EVALUATION OF A RAPID (LESS THAN 23 MINUTES) BIOCHIP BASED SYSTEM APPLIED TO THE MULTI-DRUG SCREENING FROM A SINGLE BLOOD SAMPLE

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Introduction

The use of biochip array technology provides multi-drug detection from one single sample, this multi-analytical approach increases the screening capacity and provides more information from a sample during the drug testing process. By using the fully automated benchtop analyser Evidence MultiSTAT, rapid screening results (< 23 minutes) are obtained for twenty drug classes (including new psychoactive substances) from a single sample.

The comparative evaluation reported in this study aimed to show the applicability of this biochip based system to the multi-drug screening of blood samples from forensic and clinical cases.

Methodology

For the screening, simultaneous chemiluminescent immunoassays defining discrete test sites on the biochip surface, were applied to the Evidence MultiSTAT analyser. This system processes a self-contained cartridge which contains all components required for the immunoreactions. Each sample is tested against cut-off values, the results are qualitative.

Blood samples from forensic and clinical cases, were screened following simple centrifugation and dilution (1:4). The screening results were compared to LC-MS/MS results and the percentage agreement was calculated.

Cartridge

Fully Automated Benchtop Analyser
Evidence MultiSTAT

Conclusion

The results indicate that biochip array technology allows the rapid (< 23 minutes) multi-drug screening (twenty drug classes) from a single blood sample when applied to the fully automated benchtop analyser Evidence MultiSTAT. An overall favourable agreement with LC-MS/MS was achieved. The presence of putrefactive amines -formed in post-mortem samples-, interfering with the amphetamine assay could explain the occurrence of false positive results.

This biochip based application represents a useful analytical tool for drug testing in forensic toxicology.

Results

The biochip based system allowed multi-drug screening from a single blood sample.

The simultaneous immunoassays, the number of samples and the assay cut-off were as follows:

Assay	n	Cut-off (ng/mL)
α-PVP	68	5
AB-PINACA	73	2
Amphetamine	68	50
Barbiturates	55	50
Benzodiazepines	58	20
Benzoylecgonine	68	25
Buprenorphine	58	2
Cannabinoids	69	10
Fentanyl	51	1
Methadone	59	5
Methamphetamine	67	50
Opiate	67	80
Oxycodone	68	10
Pregabalin	58	1000
Tramadol	58	5
Tricyclic antidepressants	58	60
6-MAM	68	10

The percentage agreement between the biochip based platform and LC-MS/MS was as follows:

Assay	Percentage agreement Biochip based platform and LC-MS/MS
α-PVP	100%
AB-PINACA	100%
Amphetamine	73.5%
Barbiturates	98.2%
Benzodiazepines	96.6%
Benzoylecgonine	98.5%
Buprenorphine	100%
Cannabinoids	95.7%
Fentanyl	100%
Methadone	100%
Methamphetamine	97%
Opiate	86.6%
Oxycodone	92.6%
Pregabalin	96.6%
Tramadol	98.3%
Tricyclic antidepressants	87.9%
6-MAM	100%

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