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## Special issue on illicit drugs

## Catha Edulis (Khat) Drug facilitated assault BZP 3-TFMPPGHB Synthetic aminopropiophenones 5-ethoxylated N,N-dialkylated tryptamines Sachromatography mass spectrometry Smuggling Spice Cocaine Proton magnetic resonance spectroscopy MDAI Harm reduction Nuclear magnetic resonance spectroscopy Non-invasive detection (S)-cathinone GRI.

The agony and the ecstasy associated with the area of illicit drugs is a matter of constant interest today. Prevalence of use, availability of reference standards, and novel detection methods provide many challenging and exciting opportunities, particularly when dealing with increasing levels of novelty and complexity within a globalized world. This special issue aims to present a snapshot of a variety of techniques and topics ranging from 'classic' drugs, such as cocaine to internet drugs and new psychoactive substances.

In the introductory Spotlight article James Kerwin skilfully entwines a scientific and social history of recreational drugs with particular emphasis on tetrahydrocannabinol and cannabinoid analogues. <sup>[1]</sup> The capability for non-destructive analysis of drugs has been in demand for a long time and one such technique frequently employed is Raman spectroscopy. In this issue West and Went <sup>[2]</sup> review developments reported over the past 15 years and emphasize that a variety of applications and opportunities are particularly relevant for the forensic science. Examples include the detection of bulk street drugs and also drugs detected on fibres, fingerprints, banknotes and in bodyfluids.

Closely related is the ability to rapidly detect smuggled illegal drugs hidden in a variety of containers. This presents an attractive goal, particularly within an airport or port environment. To this end, Burnett *et al.*<sup>[3]</sup> evaluate the use of Raman spectroscopy for the non-invasive detection of cocaine hydrochloride concealed in a variety of dark and white rum products and bottles. The implementation of lasers operating at 785 nm and 1064 nm allowed for the detection of cocaine present in coloured ethanolic solutions as well as different-coloured glass and plastic packaging. In most cases, the important bands remained visible in a 6% *w/v* solution.

Another exciting application for the non-invasive approach is presented by Gambarota *et al.*<sup>[4]</sup> who determine that it is possible to employ proton magnetic resonance spectroscopy for the detection of cocaine in wine bottles. The use of a 3 Tesla

scanner, a standard clinical set-up, enabled the researchers to determine the presence of the drug down to the 5 mM level.

The mild stimulant properties of *Catha edulis* (Khat) have led to increased consumption of this natural product. A minireview provided by Aleryani *et al.*<sup>[5]</sup> offers insights into the potential interactions observed between Khat consumption and the consequent generation oxygen-derived free radicals and their contribution to oxidative stress. Further research will hopefully shed more light on the impact on mental health.

While (S)-cathinone is a naturally occurring key constituent of Khat, structurally modified derivatives are of increasing importance. A number of these synthetic aminopropiophenones have attracted widespread attention recently in the form of socalled 'legal highs' although this term has become a misnomer in cases where these derivatives became controlled substances. Karila and Reynaud<sup>[6]</sup> survey the literature available on synthetic cathinones for the period 1975-2010, provide an overview of clinical effects and highlight the need for the implementation of appropriate harm reduction strategies. Other psychoactive compounds, accessible online, include  $\gamma$ -hydroxy butyrate (GHB),  $\gamma$ -butyrolactone (GBL) and 1,4-butanediol (BD) and Karila and Reynaud review a range of clinically relevant data associated with the properties of these drugs. Andresen et al.[7] present additional information related to GHB reviewing important key issues on pharmacodynamics, analytical determination, prevalence of abuse, and forensic matters.

Also in the cathinione field, Brandt *et al.*<sup>[8]</sup> have identified a total of five synthetic cathinones present in three internet products. Confirmation was obtained by laboratory synthesis and analysis by gas chromatography mass spectrometry (GC-MS) and nuclear magnetic resonance (NMR) spectroscopy. The preparation of brominated precursors carrying the 3,4-methylenedioxyphenyl-nucleus revealed extensive  $\alpha,\alpha$ -dibromination which should be of interest for further profiling studies.

More samples claiming to contain a variety of drugs obtained from Internet retailers were characterized by Baron et al.<sup>[9]</sup> who report that six out of seven products showed misleading labels. Attenuated total reflectance Fourier-transform infrared spectroscopy and GC-MS revealed the presence of 1-(3-(trifluoromethyl)phenyl)piperazine (3-TFMPP), caffeine, 1-benzylpiperazine (BZP) and 5,6-methylenedioxy-2-aminoindane (MDAI). Consumption of BZP and 3-TFMPP, and combinations thereof, has been observed since the 1990s, and a mini-review is provided by Lin et al.<sup>[10]</sup> who present an overview on the subjective effects in humans based on the implementation of commonly used rating scales.

Also in this issue, Lawrence Carter presents a mini-review on the topic of drug-facilitated sexual assault (DFSA).<sup>[11]</sup> Data were taken from a number of literature sources, data-reporting services, and databases. This insightful reflection covers a range of drugs and reminds the reader to be mindful about the complicating factors involved in DFSA.

A key constituent of the so-called 'magic mushroom' is psilocybin, an *N*,*N*-dimethylated tryptamine with powerful psychoactive properties. It serves as the pro-drug for psilocin following desphosphorylation. Shoda *et al.* present an enzyme-assisted preparation of psilocin glucuronide followed by preparative high performance liquid chromatography, determination of exact masses and 1D/2D NMR analysis.<sup>[12]</sup>

The structural modification of naturally occurring tryptamines, such as psilocybin, opens the door to a plethora of bioactive drugs which have drawn attention from medicinal, forensic, and clinical communities. Tearavarich *et al.* present a microwave-accelerated synthesis and analytical characterization of 12 previously unreported 5-ethoxylated *N,N*-dialkylated tryptamines which also extend to their deuterated counterparts.<sup>[13]</sup>

The Special Issue closes with exciting research presented by Möller *et al.*<sup>[16]</sup> who have developed and validated a screening method for the detection of major phase I and phase II metabolites of JWH-18, a synthetic cannabimimetic, often found in herbal 'Spice' smoking mixtures. High resolution mass spectrometry was successfully employed and led the authors to recommend that an emphasis can be placed on hydroxylated metabolites rather than the parent molecule.

To round of this special issue 2 articles on drug surveillance systems are offered. A review of the Drug Information and Monitoring System (DIMS) implemented in the unique drug policy setting of the Netherlands is supplied by Brunt *et al.* offering a discussion of alternate monitoring systems, drug trends and the function of the system to inform policy, prevention and harm reduction<sup>[15]</sup>. A second article by Dunn *et al.* from the Australian perspective, highlights the strengths and weaknesses of such systems when applied to an ever evolving market where new drug classes emerge rapidly<sup>[16]</sup>.

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