APPLICABILITY OF A BIOCHIP ARRAY ON THE FULLY AUTOMATED BENCHTOP ANALYSER EVIDENCE MULTISTAT TO THE RAPID MULTI-DRUG SCREENING OF BLOOD SAMPLES IN FORENSIC TOXICOLOGY

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Introduction

Biochip Array Technology (BAT) by employing miniaturized immunoassays, which define discrete test sites on a biochip surface, allows the detection of multiple drugs from a single sample. This approach facilitates the screening step of the drug testing process. By using the fully automated benchtop analyser Evidence MultiSTAT, screening results for twenty drug classes (including new psychoactive substances) from a single blood sample, are obtained in less than 23 minutes.

This comparative study aimed to evaluate the applicability of this system to the multi-drug screening of blood samples from forensic and clinical cases.

Methodology

Simultaneous chemiluminescent immunoassays on the biochip surface were applied to the Evidence MultiSTAT analyser. This system processes a self-contained cartridge where all the components required for the immunoreactions are present. Blood samples from forensic and clinical cases, were screened following simple centrifugation and dilution (1:4). Each sample is tested against cut-off values and the results are qualitative. The screening results were compared to LC-MS/MS results and the percentage agreement was calculated.

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

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Results

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%

Conclusion

The data indicates applicability of BAT to the rapid simultaneous screening (<23 minutes) of multiple drugs in post-mortem blood samples on the Evidence MultiSTAT analyser. An overall favorable 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 platform will facilitate the drug testing in forensic toxicology.

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