THE UNIVERSITY OF TEXAS AT EL PASO

UTEP RESEARCHERS DEVELOP LOW-COST DEVICE THAT DETECTS CANCER IN AN HOUR

PARTICULARLY BENEFICIAL FOR RURAL U.S. AREAS, DEVELOPING COUNTRIES

EL PASO, Texas (Oct. 24, 2024) – Researchers at The University of Texas at El Paso have created a portable device that can detect colorectal and prostate cancer more cheaply and quickly than prevailing methods. The team believes the device may be especially helpful in developing countries, which experience higher cancer mortality rates due in part to barriers to medical diagnosis.

A team of UTEP researchers led by Xiujun (James) Li, Ph.D., have created a low-cost, portable device that can detect colorectal and prostate cancer in as little as one hour.

“Our new biochip device is low-cost — just a few dollars — and sensitive, which will make accurate disease diagnosis accessible to anyone, whether rich or poor,” said XiuJun (James) Li, Ph.D., a UTEP professor of chemistry and biochemistry. “It is portable, rapid and eliminates the need for specialized instruments.”

Li is the lead author on a new study describing the device; it’s published in Lab on a Chip (https://pubs.rsc.org/en/content/articlelanding/2024/lc/d4lc00485j), a journal that focuses on micro-scale and nanoscale devices.

Li explained that the most commonly used commercial method of cancer biomarker detection, known as ELISA, requires costly instrumentation to work correctly and can take twelve hours or longer to process a sample. This delay is heightened in rural areas in the U.S. or developing countries, he said, because patient samples must be transported to larger cities with specialized instruments, contributing to a higher rate of cancer mortality.

“If you can detect biomarkers early on, before the cancer spreads, you increase a patients’ chance of survival,” Li said. “Any delays in testing, especially in regions that don’t have access to expensive tools and instruments, can be very bad for a patient’s prognosis.”

The device that Li’s team created is microfluidic, which means that it can perform multiple functions using very small amounts of fluids. The device uses an innovative ‘paper-in-polymer-pond’ structure in which patient blood samples are introduced into tiny wells and onto a special kind of paper. The paper captures cancer protein biomarkers within the blood samples in just a few minutes. The paper subsequently changes color, and the intensity of the color indicates what type of cancer is detected and how far it has progressed.

So far, the research has focused on prostate and colorectal cancers, but Li said the method they devised could be applicable to a wide variety of cancer types.

Li said that the device can analyze a sample in an hour — compared to 16 hours using some traditional methods. According to study results, the device is also about 10 times more sensitive than traditional methods even without using specialized instruments. That means the device can detect cancer biomarkers that are present in smaller quantities, typical of cancer in its early stages. A less sensitive device may not pick up on the smaller quantities, Li said.

Before the device is available to the public, Li said the prototype of the device will need to be finalized and the device tested on patients in a clinical trial, which could take several years. It would require final approval by the Food and Drug Administration before it could be used by physicians.

“Dr. XiuJun Li's innovation significantly improves point-of-care diagnostics by reducing detection times and the need for costly instruments,” said Robert Kirken, dean of the College of Science. “This makes it ideal for resource-limited settings, which will improve early diagnosis and lead to better cancer outcomes. I look forward to seeing what this innovation leads to.”

An additional co-author on the study is Sanjay Timilsina, Ph.D., a former graduate research assistant at UTEP. Li is a member of the Lab on a Chip advisory board.

About The University of Texas at El Paso

The University of Texas at El Paso is America’s leading Hispanic-serving university. Located at the westernmost tip of Texas, where three states and two countries converge along the Rio Grande, 84% of our 24,000 students are Hispanic, and more than half are the first in their families to go to college. UTEP offers 170 bachelor’s, master’s and doctoral degree programs at the only open-access, top-tier research university in America.

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By MC Staff UTEP Marketing and Communications