Handheld device could enable low-cost chemical tests

Technology plugs into mobile phones to transmit data for offsite analyses.

Anna Simmonds

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Researchers have developed a handheld electrochemical detector that can perform chemical analyses and transmit results to a cloud database from any mobile phone, even low-end models.

The detector, described on 4 August in the *Proceedings of the National Academy of Sciences*[1], could one day enable a wide range of tests — such as those for toxic metals in drinking water, blood glucose or electrolyte levels in humans, or malaria infections — at low cost, its creators say.

The device, called the "universal mobile electrochemical detector" (uMED), costs around US$25 to manufacture, and its 3.7-V lithium polymer battery can go for months or even years on a single charge. Its testing equipment includes three electrodes and a small sample well for fluids. The data that the uMed collects can be transmitted by plugging it into a cellular phone's headphone jack; the device is compatible with most phones and all network types.

Alex Nemiroski

This handheld chemical detector is made from commercially available components.

"All that is required is to insert the strip, select the test, apply the sample, and place a phone call," reports a team led by George Whitesides at Harvard University in Cambridge, Massachusetts. Their analysis suggests that data collected by uMED is comparable to that produced by a commercial electrochemical analyser.

Universal application

Most existing devices that allow mobile collection and transmission of health data are expensive and limited in their application, as they require smartphones and 3G or 4G data networks. Because nearly 3 billion people worldwide have low-end cell phones, and are often connected to networks using older technology, the Harvard team designed the uMED to be compatible with any phone or network.

This allows the data that the device collects to be analysed off-site in real time, by comparing results against a database stored in the cloud or by consultation with a medical expert through text messages.

"Providing people with the ability to easily gain information relating to levels of chemical species in themselves or in their environment is potentially very empowering for individuals and communities," says Conor Hogan, a chemist at La Trobe University in Melbourne, Australia.

Samuel Sia, a biomedical engineer at Columbia University in New York City, says that uMED's vibration

mechanism, which allows it to mix samples in its fluid well, and the use of the audio jack are particularly clever approaches to mobile data analysis.

Because uMED is constructed from commercially available components, its creators hope that it could be developed for mass production within a year. Whitesides and his colleagues are working with a team in India that is conducting field trials using the device.

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References

1. Nemiroski, A. *et al*. *Proc. Natl Acad. Sci. USA* http://dx.doi.org/10.1073/pnas.1405679111 (2014).

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