

# New diagnostic technology may lead to individualized treatments for prostate cancer

April 2 2013

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(Medical Xpress)—A research team jointly led by scientists from Cedars-Sinai Medical Center and the University of California, Los Angeles, have enhanced a device they developed to identify and "grab" circulating tumor cells, or CTCs, that break away from cancers and enter the blood, often leading to the spread of cancer to other parts of the body.

If more studies confirm the technology's effectiveness, the NanoVelcro Chip device could enable doctors to access and identify [cancerous cells](#) in the [bloodstream](#), which would provide the diagnostic information needed to create individually tailored treatments for patients with prostate cancer.

The researchers believe this technology may function as a "liquid [biopsy](#)," revolutionizing conventional biopsy practices and significantly advancing the field of personalized medicine. Today's biopsies require the removal of [tissue samples](#) through a needle inserted into a solid tumor, a procedure that is invasive and sometimes painful. Biopsies are extremely difficult in metastatic prostate cancer because the disease often spreads to bone, where the availability of the tissue is low.

The biggest challenges in the [treatment of cancer](#) are that every person's tumor differs greatly and often mutates over time, especially in response to treatment. Researchers hope that by analyzing these CTCs, doctors will be able to understand the tumor evolution in each individual. By monitoring the [genetic changes](#) in CTCs and their invasiveness in a [tissue culture dish](#), doctors may be able to quickly adjust their treatment plans

in response.

"We are optimistic that the use of our NanoVelcro CTC technology will revolutionize [prostate cancer treatment](#). We know that cancers evolve over time and that every patient's cancer is a unique problem—the 'one-size-fits-all' approach is not going to allow us to cure prostate cancer or any other cancer," said Edwin M. Posadas, MD, medical director of the Urologic Oncology Program at Cedars-Sinai's Samuel Oschin Comprehensive Cancer Institute and senior author of the article in the March online issue of *Advanced Materials*.

"This evolution means that we need to be able to monitor these changes over time and to ensure a patient's treatment is individualized and optimized. The molecular characterizations of CTCs will provide real-time information allowing us to choose the right treatment for the right patient at the right time. This improvement will be a great step toward developing personalized medicine," he added.

The existence of CTCs and their role in cancer metastasis was first suspected more than 140 years ago, and the first test for the routine measurement of CTCs became available in 2004, but earlier methods have produced low capture efficiencies and limited capability of captured cells to be utilized for later molecular analysis.

"Our technology is the combination of three state-of-the-art technologies: the NanoVelcro CTC chip, laser capture microdissection and whole exome sequencing," said Yi-Tsung Lu, MD, a postdoctoral scientist at the Cedars-Sinai Samuel Oschin Comprehensive Cancer Institute, and one of the article's first authors. "This advancement will, in principle, allow us to track the genomic evolution of prostate cancer after we initiate a therapy and will allow us to better understand the mechanism of drug resistance that is common in [prostate cancer](#) patients. We hope the comprehensive understanding of cancer biology at the

individual level will ultimately lead to better therapy choice for patients suffering from advanced cancer."

With the new system, a patient's blood is pumped through the NanoVelcro Chip—the microvilli protruding from the cancer cells will stick to the nanofiber structures on the device's surface, much like Velcro. This phenomenon facilitates the capture of rare CTCs in the blood stream. Next, laser capture microdissection technology allows the scientists to selectively cut out and pick up the CTCs from the NanoVelcro Chip, virtually eliminating any trace of any contamination from white blood cells, which can complicate analysis. Finally, the isolated and purified CTCs are subjected to single cell "next-generation" sequencing, which reveals mutations in the genetic material of the cells and may help doctors personalize therapies to a patient's unique cancer.

"To date, CTC capture technologies have been able to do little more than count the number of CTCs, which is informative but not very useful from a treatment planning perspective. It is a scientific breakthrough to have the ability to isolate pure CTCs and maintain their integrity for sophisticated genomic and behavioral analyses," said Hsian-Rong Tseng, PhD, associate professor of molecular and medical pharmacology at UCLA and the inventor of the NanoVelcro Chip concept and device. His enthusiasm is echoed by Leland W. K. Chung, PhD, director of the Urologic Oncology Research Program at the Cedars-Sinai Samuel Oschin Comprehensive Cancer Institute.

Provided by Cedars-Sinai Medical Center

Citation: New diagnostic technology may lead to individualized treatments for prostate cancer (2013, April 2) retrieved 24 April 2024 from <https://medicalxpress.com/news/2013-04-diagnostic-technology-individualized-treatments-prostate.html>

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