

Autonomous sensor could aid in early detection of urinary tract infection

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Urinary tract infections could one day be diagnosed faster than ever before with an autonomous sensor technology being developed at Purdue University.

"Current testing relies on time-consuming and costly urine culture tests performed at medical facilities and on at-home testing using store-purchased dipsticks that generally have high false alarm rates," said Babak Ziaie, professor of electrical and computer engineering in Purdue's School of Electrical and Computer Engineering. "Additionally, collecting [urine samples](#) for these methods can be challenging for infants and geriatric patients who suffer from neurodegenerative diseases. There's also a privacy and dignity issue."

According to the National Institute of Diabetes and Digestive and Kidney Diseases, urinary tract infections are the second most common type of infection in the body. For women, the lifetime risk of having a [urinary tract infection](#) is greater than 50 percent. While most urinary tract infections are not serious, some instances can lead to serious complications such as kidney infections.

"Once you detect a urinary tract infection in its early stage, it's very easy to cure," said team member Byunghoo Jung, associate professor of electrical and computer engineering in the School of Electrical and Computer Engineering. "You just need an antibiotic. Early detection is the key."

Purdue researchers have developed a bandage-sized, disposable urinary tract [infection](#) sensor module with a urine-powered battery that can be embedded in a diaper. When it is exposed to urine, the battery provides power to the sensor circuitry. The sensor checks for nitrites, chemical compounds commonly associated with urinary tract infections, and wirelessly sends the result to a [smartphone app](#) that keeps the data log and sends the results to the patient, caregiver, and/or health-

care network if required.

Several patents exist on similar technologies. However, none of them are autonomous systems.

"Ours is the only one that works fully autonomously," Ziaie said. "Conventional methods require a certain level of patient or caregiver intervention."

Researchers have created a prototype that has been tested with synthetic urine samples. Testing has shown the prototype to be more accurate than commercial dipsticks.

The autonomous feature of the technology could prove useful to patients who might not be aware of the symptoms of urinary tract infections or otherwise be unaware of the need to check for them. In such cases, urinary tract infections are difficult to detect in their early stages.

Another advantage of the autonomous system is the ability to check for urinary tract infections on a regular basis. This improves accuracy due to the amount of data regularly collected. It can also track changes in the status of urinary tract infections over time.

Work is now shifting to sizing, packaging, diaper embedding methods, smartphone app details and other efforts to prepare the technology for commercialization. A pilot study also is planned.

Provided by Purdue University

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