

Title: Sensitive screening for new psychoactive substances in human urine by GC-MS

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Purpose

Analyzing drugs of abuse (DoA) is performed for many reasons such as criminal and forensic investigations, high risk employment functions, clinical toxicology and rehabilitation programmes. In many cases a reliable and fairly affordable methodology is needed given the high productivity of the laboratories involved and the average price per sample these laboratories can charge. One of the most important requirements for this application is a sensitive method, that can be used to selectively detect all drug groups such as opiates, amphetamines, synthetic cannabinoids and synthetic opioids etc. in one single method. A complete solution is presented from the urine samples to the results. This includes a detailed description of the sample preparation SPE protocol, together with the GC-MS parameters and the observed results in some urine examples using an automated spectral deconvolution software.

Methods and materials

The drugs of abuse excreted in urine are in the form of glucuronidate conjugates. Therefore, beta-glucuronidase is used for enzymatic hydrolysis. This enzyme is commonly used during sample preparation to cleave off glucuronides and sulfate esters prior to GC-MS analysis. The urine samples were subjected to a solid phase extraction procedure:

Compound separation and detection was achieved using a single quadrupole with a special source that offers unparalleled sensitivity. Sample introduction was performed using a split/splitless injector and injection the underivatized drugs. Data was acquired in full-scan mode and processed using Analyzer Pro Deconvolution software, followed by library searching for putative compound identification.

Statement of conclusions reached

The data obtained from the experiments performed demonstrate that a single quadrupole GC-MS system in combination with the SPE provided a single quick, cost effective, and robust method for the general unknown screening of NPS. This method can be used for routine analysis of drugs of abuse in urine with a sample throughput of >12,000 samples/year. The concentration factor of 60 gained through sample preparation and the enhanced sensitivity of the ion source made it possible to reach low detection limits, which are much more sensitive than the results gained in immunological testing. This is a big advantage, especially for new psychoactive substances.