EVALUATION OF A NEW APPLICATION OF BIOCHIP ARRAY TECHNOLOGY TO THE SIMULTANEOUS SCREENING OF DRUGS IN HAIR SAMPLES ON THE EVIDENCE INVESTIGATOR ANALYSER



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INTRODUCTION

Testing for drugs of abuse in hair involves a non-invasive collection and 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 amphetamine, benzodiazepines, benzoylecgonine/cocaine, cannabinoids, hydrocodone, ketamine, methamphetamine, opiates, oxymorphone and phencyclidine from a single hair sample.

METHODOLOGY

Extraction of the drugs from hair samples (50 mg): 1) washing with water and dichloromethane 2) centrifugation and addition of methanol and zircon pulverising beads 3) spinning and pulverisation, methanol was added 4) decantation and drying. The reconstituted sample was added to the biochip for screening. Simultaneous competitive chemiluminescent immunoassays, defining discrete test sites on the biochip surface, were employed. The immunoassays were applied to the biochip analyser Evidence Investigator, with this system 54 biochips can be handled at a time.



RESULTS

Assay	Biochip based immunoassays	SOHT ng/mg	EWDTS ng/mg
	Cut off ng/mg		
Amphetamine	0.04	0.2	0.2
Benzodiazepines	0.02	N/A	0.05
Benzoylecgonine/Cocaine	0.2	0.5	0.5
Cannabinoids – THC-COOH	0.001	0.0002	0.0002
Cannabinoids $-\Delta$ 9-THC	0.01	0.05	0.05
Hydrocodone	0.04	N/A	N/A
Ketamine	0.5	N/A	0.5
Methamphetamine	0.15	0.2	0.2
Opiates	0.04	0.2	0.2
Oxymorphone	0.1	N/A	N/A
Phencyclidine	0.02	N/A	N/A

Percentage agreement with LC-MS/MS (Authentic samples, n=43)			
	Agreement (%)		
Amphetamine	98		
Benzoylecgonine/Cocaine	98		
Cannabinoids	95		
Methamphetamine	86		
Opiates	95		

Inter-assay precision (n=15) (-50% cut-off, cut-off and +50% cut-off)		
	CV (%)	
All Assays	<18	

19.004, 005, 012.156RDFT

CONCLUSION

BAT allowed multi-drug detection from a single hair sample with lower cut-offs than SoHT or EWDTS guidelines for amphetamine, benzodiazepines, bezoylecgonine/cocaine, Δ 9-THC, methamphetamine and opiates, reflecting high sensitivity. Authentic hair samples assessment using this methodology, showed favourable agreement with LC-MS/MS. This biochip based application represents a useful multi-drug screening tool as it allows not only the detection of multiple drugs from a single hair sample with a single platform (Evidence Investigator), but multiple samples can be assessed at a time (up to 54 biochips can be handled at the same time).