New sensor nanotechnology simplifies disease detection

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Dr. Krithika Kalyanasundaram, a former student at Stony Brook University and Professor Gouma's co-author on “Nanosensor Device for Breath Acetone Detection,” to be published by American Scientific Publishers in the October 2010 issue of Sensor Letters, demonstrates the device.

Researchers at Stony Brook University have developed a new sensor nanotechnology that could revolutionize personalized medicine by making it possible to instantly detect and monitor disease by simply exhaling once into a handheld device.

The new research, "Nanosensor Device for Breath Acetone Detection," will be published by American Scientific Publishers in the October 2010 issue of *Sensor Letters*. According to lead researcher Perena Gouma,

Ph.D., an Associate Professor and Director of the Center for Nanomaterials and Sensor Development in the Department of Materials Science and Engineering at Stony Brook University, and her research team, the new nanomedicine tool is designed to enable individuals to monitor signaling gas—such as acetone in exhaled breath—with their own inexpensive, non-invasive breath analyzer.

“This is a single breath analysis diagnostic tool for monitoring disease or metabolic functions that can be used to check cholesterol levels, diabetes, and even lung cancer;” explains Professor Gouma. “Lung cancer is a silent killer that can only be detected when it’s progressed vastly, but in the breath, markers can be identified that are an early signal.”

The ability to easily capture gases that detect disease early will empower individuals to take control of their own health. And it will simplify the process of monitoring diseases like diabetes. Presently, blood is required to monitor diabetes, but this new process will enable individuals to test themselves by simply breathing once into the device.

There are over 300 compounds in the breath, some of which are established indicators of disease. The only way to be able to use these indicators is with very selective sensors for a particular gas. “That’s where the breakthrough in the technology has been,” explains Gouma. “We have been able to make low-cost sensors that mark one particular gas or one particular family of gases and discriminate against another.”

In order to detect a particular disease, the specific sensors need to be identified. “For instance, if nitric oxide is important to asthma, we can detect nitric oxide. If acetone is important to diabetes, we can detect acetone,” notes Gouma. “It’s beyond the alcohol breath analyzer that people are familiar with that is non-selective.”

The project has been funded by the National Science Foundation and is presently in pre-clinical trials for use in diabetes.

In January 2010, Professor Gouma published research entitled "Chemical Sensor and Breath Analyzer for Ammonia Detection in Exhaled Human Breath," in *IEEE Sensors: Special Issue on Breath Analysis*. A Fulbright Scholar, Dr. Gouma is a tenured Associate Professor in the Department of Materials Science and Engineering at Stony Brook University.

Provided by Stony Brook University