B186 On-Scene Detection of Low-Dose Fentanyl Tablets

Pauline E. Leary, PhD, Federal Resources, Stanfordville, NY 12581; Sarah M. Davis, BS, University of New Haven, West Haven, CT 6516; M. Isabel Sanchez-Melo, MS, West Haven, CT 06516; Leah Rynearson, BS, University of New Haven, West Haven, CT 06516; Lauren Vallee, BS, Bristol, CT 06010; Emily Langlois, Quinebaug, CT 06262; Zachary Lawton, MS, PerkinElmer, Inc, Shelton, CT 06484-4794; Koby Kizzire, PhD, University of New Haven, West Haven, CT 06516; Brooke W. Kammrath, PhD, University of New Haven, West Haven, CT 06516*

Learning Overview: After attending this presentation, attendees will understand the capabilities and limitations of field detection and identification of fentanyl in low-dose tablets using commercially available portable instruments.

Impact on the Forensic Science Community: This presentation will impact the forensic science and law enforcement community by establishing the best methods for field detection and identification of fentanyl in low-dosage forms.

Concerns about the illegal trafficking of fentanyl into the United States have largely been centered on its addition, in relatively pure powder form, to heroin and other illicit street drugs. These street drugs are dangerous to the end user, emergency responders, and the public at large. Due to the high potency of fentanyl (100 times that of morphine), a new trend is emerging in the illicit drug trade with the manufacture, smuggling, and distribution of relatively low concentrations of fentanyl dosage forms, including low-dose fentanyl tablets. The United States Drug Enforcement Administration (DEA) started a Fentanyl Signature Profiling Program (FSPP), analyzing samples from fentanyl seizures to help identify the international and domestic trafficking networks responsible for many of the drugs fueling the opioid crisis. In 2017, the FSPP analyzed 520 fentanyl powder samples from seizures totaling 960kg of fentanyl. While the average purity was 5%, the DEA has indicated that fentanyl shipped directly from China often has purity levels above 90%, while fentanyl trafficked over the Southwest border from Mexico often has purity levels below 10%. For low-dose fentanyl tablets, the concentration has been estimated to be closer to 1%. These low-dose fentanyl tablets can pose a significant analytical challenge for the on-scene detection and identification of the fentanyl by law enforcement due to interference by other components of the tablet with the fentanyl chemical signature. In some instances, particularly with Infrared (IR) and Raman analytical methods, the spectral features of fentanyl become hidden behind the spectral features of the tablet's other components. This effectively masks the fentanyl signature and prevents the identification of the fentanyl when spectra are compared against library databases. In other cases, as with ion mobility spectrometry and high-pressure mass spectrometry, the fentanyl signature may be suppressed by the presence of the other components of the tablet. Additionally, there have been instances where the low concentration of fentanyl-doped tablets has been assumed to be lower than portable instruments routinely deployed to field users are capable of detecting. To date, there has not been research that compared the detection capabilities for fentanyl when this substance is dispersed in typical pharmaceutical matrices across portable-instrument platforms.

This research analyzed fentanyl-doped acetaminophen samples using various commercially available portable instruments including IR spectrometers, Raman spectrometers, Surface-Enhanced Raman Spectrometers (SERS), mass spectrometers, gas chromatography/mass spectrometers, ion mobility spectrometers, and field-based color tests. Each technique's utility for the detection and identification of fentanyl was compared, with a focus on determining limits of detection when the fentanyl is dispersed at low concentrations within complex matrices. It was concluded that neither field-based color tests nor portable vibrational spectrometers have the limit of detection capabilities to positively identify fentanyl in these low-dose tablets. Analysis using SERS lowered detection limits. Additionally, ion mobility and mass spectrometers (with and without gas chromatography) were able to detect and identify fentanyl at concentrations less than those routinely found in the low-dose tablets (1%); however, each of these portable instrumental technologies have their own challenges that must be considered when completing this analysis.

Fentanyl, Field Detection, Low-Dose Tablets

*Presenting Author