Chemists developing paper-strip urine test for at-home/office/clinic COVID-19 evaluation

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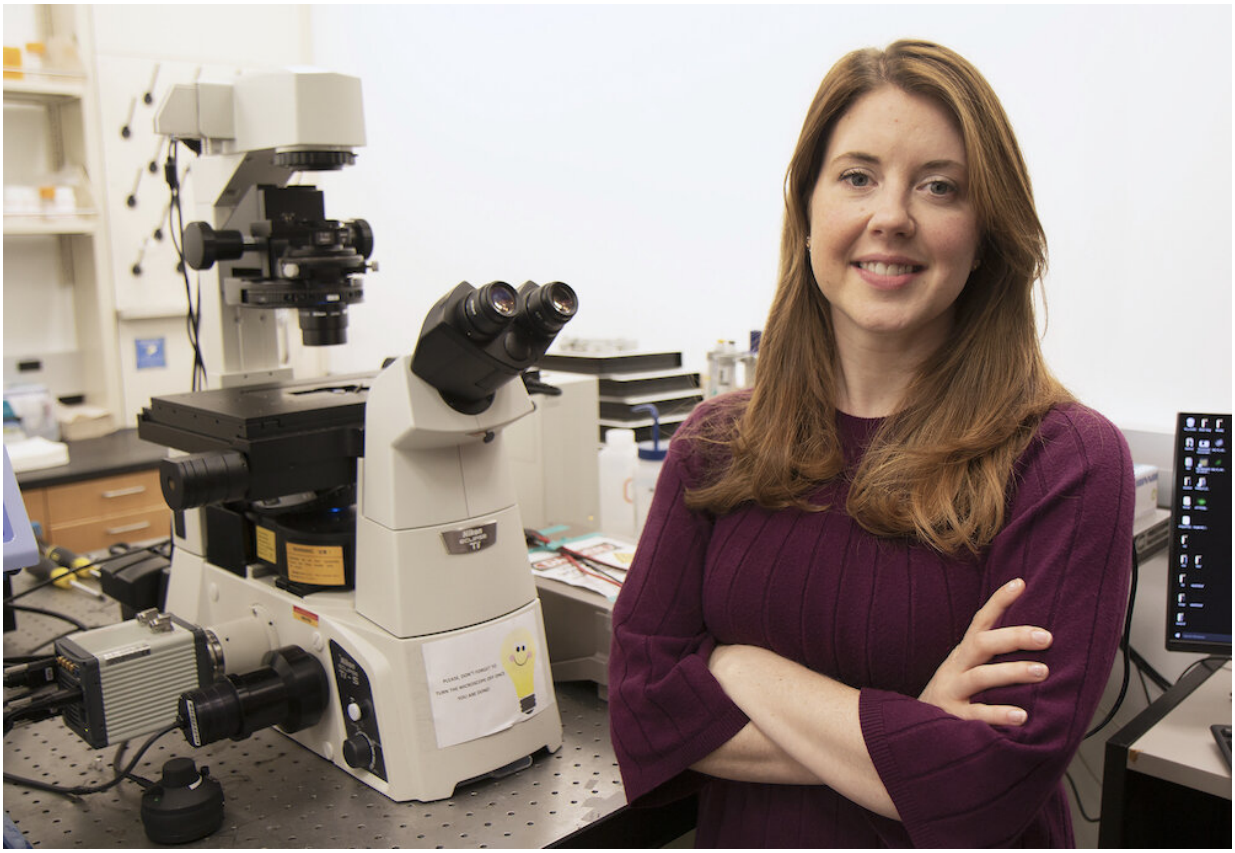

Robbyn Anand and students in her research group are developing a new paper-strip test to detect the coronavirus that causes COVID-19. Credit: College of Liberal Arts and Sciences

Chemists at Iowa State University are developing a paper-strip urine test to detect infection by the coronavirus that causes COVID-19.

It's a little like a home pregnancy test, said Robbyn Anand, an Iowa State assistant professor of chemistry and leader of the project. But it's also a little more complicated than a pregnancy test.

The test is designed to detect the presence of a coronavirus protein in a urine sample. To do that, Anand said it will have to be 10 to 1,000 times more sensitive than a pregnancy test.

Anand and the students working in her research group will use electric fields to boost test sensitivity. It's a technology and a field of study that Anand knows well. It's called electrokinetics and Anand has been working with it since 2004 to concentrate, separate, isolate and manipulate charged particles.

Anand's COVID-19 project is built on previous work that uses electric fields to help detect an inflammatory protein for an autoimmune disease called Sjögren's syndrome.

The COVID project is supported by a recently announced one-year, $55,000 grant from the Research Corporation for Science Advancement based in Tucson, Arizona. It's one of seven grants the group awarded to support physical scientists launching COVID-19 projects and, more broadly, working to detect and mitigate epidemics.

Anand said the protein-detection technology "is a little like a dam. As fluid flows through the paper strip, the electric field backs up charged molecules—including proteins—so the test line on the paper is exposed to a higher concentration of them for a longer time. Both help with the sensitivity of the test."

She said the test should work with either urine or saliva samples to deliver a quick yes or no. It could be done at home, in a workplace or in a doctor's office.

The tests would require a small power source. Anand said her research group has started with common 9-volt batteries. She said the project could also explore powering tests with devices similar to the chargers used with some electric toothbrushes.

Anand said the research group will also explore a second kind of test for COVID-19. It would involve a 3-D printed card the lab has already developed to detect DNA products from reverse transcriptase polymerase chain reaction tests—the same nasal-swab tests that have been used to detect the coronavirus. The card would be more sensitive than the readers currently used in the testing process.

Assisting Anand in her Iowa State laboratory are Sommer Osman and Kira Rahn, doctoral students in chemistry. An undergraduate, Dorian Twedt, also contributed to the preliminary work that led to the COVID-19 projects.

Anand said she's optimistic her lab can use electric fields to develop more sensitive COVID-19 tests.

"In both cases, I feel like we can have technologies that work in our lab," she said. "But how do we turn it into a commercial product? We'll need additional engineering capacity for that."

Provided by Iowa State University

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