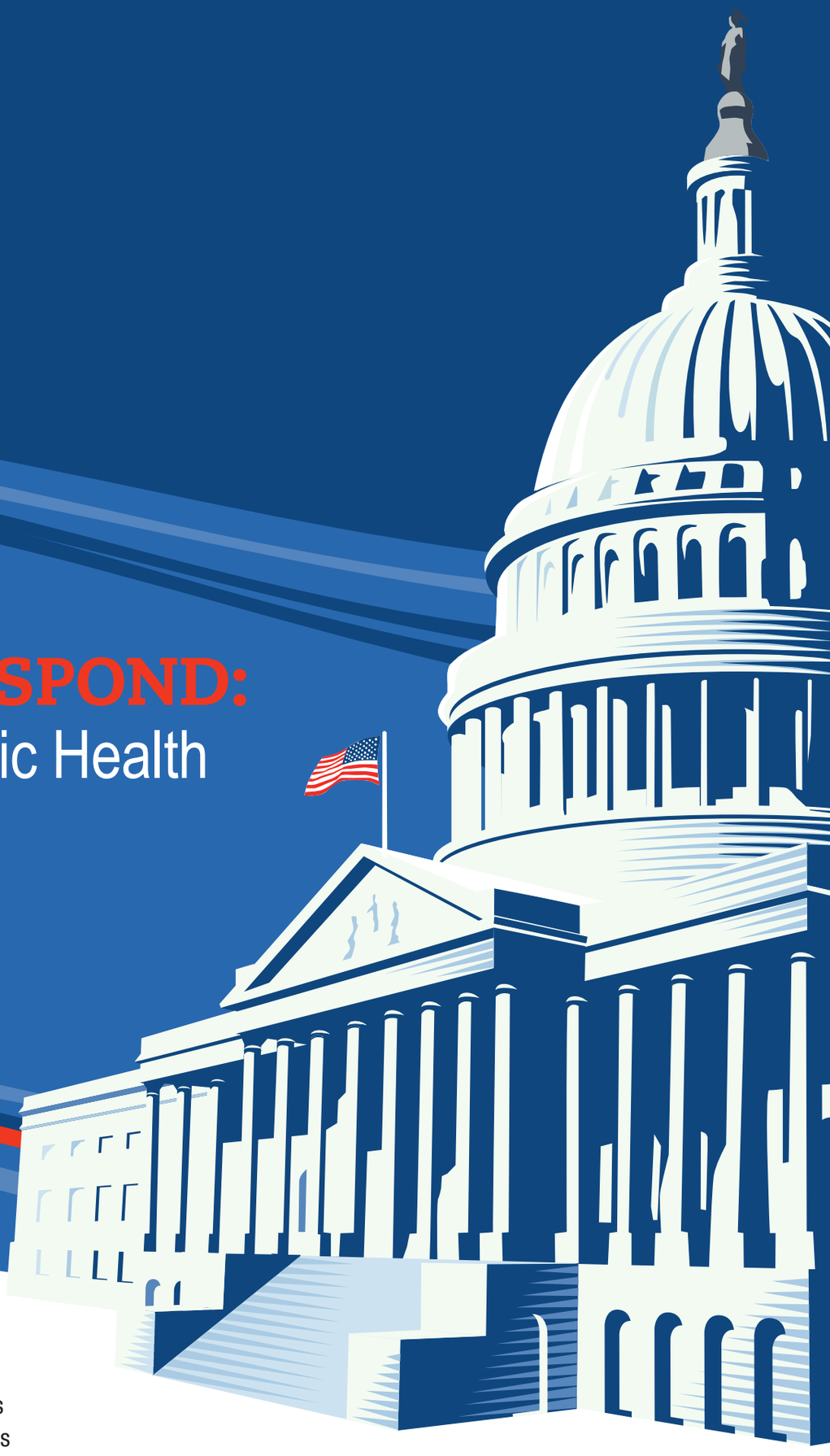
LAB MATTERS

analysis|answers|action

Winter 2017 Issue 1



RACING TO RESPOND:
The Case for a Public Health Emergency Fund

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ASSOCIATION OF PUBLIC HEALTH LABORATORIES

Lead Chemist Brandon Jones performs analysis of an unknown drug material at DC DFS PHL

Washington, DC Expands Testing for Synthetic Opioids

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The sale and distribution of illegal, controlled dangerous substances (CDS) is nothing new—heroin, cocaine and other CDS have long plagued society. What is new, however, is the alarming trend of emerging synthetic drugs. Inexpensive, easy to synthesize and available from chemical markets outside of the US, synthetic drugs represent an evolving threat to public health. For Washington, DC, the Office of the Chief Medical Examiner reported in May 2016 that over the 2014 to 2016 period, while overall opioid overdoses have slightly declined (120 to 117 per year), the number of synthetic opioid overdoses has significantly increased (e.g., from 11 to 24 for fentanyl).

