Biosensors For Measuring The Metastatic Potential And Chemoresistance Of Single 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. Furthermore, not all tumors are metastatic and determining the *metastatic* proclivity of single tumor cells remains a major challenge. Another looming scientific question is estimating the metastatic “potential” because conventional techniques, e.g., Immunohistochemistry (IHC) are not capable of this and only molecular imaging can resolve these issues. So far, improved imaging platforms have helped detect established metastases and assessed tumor cell properties such as surrogate markers of metastatic potential. However, single cell-based assays to measure the dynamic pro-metastatic signaling programs that contribute to the 'potential' for metastasis remains a *Holy Grail*.

TECHNOLOGY DESCRIPTION

Researchers at UC San Diego have developed a Fluorescence Resonance Energy Transfer (FRET) biosensor that measures the metastatic potential of single living cancer cells. Molecular imaging of metastatic ‘potential’ is a challenge. To engineer biosensors that can detect and measure metastatic '*potential*' of single living cancer cells, a comprehensive analysis of the pan-cancer phosphoproteome was carried out to search for actin-remodelers required for cell migration, that are enriched in cancers, but excluded in normal cells. Only one phosphoprotein (PP) emerged, which was a *bona-fide* metastasis-related protein found in a variety of solid tumors. The next step was to design a multi-modular biosensors that are partly derived from the PP, and because PP integrates pro-metastatic signaling by multiple oncogenic receptors, and named them ‘Integrator-of-Metastatic-Potential (IMP)'. IMPs captured the heterogeneity of metastatic potential within primary lung and breast tumors at steady-state, detected those few cells which have acquired the highest metastatic potential and tracked their enrichment during metastasis

APPLICATIONS

These findings provide proof-of-concept that IMPs can measure the diversity and plasticity of metastatic potential of tumor cells in a sensitive and unbiased way. Furthermore, this assay measures the metastatic potential and/or chemoresistance of single living cancer cells.

ADVANTAGES

This assay is capable of measuring the metastatic potential and/or chemoresistance of single living cancer cells.

STATE OF DEVELOPMENT

A working prototype has been made

INTELLECTUAL PROPERTY INFO

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OTHER INFORMATION

KEYWORDS
Fluorescence Resonance Energy Transfer (FRET), metastasis, cancer, single cell, imaging, biosensor

CATEGORIZED AS
- **Imaging**
  - Medical
- **Medical**
  - Diagnostics
  - Disease: Cancer
  - Imaging

RELATED CASES
2018-309-0

This technology is patent pending and available for licensing.

PATENT STATUS

Country	Type	Number	Dated	Case
Patent Cooperation Treaty	Published Application	WO 2019/222071	11/21/2019	2018-309

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