

Signature of circulating breast tumor cells that spread to the brain found

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Some breast tumor circulating cells in the bloodstream are marked by a constellation of biomarkers that identify them as those destined to seed the brain with a deadly spread of cancer, said researchers led by those at Baylor College of Medicine in a report that appears online in the journal *Science Translational Medicine*.

"What prompted us to initiate this study was our desire to understand the characteristics of these cells," said Dr. Dario Marchetti, professor of pathology at BCM, director of the CTC (circulating tumor cell) Core Facility at BCM and a member of the NCI-designated Dan L. Duncan Cancer Center at BCM. Often, he said, [circulating tumor cells](#) (CTCs) from [breast cancer patients](#) which spread or metastasize to the brain are not identified by the current method for identifying such cells approved by the U.S. [Food and Drug Administration](#) (CellSearch platform).

While this system is based on the detection of antibodies that target the epithelial [cell adhesion molecule](#) (EpCAM), the biomarkers identified by Marchetti and his colleagues include human [epidermal growth factor receptor](#) 2 (HER2+), epidermal growth factor receptor (EGFR), heparanase (HPSE) and Notch1 – and not EpCAM. Together, said Marchetti, these four proteins, previously known to be associated with cancer metastasis, spell out the signature of circulating tumors cells that travel to the brain.

Marchetti, using sophisticated techniques to test samples provided by Dr. Morris D. Grove of The University of Texas MD Anderson Cancer

Center, also found this same pattern of proteins in the tissue taken from [brain metastases](#) of animals injected with breast cancer circulating tumor cells (CTCs).

They tested these special circulating tumor cells in laboratory models and found that they are highly invasive and capable of spread in live animals. They also found cells with this signature in the [metastatic tumors](#) of animals with breast cancer.

"We were able to grow these cells in vitro (in the laboratory in culture) for the first time ever," said Marchetti.

Circulating tumor cells are a promising method of identifying and monitoring solid tumors and could replace tumor biopsies in some cases. However, the promise is still being studied by experts such as Marchetti. In this case, he has identified a new signature for such cells – one that directs their activities toward spreading cancer to brain – an outcome with frequently fatal consequences.

The study not only identifies a novel signature of circulating tumor cells, it shows the limitations of currently approved platforms used to identify cancer in this way. Understanding such cells can help scientist understand how the disease spreads – an initial step in developing new methods of treating metastatic disease.

"We don't claim that these biomarkers are the only important ones," said Marchetti. "We hope to find novel markers in brain metastasis that will make diagnosis and monitoring even more targeted."

They are also trying to find ways to link these circulating tumor cells back to the signature of the original or primary tumor.

Provided by Baylor College of Medicine

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