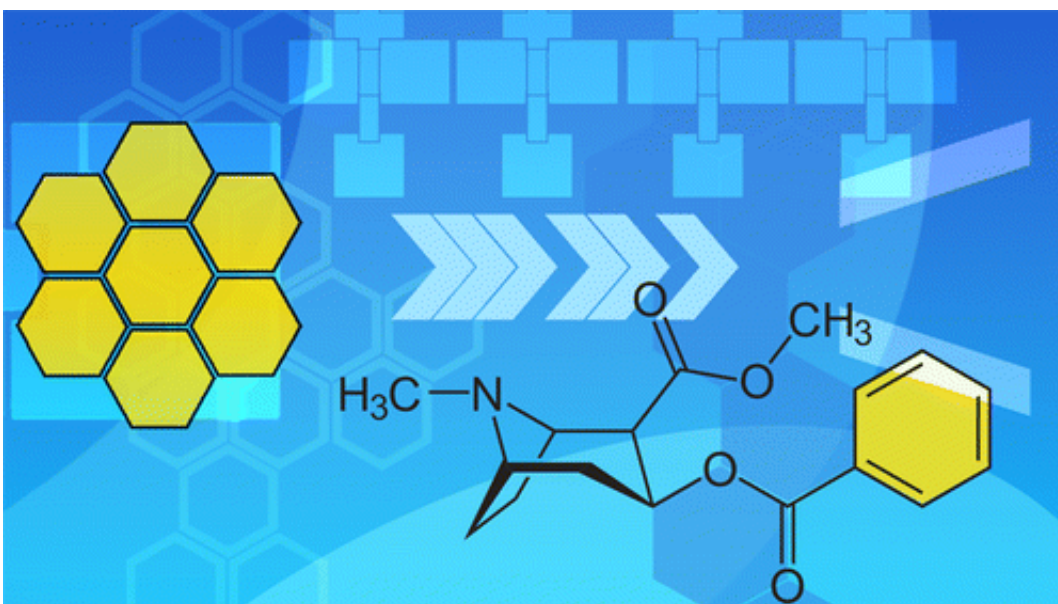


Fast, portable device for 'on-the-go,' laboratory-quality cocaine testing

June 25 2014



Testing for cocaine and other drugs usually involves two steps: a quick on-site prescreen, and then a more accurate confirmatory test at a distant laboratory. This process can take days or weeks—but that's too long in many cases where public safety is at risk. Now, researchers report development of a backpack-sized device that can perform highly accurate and sensitive tests anywhere within 15 minutes. The study appears in ACS' journal *Analytical Chemistry*.

Aaron Wheeler and colleagues explain that the current two-stage system of testing urine for drugs of abuse is expensive and time-consuming. The samples also could get lost or compromised while in transport. The ideal solution, they say, is to skip the prescreening step and instead bring the lab to the site—but in an easy-to-use, portable package. Currently, when samples arrive at labs for confirmation testing, trained technicians use a "gold-standard" method, relying on sample processing, liquid chromatography and mass spectrometry to analyze them. Small versions of instruments that implement these techniques can provide results at or near lab-quality, but they haven't been optimized and tested together as a single, portable instrument. Wheeler's team set out to do just that.

They put together a compact system that can do all the steps—extracting drugs of abuse from urine with a [microfluidic device](#) coupled to a small mass spectrometer that can identify the substances. The backpack-sized instrument could analyze [cocaine](#), benzoylecgonine (a metabolite of cocaine) and codeine in four samples in less than 15 minutes. The amount of cocaine they could detect was compatible with limits set by the United Nations Office on Drugs and Crime. The researchers say the device could be used for many different kinds of tests in which laboratory-quality results are needed quickly.

More information: "Analysis on the Go: Quantitation of Drugs of Abuse in Dried Urine with Digital Microfluidics and Miniature Mass Spectrometry" *Anal. Chem.*, 2014, 86 (12), pp 6121–6129. [DOI: 10.1021/ac5012969](#)

Abstract

We report the development of a method coupling microfluidics and a miniature mass spectrometer, applied to quantitation of drugs of abuse in urine. A custom digital microfluidic system was designed to deliver droplets of solvent to dried urine samples and then transport extracted analytes to an array of nanoelectrospray emitters for analysis. Tandem

mass spectrometry (MS/MS) detection was performed using a fully autonomous 25 kg instrument. Using the new method, cocaine, benzoylecgonine, and codeine can be quantified from four samples in less than 15 min from (dried) sample to analysis. The figures of merit for the new method suggest that it is suitable for on-site screening; for example, the limit of quantitation (LOQ) for cocaine is 40 ng/mL, which is compatible with the performance criteria for laboratory analyses established by the United Nations Office on Drugs and Crime. More importantly, the LOQ of the new method is superior to the 300 ng/mL cutoff values used by the only other portable analysis systems we are aware of (relying on immunoassays). This work serves as a proof-of-concept for integration of microfluidics with miniature mass spectrometry. The system is attractive for the quantitation of drugs of abuse from urine and, more generally, may be useful for a wide range of applications that would benefit from portable, quantitative, on-site analysis.

Provided by American Chemical Society

Citation: Fast, portable device for 'on-the-go,' laboratory-quality cocaine testing (2014, June 25) retrieved 9 April 2024 from

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