> **"As emerging synthetic drugs appear on the streets, DC DFS PHL intends to update the database and methods to ensure coverage of new substances."**

Synthetic drugs are often too new to be classified as illegal, as well as too new to be picked up on health screens from patients after a suspected overdose. A public health need at the local level exists for a group that sits in both communities, first addressing the identification and classification of new drugs, and subsequently funneling this information to other state and federal partners.

In Washington, DC, successful prosecution of new synthetic drugs along with effective current toxicological screens in 2016 led the Washington, DC Department of Forensic Science (DC DFS) Public Health Laboratory Division (PHL) to create the Forensic Chemistry Unit (FCU) to develop new drug detection techniques and work closely with the laboratory to implement new testing methods for clinical specimens. FCU was formed within the DC DFS Biomonitoring and Analytical Chemistry Unit (BACU), which partners with the US Centers for Disease Control and Prevention (CDC) as a Laboratory Response Network-Chemical (LRN-C) Level 2 Laboratory. As a member of LRN-C, BACU is partially funded by CDC's Public Health Emergency Preparedness (PHEP) Cooperative Agreement. By having the established chemical emergency response capacity from LRN-C, DC DFS was able to leverage the knowledge base and personnel of BACU to establish and provide scientific support to the new FCU.

Support of New Drug Classification

FCU has worked with the Washington, DC Office of the Attorney General (OAG) to create the "Synthetics Abatement and Full Enforcement Drug Control Emergency Amendment Act of 2015" ("SAFE DC Emergency Act"), enacted into law on April 5, 2016. Prior to this bill, the DC Uniform Controlled Substances Act of 1981 listed specific chemicals as controlled substances, not classes of chemicals, leaving a window for new synthetic drugs to avoid classification under the law. SAFE DC responds to this by grouping two categories of synthetic drugs, synthetic cannabimimetic agents and synthetic cathinones, thereby providing a basis to classify the emerging synthetic drugs as controlled substances under DC Law.

Analytical Testing Example – Fentanyl, A Synthetic Opioid

Using an acetonitrile extraction and centrifugation filtration method developed at FCU, synthetic cannabimimetic agents have a consistent limit of detection (LOD) in the low micrograms per milliliter of organic extract. Acetonitrile was found to also effectively extract synthetic opioids from matrix and identify both synthetic opioid and other controlled dangerous substances (CDS) present. Analysis of fentanyl (see Figure 1) was consistent to values reported by the Scientific Working Group for the Analysis of Seized Drugs (SWGDRUG).

During the gas chromatography mass spectrometry (GC-MS) performance specification evaluation of fentanyl using the FCU CDS method, a matrix-matched LOD (2σ at 25µg/mL) was found to be 4.3µg/mL, almost two orders of magnitude lower concentration than reference test standards (Cayman

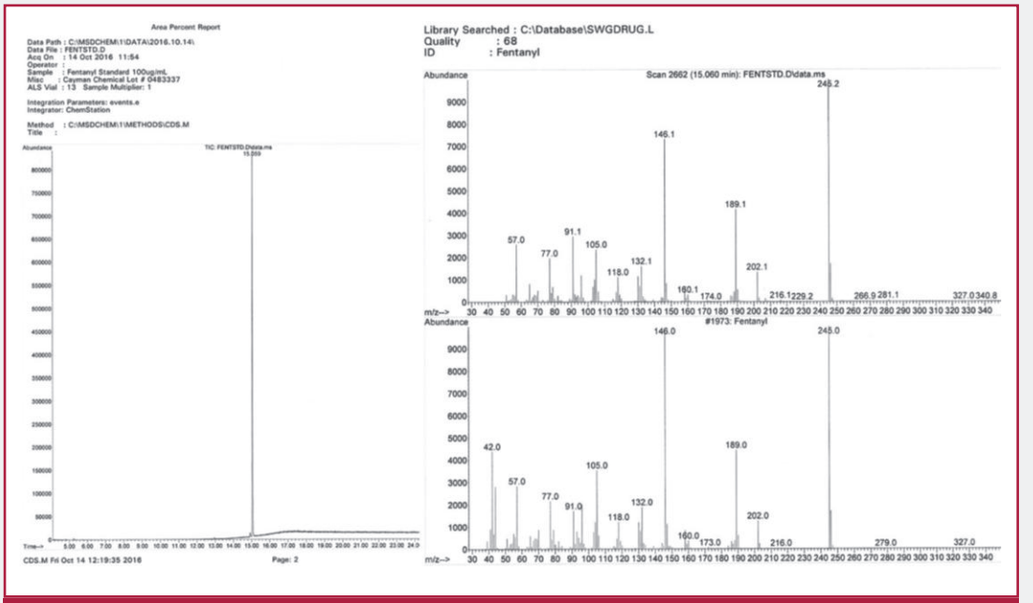

Figure 1: GC-MS analysis with HP-5ms column (Agilent) of 100µg/mL Fentanyl (in acetonitrile, Lot 483337, Cayman Chemical)

Chemical No. ISO60197). The GC performance specification yielded a retention time on a HP-5ms column of ca. 15.05min, with a precision (as CV) of 0.1%. Thus, both the GC-MS sensitivity and GC specificity are excellent for detection of fentanyl in test samples.

