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Capturing live tumor cells in the blood

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Tumor cells circulating within a patient's bloodstream can carry cancer from a primary tumor site to distant sites of the body, spreading the disease.

Now a team of researchers in China has developed a new microfluidic chip that can quickly and efficiently segregate and capture live circulating tumor cells (CTCs) from a patient's blood, with potential applications for cancer screenings and treatment assessments. The researchers describe their technique in the journal *Biomicrofluidics*, which is produced by AIP Publishing.

Many currently available devices for detecting CTCs in patients' blood are either too slow for clinical use or have other problems, such as a reduced ability to distinguish between the rare CTCs and more common white blood cells and other non-tumor cells.

The new system captures more than 90 percent of the CTCs, which makes it highly efficient. Overall processing time has also been shortened, thanks in part to a step in which red blood cells are selectively lysed, or broken apart. Lysing the red blood cells diminishes the tendency of blood to clog the system, a common problem that slows processing time in similar CTC filtering devices.

The ability to count live, individual CTCs in the bloodstream can help doctors determine the severity of a cancer, since CTC density in the blood is linked to the progression of the disease and patients' likelihood of survival. The new method could also improve "liquid biopsy"

techniques, in which a small amount of blood is drawn as an alternative to conventional tissue biopsies of primary or metastatic tumors.

In addition to potentially improving screening tests, the team believes their approach may someday help doctors control CTC-induced metastasis, which the researchers say can be far more lethal than the original tumor.

"Because our chip is able to capture viable CTCs, it creates opportunities for the development of new and efficient cancer biomarkers," says co-author Ray Han, a professor at Peking University in Beijing. It also gives researchers a chance to realize what Han calls "the grandest dream of all: a technology capable of directly removing CTCs from the human bloodstream – a form of CTC dialysis."

More information: The article, "Spatially gradated segregation and recovery of circulating tumor cells from peripheral blood of cancer patients" by Peitao Lv, Zhewen Tang, Xingjie Liang, Mingzhou Guo and Ray P.S. Han is published in the journal *Biomicrofluidics*. dx.doi.org/10.1063/1.4808456

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