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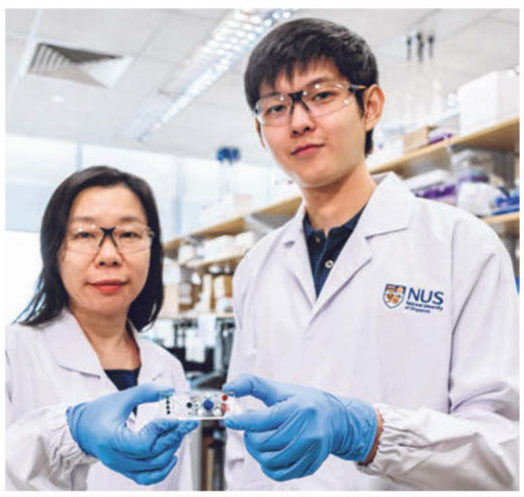
Better biopsies, thanks to NUS team

New tech promises to provide more info, make procedure less invasive for cancer patients

Jacklin Kwan



Assistant Professor Shao Huilin and doctoral student Noah Sundah with the Stamp microfluidic device that they and their team developed. The technology can detect and classify cancer cells, as well as determine the disease's aggressiveness. Patients and doctors can thus receive comprehensive reports earlier to facilitate timely treatment. PHOTO: NATIONAL UNIVERSITY OF SINGAPORE

A team of researchers from the National University of Singapore (NUS) has developed a technology that promises to make biopsies more informative and less invasive for cancer patients.

Called Sequence-Topology Assembly for Multiplexed Profiling (Stamp), it works by generating 3D DNA "barcodes". Just as a barcode, when scanned, provides information about a product and its price, a chain of DNA can tell scientists about the nature of cells.

The DNA used in Stamp is specially engineered such that it can be folded and unfolded. Assistant Professor Shao Huilin from the NUS Institute for Health Innovation and Technology, who led the project on developing the technology, likens it to origami where a flexible piece of paper can be folded into a rigid 3D shape.

Here is how Stamp works. A long chain of DNA is first folded into a pyramid-like structure to give it stability. It is then exposed to a small sample of cells extracted from a patient. The DNA attaches to the proteins in the cells and, following this, the DNA barcode changes.

When the DNA is later unfolded to be read and analysed, the barcode changes can tell scientists what proteins were present and where they were located within the cell. This information determines if cancer is present, its subtype and its aggressiveness.

As Stamp requires only a small sample and can measure billions of proteins in a single test, both patients and their doctors will be able to receive comprehensive reports about the medical condition earlier to facilitate timely treatment.

Conventionally, early diagnostic biopsies require a fine needle to be inserted into a suspicious growth to extract samples. These are then sent for tests to determine if the growth is cancerous.

This means that patients may not know the subtype of their cancer or how aggressive it is until large portions of the growth – or the entire growth – are surgically removed for further analysis. This process may take weeks for conclusive results.

Prof Shao explained that this uncertainty can often lead to great patient anxiety and less-informed health decisions. Some female patients, for example, may choose to remove the entire breast only because of the possibility that the cancer may be at an advanced stage.

The team hopes its technology will allow for tailored therapies to begin earlier. Doctoral student Noah Sundah, a member of the team, cited drug therapies that target particular proteins or the use of chemotherapy to shrink specific tumours.

The 10-member team's paper was published as the cover story of this month's issue of Nature Biomedical Engineering. The scientists conducted clinical trials using samples from 69 breast cancer patients and found that Stamp had a diagnostic accuracy of above 94 per cent, comparable with gold-standard tissue pathology which reveals clinical information only post-surgery.

Prof Shao's team is discussing with industry partners to further develop and commercialise the technology. It expects to bring Stamp to the market within the next five years. Further research is also being done to validate Stamp's applications in other types of cancer, including lung and colorectal cancer.

kwan.jacklin@sph.com.sg

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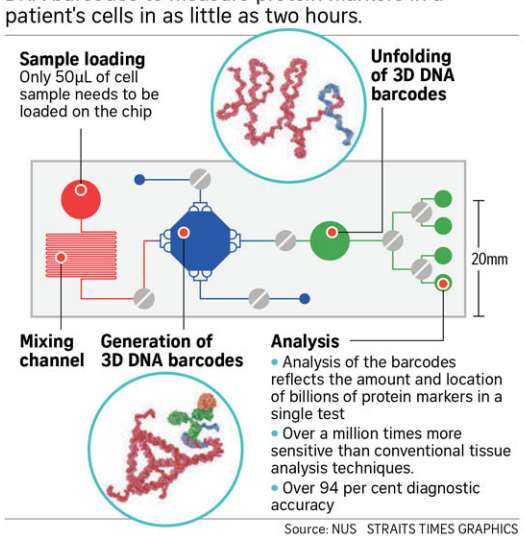
Improving sensitivity

National University of Singapore researchers have developed a technology that uses programmable DNA barcodes to measure protein markers in a patient's cells in as little as two hours.



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