



CAMAG DBS-MS 500

FULLY AUTOMATED DRIED
BLOOD SPOT EXTRACTION SYSTEM

DETECTION OF ILLICIT DRUGS FROM ONE SINGLE BLOOD DROPLET



- High throughput analysis of up to 500 DBS cards per run
- Integrated optical card recognition and barcode reading module
- Automated internal standard application module
- Unique extraction module with wash station to eliminate carry-over
- Online coupling to analysis system (LC-MS, MS or Sample Collector)
- Full control through Chronos software

FULLY AUTOMATED FORENSIC ROUTINE DRIED BLOOD SPOT SCREENING FOR WORKPLACE TESTING – IMPLEMENTATION INTO A ROUTINE LABORATORY

A new and fully automated workflow for the cost-effective drug screening based on the dried matrix spot (DMS) technology was introduced and implemented in this study [1]. More than 1200 illicit drugs can be screened from a single dried blood spot (DBS) or dried urine spot (DUS) within 20 minutes per sample using a Forensic Toxicology Database. A quantitative follow up method on positive screening results was developed for 27 target compounds (Table 1) and two internal standards. Dried matrix spot cards were integrated

into the automated workflow (Figure 1), in which the cards were checked in a camera recognition system, spiked with deuterated standards via an in-built spraying module and directly extracted. The extract was transferred online to an analytical LC column and then to the electrospray ionization tandem mass spectrometry system [2]. The target compounds were analyzed in positive multiple reaction monitoring mode on a Shimadzu 8060 with a Forensic Toxicology Database.

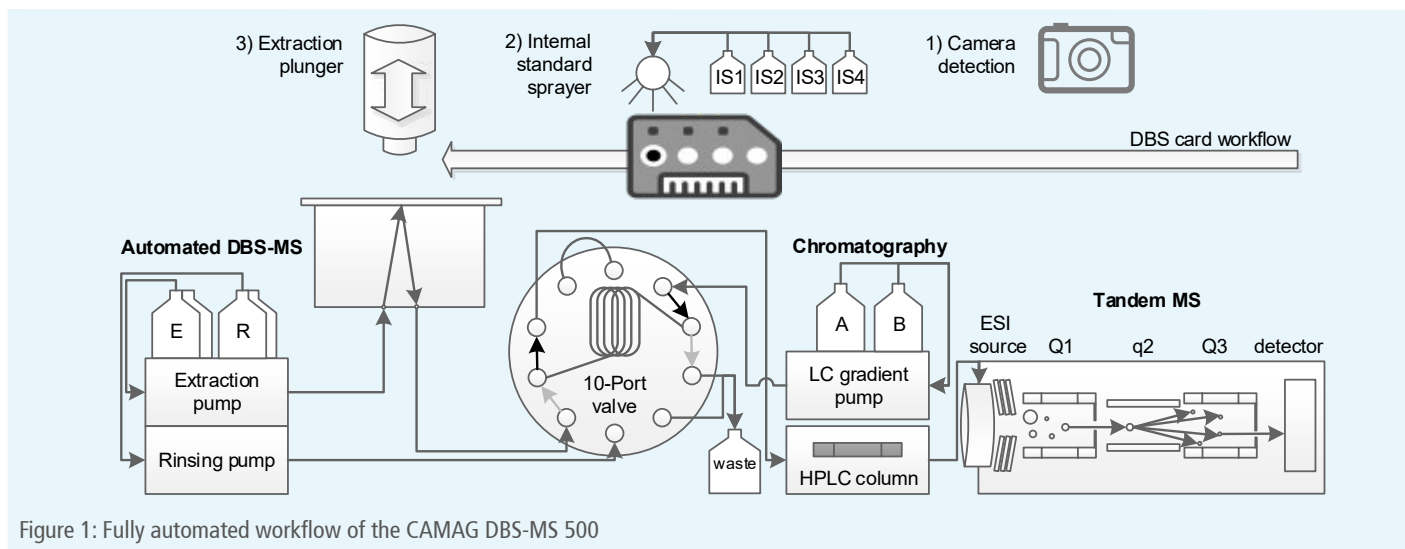


Figure 1: Fully automated workflow of the CAMAG DBS-MS 500

The quantitative method gives confident positive/negative results for all tested drugs (list below) at their individual cut-off concentration. Good precision ($\pm 15\%$, respectively $\pm 20\%$ at LOQ) and correlation within the calibration range from 5 to 1000 ng/ml

was obtained. The criteria of bio-analytical method validation guidelines were fulfilled [3]. The method was finally applied to real cases from the lab and cross checked with the existing methodologies.

Table 1: Target compounds

11-nor-delta9-tetrahydrocannabinol carboxylic acid	Alprazolam	Clobazam	Diazepam	Nordiazepam
3,4-Methylenedioxyamphetamine	Amphetamine	Clonazepam	Heroin	Oxazepam
3,4-Methylenedioxyethylamphetamine	Bromazepam	Clozapine	MAM-2201	THCA-A
3,4-Methylenedioxymethamphetamine	Cannabidiol	Cocaine	Methamphetamine	
6-Acetylmorphine	Chlorphenamine	Codeine	Midazolam	
7-Aminoclonazepam	Chlorpromazine	Delta-9-tetrahydrocannabinol	Morphine	

A new workflow for high throughput drug screening was developed and transferred into a routine environment. The method is already used on a daily basis to monitor workplace safety and for suspects from road side controls. Blood and urine samples are analyzed via the DBS-LC-MS/MS platform and depending on the context, either the drug panel or the data base method are acquired. The process

from sampling to generating the report was linked with a barcode system. Quality control cards can be prepared by the laboratory using the spraying module of the DBS-MS 500. Each process step is well documented and all analysis steps follow Good Laboratory Practice (GLP) [3]. The method can be easily modified or extended and transferred to other routine laboratories.

[1] Gaugler *et al.*, Fully Automated Forensic Routine Dried Blood Spot Screening for Workplace Testing, *Journal of Analytical Toxicology*, 1–9, 2018; doi: 10.1093/jat/bky074

[2] Gaugler *et al.*, Fully automated drug screening of dried blood spots using online LC-MS/MS analysis, *Journal of Applied Bioanalysis*, Vol.4, No.1, 7–15, 2018; doi: 10.17145/jab.18.003

[3] European Medicines Agency, "Guideline on bioanalytical method validation" 2015

