B202 The Differentiation and Identification of Fentanyl Analogs Using Gas Chromatography Interfaced With an Infrared Detector (GC/IRD)

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Learning Overview: The goals of this presentation are for attendees to : (1) obtain a better understanding of the analytical challenges associated with fentanyl-related substances; and (2) obtain knowledge and understanding of how to apply GC/IRD methodologies for the separation and identification of fentanyl-related substances.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by explaining how GC/IRD methodologies can be optimized to rapidly detect and identify structurally similar fentanyl-related substances in complex mixtures when conventional analytical techniques yield limited information.

The United States declared a national public health emergency in October of 2017 in response to the Opioids Crisis. Since 2014, there has been a significant increase of drug-related deaths attributed to the abuse of opioids, with more than 60,000 deaths in 2017. Fentanyl and related substances are among the opioids having the most impact on drug overdose deaths. Following the trend of fentanyl-related overdoses, there has been a dramatic increase of fentanyl-related, seized drugs being submitted and analyzed in crime laboratories. The structure of these drugs continues to be manipulated to generate new structurally similar substances challenging the rapid detection, identification, and reporting of these novel fentanyl substances, which is vital to the assessment and understanding of the illicit drug markets in specific locations.

Forensic scientists routinely utilize Electron Impact/Gas Chromatography/Mass-Spectrometry (EI/GC/MS) for the separation and identification of substances in drug samples; however, the use of GC/MS for the analysis of fentanyl samples comes with analytical challenges and limitations. Fentanyl analogs and their positional isomers have similar chemical structural configurations, making them difficult to detect and identify. GC/IRD is a useful and powerful tool in separating and identifying many of these compounds, for which traditional analytical techniques offer limited differentiations between them. In this study, it has been shown that similar fentanyl analogs (2- and 3- furanylfentanyl, 2-furanylbenzylfentanyl, crotonylfentanyl, cyclopropylfentanyl, methoxyacetylfentanyl, meta-fluoroisobutyryl fentanyl, and ortho-fluoroisobutyryl fentanyl) can be detected and identified using GC/IRD and optimization of GC/IRD parameters can enhance the resolution and detection of these substances. In particular, the effects of light pipe temperatures, resolution, and programmed temperature vaporizing have been studied.

GC/IRD, Fentanyl, Analogs

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