Small liquid sensor may detect cancer instantly, could lead to home detection kit

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What if it were possible to go to the store and buy a kit to quickly and accurately diagnose cancer, similar to a pregnancy test? A University of Missouri researcher is developing a tiny sensor, known as an acoustic resonant sensor, that is smaller than a human hair and could test bodily fluids for a variety of diseases, including breast and prostate cancers.

"Many disease-related substances in liquids are not easily tracked," said Jae Kwon, assistant professor of electrical and computer engineering at MU. "In a liquid environment, most sensors experience a significant loss of signal quality, but by using highly sensitive, low-signal-loss acoustic resonant sensors in a liquid, these substances can be effectively and quickly detected — a brand-new concept that will result in a noninvasive approach for breast cancer detection."

Kwon's real-time, special acoustic resonant sensor uses micro/nanoelectromechanical systems (M/NEMS), which are tiny devices smaller than the diameter of a human hair, to directly detect diseases in body fluids. The sensor doesn't require bulky data reading or analyzing equipment and can be integrated with equally small circuits, creating the potential for small stand-alone disease-screening systems. Kwon's sensor also produces rapid, almost immediate results that could reduce patient anxiety often felt after waiting for other detection methods, such as biopsies, which can take several days or weeks before results are known.

"Our ultimate goal is to produce a device that will simply and quickly

diagnose multiple specific diseases, and eventually be used to create 'point of care' systems, which are services provided to patients at their bedsides," Kwon said. "The sensor has strong commercial potential to be manifested as simple home kits for easy, rapid and accurate diagnosis of various diseases, such as breast cancer and prostate cancer."

Last January, Kwon was awarded a $400,000, five-year National Science Foundation CAREER Award to continue his effort on this sensor research. The CAREER award is the NSF's most prestigious award in support of junior faculty members who exemplify the role of teacher-scholars through outstanding research, excellent teaching, and the integration of education and research. Kwon's sensor research has been published in the IEEE International Conference on Solid-state, Sensors, Actuators and Microsystems and the IEEE Conference on Sensors.

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