New diagnostic application can detect cancer cells in the abdominal cavity in real time

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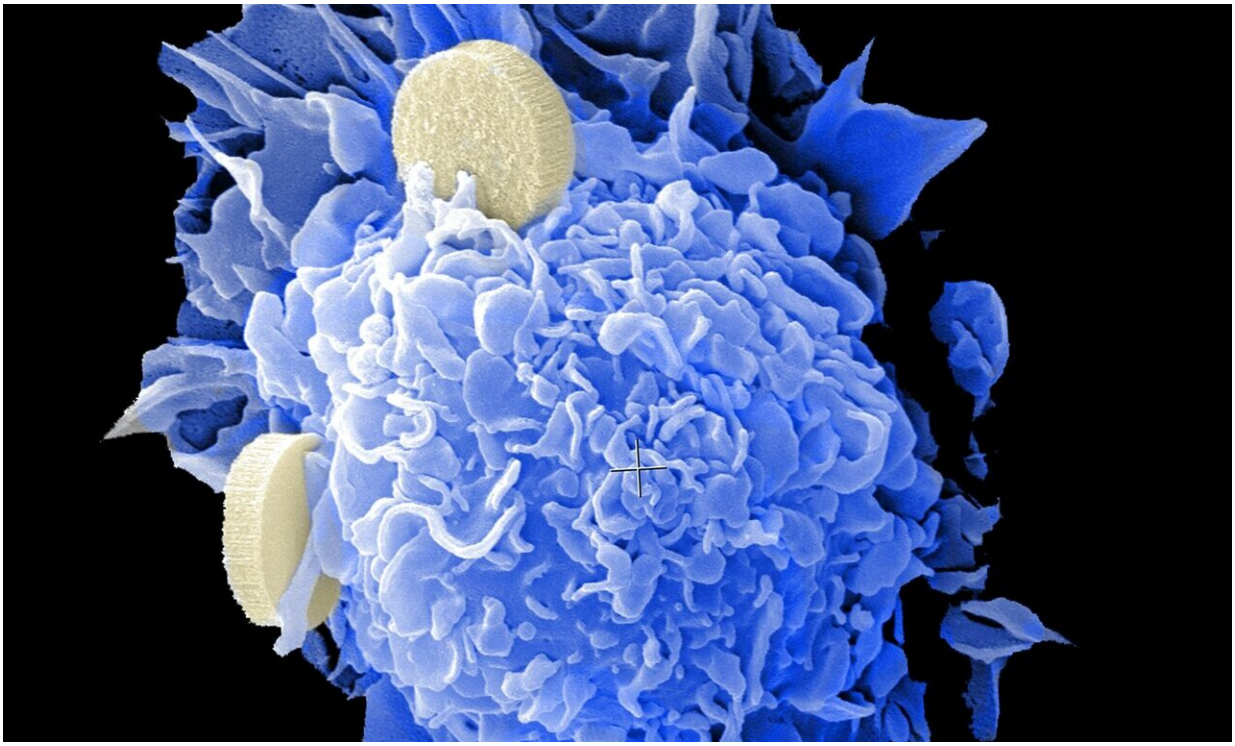

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A research team from Tel Aviv University's Zimin Institute for Engineering Solutions Advancing Better Lives, led by Prof. Noam Shomron and doctoral student Artem Danilevsky, has developed a method to detect cancer cells in the abdominal cavity in real time. Following a tumor removal surgery in the abdominal cavity, the team can

detect whether all cancer cells were removed through an interdisciplinary combination of medicine, engineering, and computer science.

Prof. Shomron explains that there are often undetected cancer cells in tumor removal surgeries—for example, in surgeries of the abdominal cavity. Those cells can spread to various body parts; subsequently, the patient must undergo chemotherapy. The problem is that the critical time frame between the surgery and cancer cell detection test results extend for several weeks, a delay which drastically increases the risk for a renewed cancer spread.

The new tool is based on a genetic sequencing device called MinION, produced by Oxford Nanopore Technologies. The tool allows doctors and patients to receive results quickly, in a range from minutes to several hours. The researchers take blood and abdominal cavity fluid samples while the patients undergo tumor removal surgery. The samples are inserted into the MinION device, which, programmed with a unique algorithm developed by the researchers, can tell whether the sample is more similar to that of a healthy person or a cancer patient.

The researchers note that the innovative technology is already implemented in a preliminary pilot trial at Tel Aviv Sourasky Medical Center (Ichilov). "We are waiting outside Dr. Guy Lahat's operating room, at the Division of Surgery at Ichilov, and during the surgery, we wait for Dr. Shelly Loewenstein to collect a small part of the abdominal cavity fluid sample for us," Prof. Shomron explains. "The sample itself is sent for the standard lab test. The lab test results arrive after a few weeks.

"Simultaneously, we insert our sample into the MinION and calculate whether it contains cancer cells or healthy ones. It's a lot less complicated than sequencing the whole genome. If the results turn out positive, Dr. Lahat continues with a designated abdominal cavity

chemotherapy treatment. Afterwards, he performs a saline washing, takes another sample and repeats the cycle again, until we ensure that the patient is free of cancer cells. With a simple but smart application based on existing technology, we can outline a lifesaving medical treatment," Prof. Shomron adds.

The researchers warn that the implementation of the novel device is still in its initial trial stages, and more time is required before the new device can reach the precision level of older, slower, and larger devices. Prof. Shomron also estimates that in several years it might be possible to expand the implementation of this novel technology to detect cancer cells with a simple blood test during everyday life, not only during a surgery.

The Zimin Institute for Engineering Solutions Advancing Better Lives, established with a generous donation from the Zimin Foundation, is the only research institute that focuses on breakthrough projects which have an implementation potential to change the world in various respects, ranging from slowing the aging process to artificial intelligence.

"The Institute was searching for an engineering application to improve life," Prof. Shomron says. "They asked for novel and unique projects, projects that would not get a funding from any other foundation but would be implementable.

"We combined several research areas in order to offer a smart and fast diagnostic tool, but there were no buyers," Prof. Shomron continues. "We went through various hospital divisions and asked the doctors, 'Who wants a DNA test done in an hour?' Fortunately, we found Dr. Lahat, the Director of the Division of Surgery at Ichilov, who jumped on the opportunity to shorten and improve diagnostic processes for the benefit of cancer patients."

Provided by Tel Aviv University