BIOCHIP BASED MULTI-DRUG SCREENING OF HAIR SAMPLES ON THE EVIDENCE INVESTIGATOR ANALYSER

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Introduction

Multi-drug detection facilitates and increases the screening capacity during the drug testing process. The collection of hair samples is non-invasive and the use of this matrix for drug testing, provides a large window of detection as well as the history of drug exposure over time for an individual. Society of Hair Testing (SoHT) and European Workplace Drug Testing Society (EWDTS) guidelines for drug testing in hair are in place.

This study reports a new application of biochip array technology to the simultaneous screening of multiple drugs (amphetamine, benzodiazepines, benzoylecgonine/cocaine, cannabinoids, hydrocodone, ketamine, methamphetamine, opiates, oxymorphone and phencyclidine) from a single hair sample on the semi-automated analyser Evidence Investigator.

Methodology

Simultaneous competitive chemiluminescent immunoassays, defining discrete test sites on the biochip surface, were employed for the screening of drugs. The immunoassays were applied to the biochip analyser Evidence Investigator. With this system 54 biochips can be handled at a time.





Biochip carrier (3x3 biochips)

Assay	Amphetamine	Benzodiazepines	Benzoylecgonine/Cocaine	Δ9-THC
Cut-off (ng/mg)	0.04	0.02	0.2	0.01
LOD (ng/mg)	0.032	0.004	0.018	0.008
Assay	THC-COOH	Hydrocodone	Ketamine	Methamphetamine
Cut-off (ng/mg)	0.001	0.04	0.5	0.15
LOD (ng/mg)	0.0008	0.01	0.354	0.068
Assay	Opiates	Oxymorphone	Phencyclidine	_

Assay	Opiates	Oxymorphone	Phencyclidine	_
Cut-off (ng/mg)	0.04	0.1	0.02	_
LOD (ng/mg)	0.02	0.046	0.01	_

Semi-automated benchtop biochip analyser Evidence Investigator

Multiple drugs were detected from a single hair sample with the biochip platform. Regarding the cut-offs, for drugs appearing in the SOHT or EWDTS guidelines, the cut-off for ketamine was the same and for amphetamine, benzodiazepines, benzoylecgonine/cocaine, Δ 9-THC, methamphetamine and opiates the cut-offs were lower with the biochip platform, reflecting high sensitivity. Favourable agreement with LC-MS/MS was found for the drugs present in the authentic samples. With the Evidence Investigator multiple samples can be assessed at a time (up to 54 biochips can be handled at the same time) which increases even further the screening capacity.



Amphetamine	Benzodiazepines	Benzoylecgonine/Cocaine	Δ9-THC
0.2	N/A	0.5	0.05
0.2	0.05	0.5	0.05

THC-COOH	Hydrocodone	Ketamine	Methamphetamine
0.0002	N/A	N/A	0.2
0.0002	N/A	0.5	0.2

Opiates	Oxymorphone	Phencyclidine	_
0.2	N/A	N/A	_
0.2	N/A	N/A	_

Percentage agreement with LC-MS/MS (Authentic samples, n=43)

cision	Assay	Agreement (%)
	Amphetamine	98
d +50% cut-off	Benzoylecgonine/cocaine	98
%) < 8	Cannabinoids	95
	Methamphetamine	86
	Opiates	95