Isolation of Target Biomolecules from Complex Samples Using Nano/Microscale Motors

Tech ID: 21897 / UC Case 2011-171-0

BACKGROUND

The ability to capture and study circulating tumor cells is an emerging field with implications for early detection, diagnosis, determining prognosis, and monitoring of cancer, as well as for understanding the fundamental biology of metastasis. Current techniques of identifying and isolating such cells usually involve flowing cells in a chip across an antibody coated surface. However, these devices usually require complex geometries to ensure effective contact of the target cells with the functionalized surfaces. Such a problem can be avoided by using micro/nanoscale motors that can be programmed to scower an entire static sample as many times as needed. Further, the movement of the nano/microscale motor increases the solution convection thereby improving the diffusion of the target antigen, making for a quicker and more favorable recognition reaction. This also helps eliminate non-specific binding of the antigen while on its way to a clean environment for post-capture analysis.

TECHNOLOGY DESCRIPTION

UC San Diego researchers have developed methods and devices, using self-propelling or externally actuated nano/microscale motors functionalized with appropriate receptors/ligands, to capture, isolate, and transport target biomolecules from raw biological samples (e.g., serum, urine, bacterial lysates, saliva). In exemplary embodiments, functionalized microrockets enable the isolation of rare cancer cells, nucleic acids, and protein antigens from raw samples within minutes to tens of minutes. The nano/micromotors and captured entities are guided from a raw sample reservoir across a microchannel to a clean reservoir where the entities can undergo subsequent analysis (e.g., by fluorescence microscopy, PCR, gel electrophoresis and sequencing). The technique can be implemented for microliter samples and in a lab-on-a-chip system. The invention's selective capture and transport of analytes without sample pre-processing holds great promise for rapid, low-cost, early diagnosis and monitoring of cancer, genetic/bioaffinity assays and other applications involving untreated biological samples.

INTELLECTUAL PROPERTY INFO

This technology has a patent pending and is available for licensing and/or sponsorship.

RELATED MATERIALS

- Microrockets Aim at Cancer Diagnostics
- Microrockets Take Off--Diagnostics: Tiny Motors Capture Cancer Cells and DNA from Biological Fluids
- Micromachine-Enabled Capture and Isolation of Cancer Cells in Complex Media, Angew. Chem., Int. Ed., 2011, 50 (18), pp 4161-4164.
- Functionalized Micromachines for Selective and Rapid Isolation of Nucleic Acid Targets from Complex Samples, Nano Lett., 2011, 11 (5), pp 2083-2087.
- http://pubs.acs.org/doi/abs/10.1021/nl2005687

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	9,982,356	05/29/2018	2011-286
United States Of America	Issued Patent	9,879,310	01/30/2018	2011-171
United States Of America	Issued Patent	9,868,991	01/16/2018	2010-003
United States Of America	Issued Patent	9,698,708	07/04/2017	2011-081
United States Of America	Issued Patent	9,352,963	05/31/2016	2009-391
United States Of America	Issued Patent	9,347,143	05/24/2016	2011-286

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OTHER INFORMATION

KEYWORDS

microrocket, micromotor, nanomotor, nanomachine, cell isolation, sorting, cancer diagnostic, genetic assay

CATEGORIZED AS

- **Biotechnology**
  - Genomics
- **Medical**
  - Devices
  - Diagnostics
  - Gene Therapy
  - Research Tools
  - Screening
- **Nanotechnology**
  - NanoBio
- **Research Tools**
  - Nucleic Acids/DNA/RNA
  - Screening Assays

RELATED CASES

2011-171-0, 2009-391-0, 2010-003-0, 2011-081-0, 2011-286-0, 2010-207-0

Additional Patent Pending

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