



K7 The Identification of the Pyrolytic Products of Two Drugs of Abuse: Heroin and Fentanyl

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After attending this presentation, attendees will: (1) better understand the developed procedure for identifying pyrolytic products; (2) be aware of new analytes for heroin and fentanyl to be used in analysis; and, (3) have an insight into the possibility of exploration into the toxicity of pyrolytic products.

This presentation will impact the forensic science community by providing additional target analytes of heroin and fentanyl while providing insight into possible additional origins of toxicity.

Overdoses due to heroin and fentanyl have increased in recent years. Heroin is an opioid pain killer commonly abused for its euphoric effects. Side effects of heroin include difficulty breathing, nausea, vomiting, and decreased heart rate. Fentanyl is also an opioid used to treat severe pain, typically after surgery or during chemotherapy. Heroin is approximately ten times as potent as morphine while fentanyl is approximately ten times as potent as heroin. As a result, fentanyl overdoses can occur at much smaller doses than with heroin. Recently, cases have been reported in which heroin has been cut with fentanyl. This poses danger to both experienced and naïve users as they are unaware of this combination. Susceptibility to overdose is increased as they ingest a nonlethal dosage of heroin, but are unknowingly ingesting a lethal dose of fentanyl.

There are several modes of ingestion in which people abuse these drugs, but when inhaled, increased risk to the users may arise. Smoking delivers the drug directly into circulation without first-pass metabolism, which increases the risk of sudden death. In addition, the smoking process itself could produce acutely toxic products that have yet to be identified as the parent compounds thermally degrade into pyrolytic products that often differ from the metabolites. The toxicity of these unique pyrolytic products is not well understood. Accordingly, the goal of this project was to characterize the pyrolytic products of heroin and fentanyl, compare to literature findings, and determine if there are any unique products that are formed in the presence of both compounds.

A previously developed procedure was utilized to pyrolyze heroin and fentanyl individually and combined. Samples were collected using a methanolic extraction from the residue and glassware. Samples were evaporated over nitrogen gas, reconstituted in methanol, and analyzed using gas chromatography/mass spectrometry. The identification of observed products was confirmed with reference standards where available, and any remaining products were tentatively identified via a NIST library search. To date, the following compounds have been confirmed as pyrolytic products of fentanyl: N-phenyl-propanamide, 4-(2-phenylethyl)-pyridine, and quinolone. As for heroin, the confirmed products are as follows: morphine, morphine-3-acetate, 6-monoacetylmorphine, 1-naphthalenol, and quinolone. Pyrolysis of the mixture produced a combination of these products, but no unique compounds were observed. Some of the products are also metabolites which could have important implications for estimation of doses from metabolic products.

Those who view this poster will be able to understand the developed procedure for identifying pyrolytic products, learn of new markers of heroin and fentanyl use to include in analytical procedures, and have an insight into the possibility of exploration into the toxicity of pyrolytic products.

Pyrolysis, Heroin, Fentanyl

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