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Abstract

Highly Selective Electrochemical Profiling of Heroin in Street Samples †

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The trafficking and consumption of drugs of abuse are global concerns that threaten social structures and jeopardizes the security of nations [1]. In particular, heroin use still accounts for the largest share of drug-related harm [2]. Thus, effective, rapid, low-cost, and selective analytical methods are vital to hinder drug trafficking and to prevent its availability on the drug market [3]. This way, chemical color tests and sophisticated spectroscopic instrumentation are often the first choice. However, significant drawbacks should be considered, e.g. the inaccuracy of the color tests or the high cost and low portability of the spectroscopic devices. Interestingly, electrochemical sensors have proven to be the solution for the on-site detection of illicit drugs due to their balance between affordability and analytical performance [4,5].

The present study reports on an improved method for the on-site profiling of heroin. The principle is based on two-peak recognition, i.e., from heroin and its main metabolite 6-monoacetylmorphine (6-MAM) at a basic pH (Figure 1). Unfortunately, paracetamol, which is the most encountered cutting agent in heroin seizures, completely overlaps the 6-MAM peak at unmodified electrodes, thus hindering its potential use to selectively detect heroin. As a result, a rapid and smart electrochemical pretreatment is presented to overcome this masking phenomena. Moreover, a customized script is integrated to enhance peak-to-peak separation and enlighten the full composition of heroin samples.

Overall, the proposed strategy paves the way to the rapid, user-friendly, and low-cost on-site detection of heroin in real scenarios by law enforcement officers through: (i) analysis of suspicious powders on the street, and (ii) rapid screening of cargos in border settings (e.g., airports and harbors).

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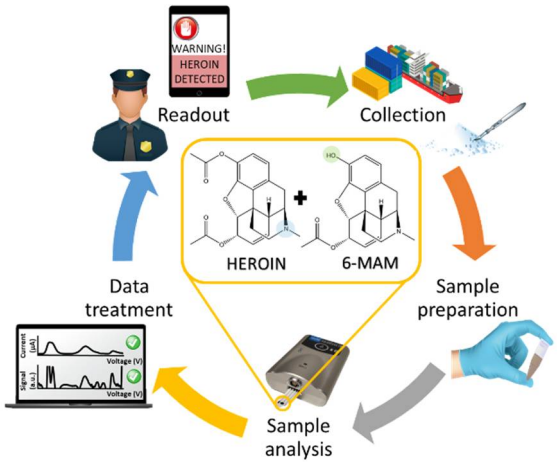

Figure 1. Schematic of the concept for the on-site screening of heroin.

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