A new method relying on nanotechnology to measure tumor metastasis by detecting the amount of circulating tumor cells in a patient’s blood has been announced by researchers at the University of California, Los Angeles (CA, USA). The method is potentially faster, cheaper and more sensitive than currently existing methods and could represent an alternative to invasive biopsies. The technique has the potential to diagnose cancer, provide doctors with information on patient prognosis and also to monitor the effectiveness of treatments.

The detection technique is based on an existing method, in which a 1 × 2 cm silicon chip containing the sample to be tested is stained with immunofluorescence and the circulating tumor cells in the sample counted using an automated microscope. Senior author of the study, Professor Hsian-Rong Tseng, and his team adapted this method by adding densely packed nanopillars to the silicon chip, altering the topography of the chip and making the diagnosis more sensitive. The team believe that having a varied chip topography allows the chip to interact with nanosized components in blood cells, thus increasing the chip’s sensitivity.

The chip was tested against a control chip with a flat surface, using an anti-epithelial cell adhesion molecule that is specific to, and therefore able to detect and capture, tumor molecules.

The nanopillar-encrusted chip captured approximately 45–65% of the circulating tumor cells in a demonstration experiment using a culture medium containing breast cancer cells, compared with the 4–14% of cells found using the chip alone, a greater than tenfold improved sensitivity. The addition of the nanopillar surface also allowed researchers to reduce the time taken to complete the test from 3–4 h to only 2 h. Lead author of the study, Shutao Wang, said of the results: “The nanopillar chip captured more than 10-times the amount of cells captured by the currently used flat structure.”

Currently, the most popular method to diagnose tumor metastasis is a tumor biopsy, although this requires invasive surgery and potential sites for biopsy are difficult to locate in early stages of cancer. The new test method, using innovative lab-on-a-chip techniques, has been dubbed a ‘liquid biopsy’ by the team.

“We hope that this platform can provide a convenient and cost-efficient alternative to circulating tumor cell sorting by using mostly standard laboratory equipment,” commented Tseng, who is also part of the California NanoSystems Institute.

Further clinical research and other studies to ascertain the chip’s efficacy at detecting circulating cancer cells in human serum, urine and abdominal fluids are planned by the team.