulating tumor cells (CTCs). The current standard for cancer diagnosis however, relies on invasive biopsies that are timely to analyze. Due to the need for biopsy collection, the diagnosis of early stage cancers that may have metastatic sites is difficult to distinguish and may often be overlooked. Therefore, the use of a cancer diagnostic that could rely on capturing CTCs in the body could lead to a method of identifying early stage metastatic cancer.

CTCs can be thought of as a convenient to access “liquid biopsy” of a tumor. While significant endeavors have been undertaken to utilize this novel “biomarker”, there has been limited success. The major technical challenge has been the ability to efficiently and specifically capture the low abundance of CTCs among a high number of blood cells. Therefore, to pave the way toward molecular and functional analyses of CTCs, there is a large need to develop a new CTC assay that is efficient and specific for CTCs and can release them without disrupting viability and function.

INNOVATION

Dr. Tseng at UCLA has developed a pioneering NanoVelcro cell-affinity assay using nanostructured substrates to capture CTCs in a stationary device setting. This device functions comparably to Velcro by adhering CTCs specifically to a nanoparticle substrate. Beyond this, the nanostructures negligibly capture white blood cells (WBCs), without disturbing the viability or function of the captured CTCs. 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

STATE OF DEVELOPMENT

The invention has been tested on capturing CTCs in a suspension of breast cancer cells, and is currently being developed in patient derived blood samples.

PATENT STATUS

Country	Type	Number	Dated	Case

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INVENTORS

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OTHER INFORMATION

KEYWORDS

oncology, circulating tumor cells, 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

2013-052-0

United States Of America	Issued Patent	10,444,233	10/15/2019	2013-052
Japan	Issued Patent	6300799	03/09/2018	2013-052

RELATED MATERIALS

▶ Wang, S. , Liu, K. , Liu, J. , Yu, Z. T., Xu, X. , Zhao, L. , Lee, T. , Lee, E. K., Reiss, J. , Lee, Y. , Chung, L. W., Huang, J. , Rettig, M. , Seligson, D. , Duraiswamy, K. N., Shen, C. K. and Tseng, H. (2011), Highly Efficient Capture of Circulating Tumor Cells by Using Nanostructured Silicon Substrates with Integrated Chaotic Micromixers. Angew. Chem., 123: 3140-3144. doi:10.1002/ange.201005853

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- ▶ Single Circulating Tumor Cell Isolation Using Laser Microdissection And A Polymer Enrichment Assay
- ▶ A Supramolecular Approach for Preparation of Size-Controllable Nanoparticles
- ▶ 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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