

New lab-on-a-chip technology could improve accuracy of lab tests, deliver results sooner

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(PhysOrg.com) -- Instead of a needle in the arm, a simple prick of the finger could one day provide more than enough blood for a laboratory to run a multitude of complex tests and deliver results in seconds.

Researchers at the University of Calgary's Schulich School of Engineering have developed a new way to dispense and manipulate fluids on a microchip, a method that could improve efficiency and accuracy. This would have an impact on practically every field that involves laboratory testing such as food safety, police forensics and health care - from routine medical tests to detecting specific strains of influenza during pandemics.

"What we have here is a very controlled and more efficient method of creating structured particles," explains Dr. Karan Kaler, Director of the Biosystems Research and Applications Group at the Schulich School of Engineering. "We can control the exact size and spacing of the droplets, while other techniques cannot achieve the same precision."

It is also possible to test samples that are up to one million times smaller than ever before: the size of a picolitre, or one-trillionth of a litre.

Testing is taking place at the microscopic level and it happens so quickly the only way to capture images is through a high-speed camera attached to a microscope.

This new method involves creating a structure called a micro-emulsion, which is a droplet of fluid captured inside a layer of another substance. The two substances don't mix, much like water and oil. This process

eliminates many of the steps that are traditionally required to dispense, separate and transfer droplets.

"What we are trying to do is form these emulsions on the chip in a simultaneous way," says Ravi Prakash, PhD student at the Schulich School of Engineering. "We can position them exactly where we want on the chip, dispense them, move them and mix them."

Samples are dispensed electronically and tested by sensors on microchips. The chips transfer data wirelessly to a computer. Because the process is fully automated, there is less handling of samples by laboratory staff and, therefore, less chance of human error or sample contamination.

The long-term vision for this technology is to create hand-held devices for patients to use at home for testing fluids such as [blood](#) and urine. This could prevent long waits at clinics and deliver test results faster. The researchers also believe this technology could have health benefits. Smaller samples would make testing less invasive and less costly, which could result in earlier detection of diseases such as cancer.

Provided by University of Calgary

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