Forensic drug profiling: a tool for intelligence-led policing

by

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Certificate of authorship and originality

I certify that the work in this thesis has not previously been submitted for a degree nor has it been submitted as part of the requirements for a degree except as fully acknowledged within the text.

I also certify that the thesis has been written by me. Any help that I have received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all the information sources and literature used are indicated in the thesis.

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Abbreviations

ACC	Australian Crime Commission
ACT	Australian Capital Territory
AFDL	Australian Forensic Drug Laboratory
AFP	Australian Federal Police
AGD	Attorney-General's Department
AIDDC	Australian Illicit Drug Data Centre
AIDIP	Australian Illicit Drug Intelligence Program
Al/Hg	Aluminium amalgam
APAAN	Alpha-phenylacetoacetonitrile
ATM	Automated teller machine
ATS	Amphetamine-type substances
AUC	Area under the curve
BIDFCAA	Building Illicit Drug Forensic Capacity Across Australia
BMK	Benzyl methyl ketone
2C-B	4-Bromo-2,5-dimethoxyphenethylamine
CE-DAD	Capillary electrophoresis-diode array detector
CHAMP	Collaborative harmonisation of methods for profiling of amphetamine type stimulants
CISC	Criminal Intelligence Service Canada
CMP	1-(1',4'-Cyclohexadienyl)-2-methylaminopropane
CNS	Central nervous system
DDU	Discrete dosage unit
DET	Detection error trade-off
EA	Elemental analysis
EER	Equivalent error rate
ENIPID	Enhanced National Intelligence Picture on Illicit Drugs
FN	False negative
FP	False positive
GBL	Gamma butyrolactone

GC-FID	Gas chromatography-flame ionisation detector
GC-MS	Gas chromatography-mass spectrometry
GIS	Geographical information system
HCl	Hydrochloric acid
ICP-AES	Inductively coupled plasma-atomic emission spectroscopy
ICP-MS	Inductively coupled plasma-mass spectrometry
IDDR	Illicit Drug Data Report
IRMS	Isotopic ratio mass spectrometry
IT	Information technology
LC-ELSD	Liquid chromatography-evaporative light scattering detector
LC-FLD	Liquid chromatography-fluorescence detector
LC-MS/MS	Liquid chromatography-tandem mass spectrometry
LIMS	Laboratory information management system
LOD	Limit of detection
LR	Likelihood ratio
LRN	Laboratory reference number
MA	Methylamphetamine
MBDB	Methylbenzodioxolylbutanamine
MDA	3,4-Methylenedioxyamphetamine
MDMA	3,4-Methylenedioxymethylamphetamine
MDB	N-methyl-3,4-(methylenedioxy)benzylamine
MD-benzyl-MDMA	N-(3,4-methylenedioxyphenylmethyl)-N-[2-(3,4-methylenedioxyphenyl)]-methylethyl]-N-methylamine
MD-DPIA	di-[1-(3,4-methylenedioxyphenyl)-2-propyl]amine
MD-DPIMA	di-[1-(3,4-methylenedioxyphenyl)-2-propyl]methylamine
MDEA	3,4-Methylenedioxyethylamphetamine
3,4-MD-P2P	3,4-Methylenedioxyphenyl-2-propane
MD-P2P-OH	3,4 –Methylenedioxyphenyl-2-propanol
MD-P3B	3-(3,4-Methylenedioxyphenyl)-3-buten-2-one
$NaBH_4$	Sodium borohydride
$NaBH_3CN$	Sodium cyanoborohydride

N-acetyl-MDA	N-acetyl-3,4-methylenedioxyamphetamine
N-acetyl-MDMA	N-acetyl-3,4-methylenedioxymethylamphetamine
NDPRAC	National Drug Precursor Risk Assessment Capability
N-formyl-MDA	N-formyl-3,4-methylenedioxyamphetamine
N-formyl-MDMA	N-formyl-3,4-methylenedioxymethylamphetamine
NGO	Non-governmental organisation
NIFS	National Institute of Forensic Science
NIM	National Intelligence Model
NMI	National Measurement Institute
NPS	New psychoactive substances
NSW	New South Wales
OTC	Over the counter
PCA	Principal component analysis
PMMA	Para-methoxymethylamphetamine
PMK	Piperonyl methyl ketone
P2P	1-Phenyl-2-propanone
PROMIS	Police Realtime online management information system
PtO	Platinum oxide
ROC	Receiver operating characteristics
STP/DOM	2,5-Dimethoxy-4-methylamphetamine
TN	True negative
TP	True positive
TT	Tablet type
UK	United Kingdom
UNIDCP	United Nations International Drug Control Programme
UNODC	United Nations Office on Drugs and Crime
WA	Western Australia

Publications

M. Morelato, A. Beavis, M. Tahtouh, O. Ribaux, P. Kirkbride, C. Roux, *The use of forensic case data in intelligence-led policing: The example of drug profiling*, Forensic Science International 226 (2013) 1-9. **(Chapter 1)** [1].

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M. Morelato, A. Beavis, M. Tahtouh, O. Ribaux, P. Kirkbride, C. Roux, *The use of methylamphetamine chemical profiling in an intelligence perspective and the problem of homogeneity*, Forensic Science International 246 (2015) 55-64 **(Chapter 4)** [3].

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Abstract

Forensic science is mainly focused on generating evidence for judicial proceedings. However, it has been recognised that a significant gap exists between the potential of forensic science and its actual use. The current situation still tends to restrain forensic scientists within their specialisation, reinforcing the concept of centralised laboratories distant from and with no direct connections to police organisations. A change of perspective is required in order to fully utilise the potential of forensic science at the earliest stages of the forensic process. This change is slowly happening but is still in its infancy. Vast information about the criminal environment and criminal activity exists and could potentially be used as a key element in an intelligence perspective.

This research focuses on the potential of forensic traces in an intelligence perspective. The study starts with a specific focus on the use of 3,4-methylenedioxymethylamphetamine (MDMA) and methylamphetamine (MA) profiles in an intelligence-led perspective. Using Australian Federal Police (AFP) case data, it was demonstrated that chemical profiling of illicit drugs can be used to go beyond simply refuting or confirming a connection between cases. It was shown that the use of only one profiling technique was adequate to obtain more timely intelligence products that could be used in an operational intelligence perspective. The process developed can be extended to other traces and further general developments are required to address persistent challenges to ensure the progress of the discipline as well as its widespread implementation in the future. A collaboration and comparative analysis was thus undertaken between two forensic intelligence approaches developed independently in Australia and in Europe regarding the monitoring of apparently very different kind of problems: illicit drugs and false identity documents. A general and multi-commodity model was proposed and it is believed that this model could guide the use of any forensic case data in an intelligence-led perspective.