RAPID SIMULTANEOUS SCREENING (LESS THAN 23 MINUTES) OF TWENTY DRUG CLASSES FROM A SINGLE WHOLE BLOOD SAMPLE ON THE BIOCHIP ANALYSER EVIDENCE MULTISTAT

RANDOX TOXICOLOGY

V. Anderson, D. Cahir, E. McKinstry, G. Norney, P. Robinson, J. Darragh, M.L. Rodríguez, R.I. McConnell, S.P. FitzGerald.
Randox Toxicology Ltd., Crumlin, United Kingdom
e-mail: scientific.publications@randox.com

Introduction

Drug testing has been used in a variety of disciplines e.g. emergency medicine and clinical toxicology, criminal; justice, and workplace. Biochip array technology (BAT) enables the multi-analytical screening of drugs from a single sample, which increases the screening capacity and facilitates the testing process.

By applying BAT to the fully automated Evidence MultiSTAT analyser, this study aimed to develop a simple (fully automated), rapid (<23 minutes) reliable (accurate and precise) simultaneous screening of 20 drug classes, including new psychoactive substances, from a single sample of blood.

Methodology

Simultaneous biochip based immunoassays were applied to the Evidence MultiSTAT, which processes a self-contained cartridge containing all the components required for the reactions. After simple centrifugation and dilution (1:4) the blood sample is ready to be added to the biochip. The blood sample is tested against a cut-off sample, the results are qualitative.

Repeatability (assessment of sample replicates at +50% and -50% of the cut-off), accuracy (assessment of 50 negative samples and 50 positive samples) and correlation of authentic sample results (n=113) with LC-MS/MS were determined. The results were presented as percentage agreement.

Simultaneous immunoassays and cut-offs:

Assay	Cut-off (ng/mL)
AB-CHMINACA	5
AB-PINACA	2
α-PVP	5
Amphetamine	50
Barbiturates	50
Benzodiazepines	20
Benzoylecgonine/cocaine	25
Buprenorphine	2
Cannabinoids	10
ETG	500
Fentanyl	1
Methadone	10
Methamphetamine	50
Opiate	80
Oxycodone	10
Phencyclidine	5
Pregabalin	1000
Tramadol	5
Tricyclic antidepressants	60
6-MAM	10

Repeatability

Assay	± 50% cut-off Agreement (%)		
	Batch 1	Batch 2	Batch 3
AB-CHMINACA	97.5	97.5	100
AB-PINACA	100	97.5	100
α-PVP	100	100	100
Amphetamine	100	100	100
Barbiturates	100	97.5	100
Benzodiazepines	97.5	100	100
Benzoylecgonine/cocaine	100	100	97.5
Buprenorphine	100	100	100
Cannabinoids	97.5	100	98.8
ETG	100	97.5	100
Fentanyl	97.5	100	100
Methadone	100	100	100
Methamphetamine	100	100	100
Opiate	100	100	100
Oxycodone	100	100	100
Phencyclidine	97.5	97.5	100
Pregabalin	100	100	100
Tramadol	100	100	100
Tricyclic antidepressants	97.5	100	100
6-MAM	100	100	100

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Accuracy

Assay	Agreement (%)		
	Batch 1	Batch 2	Batch 3
AB-CHMINACA	100	94	95
AB-PINACA	100	99	100
α-PVP	100	100	100
Amphetamine	100	100	100
Barbiturates	100	100	100
Benzodiazepines	100	98	100
Benzoylecgonine/cocaine	99	100	100
Buprenorphine	95	100	100
Cannabinoids	99	100	100
ETG	100	98	99
Fentanyl	100	100	100
Methadone	100	100	100
Methamphetamine	100	100	100
Opiate	100	97	100
Oxycodone	100	100	100
Phencyclidine	99	100	100
Pregabalin	100	100	100
Tramadol	100	100	100
Tricyclic antidepressants	100	100	100
6-MAM	99	100	100

18.087.12BRDFT, 18.022.023.15ORDFT

Authentic samples (n=113): agreement (%) biochip on Evidence MultiSTAT vs confirmatory method

Assay	Agreement (%)
AB-CHMINACA	99.1
AB-PINACA	97.3
Amphetamine	97.3
Barbiturates	95.6
Benzodiazepines	89.4
Benzoylecgonine/cocaine	99.1
Buprenorphine	92.9
Cannabinoids	98.2
Fentanyl	98.2
Methadone	99.1
Methamphetamine	98.2
Opiate	99.1
Oxycodone	94.7
Pregabalin	90.3
Tramadol	98.2
Tricyclic antidepressants	96.5
6-MAM	87.6

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Conclusion

The results show applicability of BAT on the Evidence MultiSTAT analyser to the simple, rapid (<23 minutes) and reliable simultaneous screening of 20 drug classes from a single blood sample.