A137 Characterization of Legal Highs

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The goal of this presentation is to demonstrate the characterization of five legal highs that have either been encountered in Singapore or have already surfaced in other countries.

This presentation will impact the forensic science community by establishing the usage of structure elucidation techniques which will enhance the forensic laboratory's ability and confidence in the identification of legal highs.

New synthetic drugs such as the cathinones (e.g., methylone, butylone MDPV) and cannabinoids (e.g., JWH-018, HU-210, CP 47,497) are making their headways into many countries. These synthetic drugs are often termed as legal highs as they are analogues of existing banned drugs of abuse, bearing similar chemical structures and psychoactive properties as their illegal counterparts. These products are often marketed using labels such as "bath salts," "incense," and "botanical specimens." These seemingly licit product names are used as a ploy to deceive the legal forces from their true recreational use. Consequentially, legal highs have become increasingly popular as legal alternatives to illicit psychoactive substances for the drug abusers. This in turn, brings about a high demand for legal high which is further facilitated by their widespread and easy availability on the internet. Labels on the packaging of legal highs sold over the internet are often unreliable indicators of its actual contents. Consumers may be led to believe that the products are legal which makes internet sales of legal highs highly lucrative.

The accessibility of legal highs for recreational usage and the constant emergence of new legal highs have posed challenges to forensic laboratories around the world in their testing and identification. Due to the novelty of these drugs, reference materials of such legal highs are often not available. Literature reports containing detailed analytical data of such drugs are often limited and, in most cases, unavailable as well. These have made their identification extremely challenging. Hence, there is a need for forensic laboratories to constantly identify alternative techniques and develop capabilities to fully characterise these new legal highs.

The objective of this paper is thus to demonstrate the characterization of five legal highs that have either been encountered in Singapore or have already surfaced in other countries. These five include methiopropamine, methoxetamine, and three synthetic cannabinoids. Methiopropamine is a thiophene-based structural analogue to methamphetamine. It possesses similar chemical structure except for the replacement of the heterocyclic moiety for a phenyl group. Another legal high encountered, methoxetamine, is an analogue of ketamine. Being structurally similar, these legal highs are believed to be able to exhibit similar psychoactive properties as their illicit counterparts. As methiopropamine and methoxetamine are both very new to the drug market, very little information on these two drugs is available.

Synthetic cannabinoids, or "Spice," are examples of legal highs marketed as herbal products. They are easily available over the internet and their popularity as ''legal drugs'' have rapidly increased due to their reputation of being potent herbal intoxicants and also as ''legal'' alternatives to the strictly regulated cannabis.

In this paper, several techniques were used in the characterization of these five drugs. Accurate mass analysis was performed using the orbitrap and time-of-flight mass spectrometry while gas chromatography/mass spectrometry (GC/MS), Fourier transform infrared spectrometry (FTIR), and nuclear magnetic resonance spectroscopy (NMR) were employed in structural eludication. The analytical data and the interpretation of the results obtained will be presented in this paper. The establishment of the usage of such techniques will enhance the forensic laboratory's ability and confidence in the identification of these legal highs.

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