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New approaches refine molecular imaging for detecting cancer metastasis

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(PhysOrg.com) -- Researchers may be a step closer to improving the detection of metastatic tumors in an organism - in real time - using a non-invasive approach that pairs an imaging agent with a genetic element that only expresses itself when it is in cancer cells.

The work, a collaborative effort between Virginia Commonwealth University and Johns Hopkins University, could lead to improved and earlier detection of tumors and metastases in patients and allow clinicians to monitor the cancer's response to therapy. The research builds upon a genetic element previously discovered and characterized by a VCU researcher Paul B. Fisher, M.Ph., Ph.D.

In the new study, published online in the December issue of the journal *Nature Medicine*, VCU researchers, together with researchers from the Johns Hopkins Medical Institutions, have shown how the genetic element, known as progression elevated gene-3 promoter, or PEG-Prom, can be used to image metastases in multiple animal models of human melanoma and human breast metastasis. The system can be used to measure gene expression, protein interaction or track gene-tagged cells in vivo. This approach offers significant advantages in sensitivity and accuracy over currently used imaging strategies.

PEG-Prom, which has been shown to have unique cancer specificity, was originally cloned in Fisher's laboratory during his time at Columbia University. Fisher is VCU's principal investigator on the study, and the first incumbent of the Thelma Newmeyer Corman Endowed Chair in

Cancer Research with the VCU Massey Cancer Center.

“The PEG-Prom is the unique aspect of this innovative imaging approach. It is a cancer-specific region of the PEG-3 gene that selectively expresses when in cancer cells. It has minimal expression in normal tissue or animals without cancer,” said Fisher, who also is professor and chair of the Department of Human and Molecular Genetics, and director of the VCU Institute of Molecular Medicine in the VCU School of Medicine.

“This new, non-invasive imaging approach will allow researchers to test chemoprevention strategies and to use repeat applications to follow the course of therapy over time and more accurately define therapeutic outcome and response to therapy than using current methodologies,” he said.

“The potential for this approach to translate into a more effective mode of imaging in humans is extremely high. The benefits to patients would be enormous. One could diagnose tumor formation and cancer that has spread earlier and therefore allow testing of effective therapies. When combined with a therapeutic agent — a radiation emitting compound, a chemotherapeutic agent, or a cytokine such as mda-7/IL-24 — it could in the future permit both imaging and therapy of cancers and metastases (“theranostics”),” Fisher said.

According to Fisher, specific aspects of this technology are patented or in the process of being patented.

Provided by Virginia Commonwealth University

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