New technology enables machines to detect microscopic pathogens in water

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Detecting one of the world's most common pathogens in drinking water soon may no longer be bottle-necked under a laboratory microscope.

Pathogens, meet technology.

A new system developed by Texas AgriLife Research automatically scans a water sample and points to potential pathogens much faster than what humans can accomplish. Hence, the diseases these pathogens may be nipped in the bud before making people sick.

"Currently, it takes humans a long time and a lot of effort to peer through microscopes and look for green dots (indicating the presence of cryptosporidium or giardia pathogens)," said Dr. Suresh Pillai, AgriLife Research scientist and professor of microbiology at Texas A&M University. "This system is more accurate and can provide results immediately for users around the world."

Pillai and his team have been working on the issue since 1996 when he first proposed that to fine-tune the search for pathogens, scientists needed to find a way to "substitute humans with automatic image analysis systems." By the year 2000, "we actually proved that it could be done," Pillai said, who then spent the next nine years seeking a commercial partner who could "move this technology into the marketplace."

Eventually, Pillai found Smart Imaging Technology in Houston.

Together they sought additional funding from the state through the Texas Emerging Technology Fund to bring the process into reality. Pillai said the company is in the "final stages" of bringing the detection system online.

"Basically, you put a slide under a microscope, and it will automatically scan the microscope and put potential flags on all potential objects of interest," Pillai explained. "Then the software that was developed as part of this project can hone down on every one of those potential objects and query it to see whether it is the right image based on a number of parameters that we have developed for it to detect."

The automated system was developed specifically to seek out cryptosporidium and giardia -- pathogens that are transmitted via water and cause severe diarrhea in people with compromised immune systems. They are spread globally through contaminated drinking water.

"But we can develop the same thing for other pathogens of interest - anything that is large enough to be detected with a microscope," Pillai said, pointing to Toxoplasma gondii, the pathogen that can pass from cats to pregnant women and cause fetal death. "Right now we have very few people in the country who can identify Toxoplasma gondii under a microscope."

Whether a private company or a university operates the automated microscopic detection of pathogens, the capability could also be offered via the Internet nationally as well as to other countries where money to purchase the equipment is not available, Pillai noted. Because it is automated, the computerized system could be available globally every day and around the clock.

Pillai envisions a variety of applications for this technology, including as a teaching tool for undergraduate and graduate students, a training tool for employees, as a resource for researchers working with protozoan pathogens, and as a means of fee-for-service for pathogen detection.

"We are looking at ways how this technology can address some of the key challenges facing pathogen detection in food and water. We are actively seeking funding to take it to that next level," he said.

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