Finally, a characteristic Fourier transform infrared spectroscopy (FT-IR) profile was determined from the deposited fentanyl hydrochloride salt using a benchtop FT-IR system (see Figure 2). An example that illustrates the detection of synthetic opioids was a suspected CDS white powder found within a rolled-up bill. The material quantity was minute; however, even small amounts of the drug are still highly toxic. Donned in full PPE, including gloves, lab coat and an N95 mask, the material was removed, diluted in acetonitrile, centrifuged and filtered (see Figure 3).

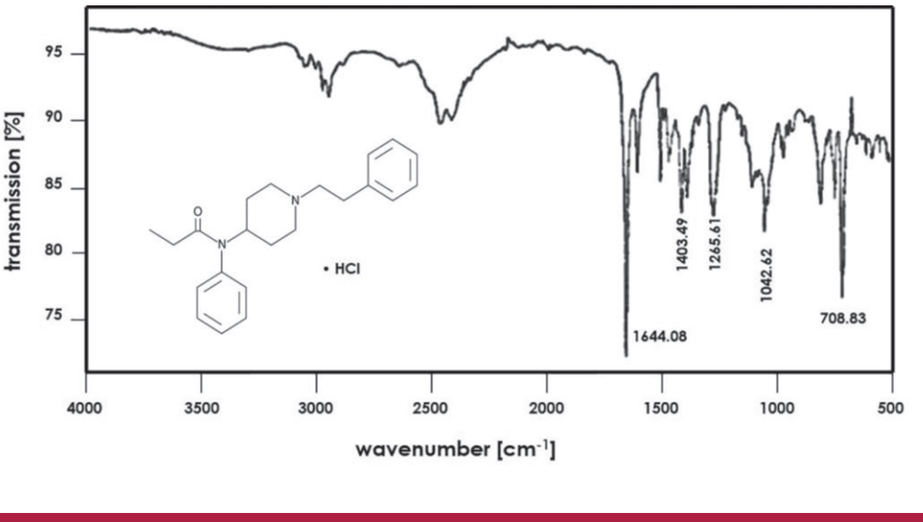

Figure 2: FT-IR analysis of deposited 500µL of 100µg/mL Fentanyl-HCl, after evaporation (Spectrum II, Perkin Elmer)

Going Forward

As emerging synthetic drugs appear on the streets, DC DFS PHL intends to update the database and methods to ensure coverage of new substances. Working with the OAG, new legislation will continue to evolve to address new synthetic drugs in a consistent and systematic way, as seen with the SAFE DC Bill of 2015. Future research will be to study correlations of toxicological reports with drugs identified at the scene or within the area, providing valuable feedback to evaluate the effectiveness of drug screens and provide advance notice to local toxicologists of emerging drugs of abuse.

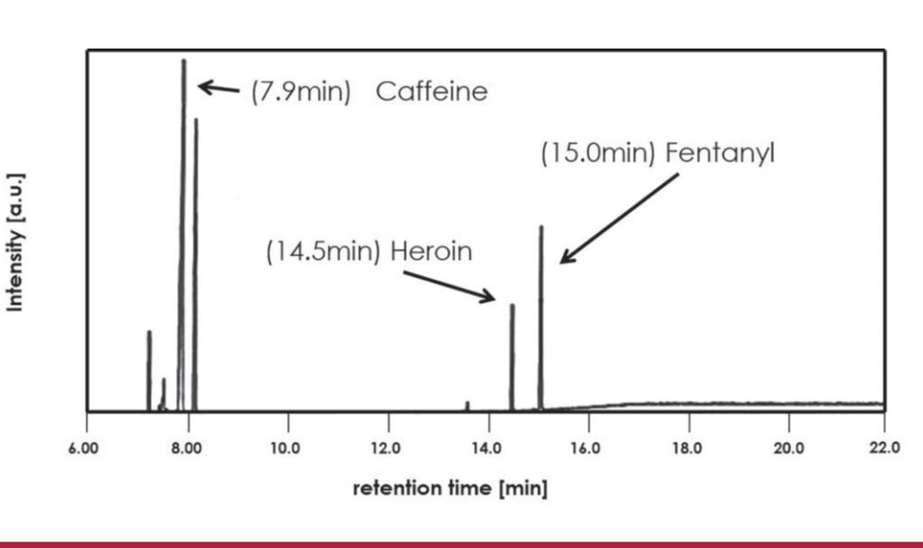

Figure 3: Analysis of suspected CDS white powder, containing Fentanyl and Heroin (other non-CDS noted)