

THE CANCER STEM CELL FINDER: A NEW CO-DEVELOPMENT OPPORTUNITY

Reference No.: E-215-2011

Keywords: Therapeutic, cancer, cancer stem cells, CSC

Background:

The National Cancer Institute is seeking parties interested in collaborative research to co-develop a novel reporter construct that can be used to identify, monitor, and allow for the manipulation of cancer stem cells (CSCs).

Technology:

Scientists at the [NCI Laboratory of Experimental Immunology](#) have designed a novel reporter construct that can be used to identify, monitor, and allow for the manipulation of cancer stem cells (CSCs). CSCs are a subset of poorly differentiated tumor cells expressed at low frequency within a tumor and are resistant to conventional chemotherapies. CSCs have high metastatic potential and give rise to new tumors that spread cancer throughout the body. These characteristics make CSCs prime targets for developing new therapeutic agents to eradicate cancer.

The reporter construct is a novel expression vector composed of the Sleeping Beauty transposon plasmid and a Nanog promoter linked to green fluorescent protein (GFP). Nanog is a transcription factor that is overexpressed in embryonic stem (ES) cells and tumors that resemble ES cells. When introduced into a population of tumor cells, the Nanog-GFP-Sleeping Beauty transposon construct is able to integrate into tumor cell DNA via transposition. If the transposed cell is a CSC, the Nanog transcription factor overexpressed in that CSC will bind to the Nanog-promoter in the reporter construct to drive GFP expression within the cell. Thus, CSCs can be isolated based on their selective expression of the GFP label. The NIH scientists have utilized their reporter construct to identify small populations of CSCs in mouse and human breast cancer cell models.

Potential Commercial Applications:

- Identify CSCs with high metastatic potential in patients to target with therapeutic intervention
- Screen therapeutic drug candidates to identify their effectiveness against CSCs in comparison to more highly differentiated tumor cells
- Investigate genes, surface proteins, and other markers responsible for CSC "stem-ness" to develop CSC diagnostics and identify therapeutic candidates to stop or reverse the properties contributing to the high metastatic potential of these cells
- Identify transcription factors/genes activated in the tumor microenvironment that trigger metastasis

Competitive Advantages:

- The reporter construct is validated to identify CSCs in both human and mouse tumor cell populations
- Researchers and clinicians can monitor the "stem-ness" of a tumor cell population to predict the metastatic potential of a tumor
- CSCs are identified *in vivo* in somatic cells via GFP labeling without utilizing a virus for transfection
- CSCs can be isolated, monitored, and traced via their GFP label in both *in vitro* and *in vivo* experimentation

- Facilitates the generation of a large quantity of CSCs for further study

R&D Status: pre-clinical in vitro / in vivo data available (animal)

IP Status: Research Tool. Patent protection is not being pursued for this technology.

Please submit an information request form referencing invention no. **E-215-2011** on <http://techtransfer.cancer.gov>, or contact: John D. Hewes, Ph.D., NCI Technology Transfer Center, Tel.: 301-435-3121, Email: hewesj@mail.nih.gov