

## Small Chips Tackle Big Problems

Diagnostics-For-All

Harvard University



People all over the world who have never heard of George Whitesides owe him a debt of gratitude, or will one day.

Among his many research interests, the Harvard chemistry professor is known for groundbreaking work in microfluidics, the manipulation of minute amounts of liquids in tiny spaces.

Whitesides invented a paper-based microfluidic chip the size of a thumbnail—a miniature, portable laboratory can test a tiny sample of bodily fluid for signs of health or disease. The chip is inexpensive to make, easy to use and, most important to its inventor, ideal for helping people in the developing world and other resource-poor areas.

“ In 2007, Whitesides and like-minded colleagues started a nonprofit company, *Diagnostics For All (DFA)*, aimed at making the patterned-paper technology available worldwide.

The paper is patterned with water-averse polymers, forming a series of channels that guide a fluid sample to a specific location on the chip that is pre-treated with a reagent. When the reagent is exposed to the fluid sample, it results in a color change that can be translated into a diagnosis.

Citing its commitment to acting with flexibility and speed to improve global health, Harvard University, through its Office of Technology Development, in 2009 gave DFA exclusive licensing rights for diagnostic technology developed by the Whitesides Research Group at the university.

DFA's first paper-based diagnostic chip test was for liver function. This simple procedure, in which a drop of blood is assessed in about 15 minutes, could save thousands if not millions of lives once the test receives full approval for use. Early diagnosis of impaired liver function could help people with AIDS or tuberculosis. More than 400,000 people in Africa died from TB in 2016, according to the World Health Organization.

Other uses for the paper-based technology include measuring micronutrient levels in children and assessing vaccination coverage and disease incidence in the developing world. In fact, DFA's scientists say the sky's the limit on the types of tests that can be embedded on a paper chip.

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