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Research Highlights

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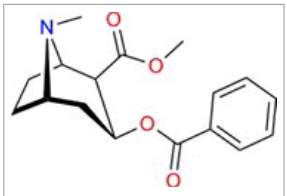
Microfluidic drug detection: Know when to fold

Gavin Armstrong

The real-time detection of cocaine in blood serum has been achieved using an aptamer-based electrochemical sensing device



A range of techniques can be used to detect analytes in complex aqueous solutions, making use of the changes in properties such as charge or mass that occur when the analyte binds to the sensor. Such adsorption-based devices suffer from an inability to differentiate between genuine target molecules and contaminants — giving false positives when assessing unprocessed samples.

Sensors that use analyte-induced changes in biomolecule conformation do not have this problem because the non-specific binding of non-target molecules does not induce the conformational changes required to create a signal. Now, Tom Soh and colleagues at the University of California, Santa Barbara, have developed[1] such a sensor, using the conformational changes of a DNA aptamer to sense cocaine in blood serum.

The device consists of a microfluidic chamber that contains a reference electrode and several gold electrodes functionalized with a layer of 32-base DNA aptamers. Importantly, these have a redox-active methylene blue moiety attached to their free end, and they remain unfolded until the specific binding of cocaine. The target-induced folding brings the methylene blue closer to the gold electrode, increasing the efficiency of electron transfer from methylene blue to the electrode and in turn increasing the measurable current. Changes in current can thus be related to cocaine concentration.

Reference

1. Swensen, J. S. *et al.* Continuous, real-time monitoring of cocaine in undiluted blood serum via a microfluidic, electrochemical aptamer-based sensor. *J. Am. Chem. Soc.* doi:10.1021/ja806531z (2009). | Article |

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