

How long is a piece of thread? Long enough to save a life

February 26 2010

A discovery by Monash University scientists could see humble cotton thread emerge as a core material in low-cost 'lab-on-chip' devices capable of detecting diseases such as kidney failure and diabetes.

In a world first, the researchers have used ordinary cotton thread and sewing needles to literally stitch together the uniquely low-cost microfluidic analytical device, which is the size of a postage stamp.

Microfluidic analytical devices, which have been produced from a range of materials over the last couple of decades, allow scientists to carry out chemical analyses of minute fluid samples, such as blood and urine. Production of conventional devices is complicated and expensive, requiring the incision of channels into chips made of silicon, glass, ceramic or metal.

The device, created by Associate Professor Wei Shen and his research team from Monash University's Engineering Faculty, works by wicking fluid along the microscopic fibres of cotton thread sown into a [polymer film](#). The thread's absorbent property ensures a defined flow for fluids being tested, so complex channels and barriers do not need to be etched into the chip.

Associate Professor Shen said the cotton-based microfluidic system was a novel concept and he hoped further research could lead to the provision of low-cost disease screening and detecting devices to developing countries.

"There are currently promising technologies in the area of paper-based microfluidic diagnostic devices, however the disadvantage is that it requires expensive equipment to fabricate the sensors," Associate Professor Shen said.

"The benefit of cotton thread-based devices is that they can be made using simpler equipment, such as sewing machines, so they could be produced in developing regions where high-cost diagnostics are not available and not feasible. We are in the very early days of this research, but we are very excited about where it could lead."

Associate Professor Shen, whose discovery is detailed in the latest issue of *ACS Applied Materials and Interfaces*, said the low-cost simplicity of the cotton-thread concept belied its power and potential to make a huge difference to healthcare in many parts of the world.

"Communities in the developing world are very vulnerable to diseases, so early detection and screening systems can save many lives. However, many of the current commercial devices are not cheap enough for large-scale health-care projects involving disease detection, so an affordable alternative could make a huge difference.

"My research team is thrilled about this discovery. Our results demonstrate that thread is suitable for fabricating microfluidic diagnostic devices for monitoring human health, the environment, and food safety testing - especially for less-industrialised or remote communities. Further research could also lead to use in personal products such as baby nappies."

Provided by Monash University

Citation: How long is a piece of thread? Long enough to save a life (2010, February 26) retrieved

3 May 2024 from <https://phys.org/news/2010-02-piece-thread-life.html>

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