

## **CSI-Style DNA Fingerprinting Tracks Down Cause of Cancer Spread**

Garth Sundem, University of Colorado Cancer Center



The University of Colorado Cancer Center along with Yale University and the Denver Crime Lab [report in the journal PLoS ONE](#) [1] the first proof of cancer's ability to fuse with blood cells in a way that gives cancer the ability to travel, allowing previously stationary cancer cells to enter the bloodstream and seed sites of metastasis around the body. The work used DNA fingerprinting of a bone marrow transplant patient with cancer, along with DNA fingerprinting of the patient's bone marrow donor, to show that subsequent metastatic cancer cells in the patient's body carried parts of both genomes, fused together into a hybrid cancer cell.

Metastasis is responsible for the overwhelming majority of cancer deaths and there are many theories as to how it occurs, but the problem remains yet unsolved. John Pawelek, PhD, at Yale has pointed out that the combination of a cancer cell with a blood cell could explain how a cancer cell acquires the ability to move through the body. The problem is there has been no way to prove this through genetic analyses of the tumor cells - they are too similar to the patient's non-tumor cells and so you can't tell if the mutations that allow a cancer cell to travel arose in the cell itself or through fusion with another source.

"One night on a bus ride returning from a conference, John pointed out that, in a patient with a bone marrow transplant, the blood cells come from someone else -

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one person with two genomes,” says Richard Spritz, MD, investigator at the CU Cancer Center and professor of pediatrics at the CU School of Medicine. “He had received a pathology specimen of a melanoma tumor that had metastasized to the brain of a patient who had previously received a bone marrow transplant from his brother, and he asked me whether, as a collaboration, we could distinguish between the donor and patient genomes in a cancer cell? I knew that one of the best ways to accomplish this was by DNA fingerprinting.”

And so began a wide-reaching collaboration to include, among others, Gregory LaBerge, PhD, who had earned his doctorate in the Spritz lab and was now Director of the Denver Police Department Forensics and Evidence Division.

“This is one of the first instances I know of in which forensic technology has been used to support basic science,” Spritz says. “John isolated metastatic cancer cells using technology available at the CU Cancer Center, and Greg did DNA fingerprinting. Between Yale, CU, and the Denver Crime Lab, this is really a remarkable collaboration.” After much dedicated work to this single tumor, they found that the entire tumor was populated by cancer cell hybrids with genomes containing both donor and patient DNA.

“Is fusion the mechanism that allows all cancer cells to travel? It’s too early to tell, but research toward answering this question is ongoing,” Spritz says. He points out that fusion leading to metastasis is likely to be at least somewhat common, as they found this mechanism in the first case they tested. “Of course it could be a fluke,” he says. “But I don’t think so.”

“The finding could have major implications for the treatment of metastatic cancers of many kinds. It really focuses your thinking – if traveling tumor cells essentially think they are blood cells, that means we might be able to focus approaches to attack them,” Spritz says.

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[1] <http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0066731>