Development of a Microfluidic Adhesion Assay for the Isolation of Weakly Adherent Metastatic Cancer Cells

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BACKGROUND

Metastasis is a complex process in which cancer cells migrate from the primary tumor, invade into the vasculature, and travel to distant parts of the body to establish secondary tumors. Cells with a greater metastatic potential have a proclivity for leading migration away from the primary tumor. Progress in identifying cells primed to metastasize and in assessing metastatic risk has been slow. This may be due in part to the lack of consistent molecular prognostic markers between cancer types and significant heterogeneity in metastatic potential within the tumor. However, all metastatic cells – independent of tumor type or heterogeneity within the tumor – must detach from the tumor, migrate through the surrounding tissue, and invade the blood stream. This process involves a significant change in adhesion, which can be quantified in a heterogeneous population of cancer cells.

TECHNOLOGY DESCRIPTION

Researchers at UC San Diego have developed a microfluidic-based adhesion assay to isolate weakly adherent metastatic breast cancer cells, which demonstrate an increase in migratory propensity compared to an unselected cell population. Adhesion is differentially modulated to select metastatic cells using an epithelial tissue-specific buffer. Weakly adherent cancer cells are more metastatic, so a higher percentage of cells found within a tumor that detach in these conditions should correlate to higher likelihood of metastasis. Heterogeneity in cancer cell adhesion strength indicates variable metastatic potential in stromal-like conditions. Our fluidic-based separation method allows us to sort metastatic cells based on this potential, which stratifies motility rates that inversely scale with adhesion strength.

APPLICATIONS

These data imply potential prognostic capabilities of this assay for surveilling tumor stroma post resection as a readout of recurrence free survival time. This would allow detection from patient biopsies to be performed in pathology lab at hospitals.

ADVANTAGES

Unlike other biomarker-based metastatic assays, our approach employs physical parameters that only subsets of metastatic cell lines exhibit.

STATE OF DEVELOPMENT

A working prototype for animal studies is ongoing to confirm the results from the *in vitro* cancer cell lines. Additional studies on humans is planned.

INTELLECTUAL PROPERTY INFO

A provisional patent has been submitted and the technology is available for licensing.

PATENT STATUS

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OTHER INFORMATION

KEYWORDS
Cancer, cell adhesion, diagnosis, epithelial tumors, metastasis, prognostic assessment, assay

CATEGORIZED AS
- Medical
  - Devices
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RELATED CASES
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Patent Pending

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