



D36 Characterization of Legal Highs and Their Pyrolysis Products

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After attending this presentation, attendees will become familiar with methiopropamine (3-MPA) and 6-(2-aminopropyl)benzofuran (6-APB), two of the latest legal highs that are being sold legally, both online and in head shops across the country. The contents of these drugs have been verified; therefore, this presentation will focus on the by-products formed when MPA and 6-APB are smoked. Attendees will learn about the process of pyrolysis and the importance of identifying the pyrolysis products of legal highs.

This presentation will impact the forensic science community by informing attendees how law enforcement and health professionals are grappling with the hazards presented by the current proliferation of legal highs. Never intended as pharmaceuticals, the pharmacology of these drugs are unknown. Therefore, treatment for patients who have taken these drugs is limited to symptomatic care. This project focuses on the next level of harm, the pyrolysis products formed when the legal highs are consumed by insufflation. This information can be used not only to aid in identifying drugs in a laboratory setting and help them to become scheduled, but may also help to save lives.

Legal highs are any mind-altering substance produced and sold in a manner to avoid the legal consequences of illicit substances. They have been advertised and sold as Spice, Bath Salts, plant food, and research chemicals. They are often analogs or derivatives of classical drugs of abuse such as cathinones and amphetamines, but do not fall under the Federal Analog Act as they are marketed "not for human consumption."

The harmful substances are not limited to the primary components within the drugs, but can include potentially toxic by-products that result when the drugs are smoked. Heroin, cocaine, and methamphetamine are all known to produce toxic by-products as a result of pyrolysis.

As part of an ongoing research project, legal highs have been purchased from local head shop's Internet web sites. Some of the substances identified include methiopropamine, 6-(2-aminopropyl)benzofuran (6-APB), 5-(2-aminopropyl)benzofuran (5-APB), and UR-144 (1-Pentylindol-3-yl)-(2,2,3,3-tetramethylcyclopropyl)methanone). The objective of this project is to identify the pyrolysis products from these legal highs which may play a significant role in the pharmacological and toxicological effects of these drugs.

The powder is loaded onto an aluminum foil boat and placed in a 25ml Erlenmeyer flask. The bottom of the flask is heated with a disposable cigarette lighter until the sample is black and no more fumes are visible. The aluminum boat is removed and the residues remaining in the flask are dissolved in methylene chloride. The residues are analyzed by gas chromatography and mass spectroscopy.

The pyrolysis products of methiopropamine and 6- and 5-APB have both been analyzed. Four pyrolysis products were presumptively identified from the pyrolysis of methiopropamine. Those products include the methylation and demethylation of the nitrogen atom. Both of these products are consistent with the pyrolysis of methamphetamine, an analog of methiopropamine. Ethylation of the nitrogen atom also occurred, which may indicate the use of ethanol during the synthesis process.

The pyrolysis of APB was more complex, producing nine pyrolysis products. Of those, six have been tentatively identified. Four of those products are consistent with the pyrolysis of methamphetamine: oxidation of the carbon chain and formation of a double bond followed by removal of the nitrogen group. The other two products are consistent with the pyrolysis of the benzofuran ring: addition of a methyl group to the ring followed by a combination reaction of two APB molecules.

Methiopropamine (MPA), 6-APB, Pyrolysis