

Drug Screening using Compact Portable Device for Supervised Injection Sites

Affordable, low maintenance, portable device could save millions of lives

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APPLICATION NOTE

Beginning in the late 1990's, opioid consumption has rapidly increased in the United States and Canada. Where access to pharmaceutical opioids is limited, heroin and counterfeit pills or powder are sold in the unregulated market. These powders and pills are of unknown content and may contain highly toxic opioids that could result in unintentional overdoses. With the rise in consumption, there has been an increase in the adulteration of the products to increase profitability while still maintaining efficacy. The use of fentanyl and carfentanyl as adulterants, opioids that are 50-100 and 10,000 times more toxic than morphine, respectively, is exacerbating an already serious public health issue.¹

Because of the toxicity, a single kilogram of fentanyl purchased from a drug trafficking organization has the potential to produce 16-24 times more product than heroin.¹ In this product, often unbeknownst to the consumer, these highly toxic opioids are frequently used as adulterants or used entirely in place of the named drug to increase profitability, thus increasing the chances of an overdose. Consequently, deaths from opioid overdoses have reached an all-time high.

In response to the rising epidemic, some governments have passed bills making supervised injection sites (SIS) a potential avenue for reducing the rate of drug overdoses. SISs are health care facilities where staff are trained to provide health education, support and connections to services as well as intervening in serious

adverse events such as drug overdoses. They provide a safe, hygienic and non-judgement environment in which individuals may consume illicit drugs without fear of arrest. The benefits of SIS are to: (1) prevent an overdose from becoming fatal through quick intervention, (2) reduce the frequency of public injection and publicly discarded syringes, (3) increase access to health services including substance use treatment, and (4) change behaviors associated with acquiring HIV and hepatitis. The benefits of drug checking services within an SIS are: (1) it provides the consumer information about the contents of their drugs prior to consumption allowing them take steps to reduce their risk of overdose, (2) it identifies when a highly toxic substance may be in the local drug supply so advisories can be issued to local service agencies and first responders, (3) it encourages use of supervised injection services and the benefits mentioned above, and (4) it detects novel substances or drug combinations that may impact the consumer.

Initially approved by the Canadian federal government in 2017, the nation now has four official SISs in operation in Ottawa and four sites approved in Toronto. While most SISs are prepared to respond quickly to overdoses, a better practice is to screen drugs for harmful impurities prior to injection. Some SISs are taking such precautions by providing the option for clients to test their drugs prior to injection with BaySpec's Portability™ Mass Spectrometer, a low maintenance, cost effective, portable instrument weighing only 20 pounds.



Figure 1 - US overdose deaths involving opioids. Deaths per 100,000 population by year.²



Figure 2 - BaySpec's Portability™ Mass Spectrometer outfitted with thermal desorption (TD) electrospray ionization (ESI) source

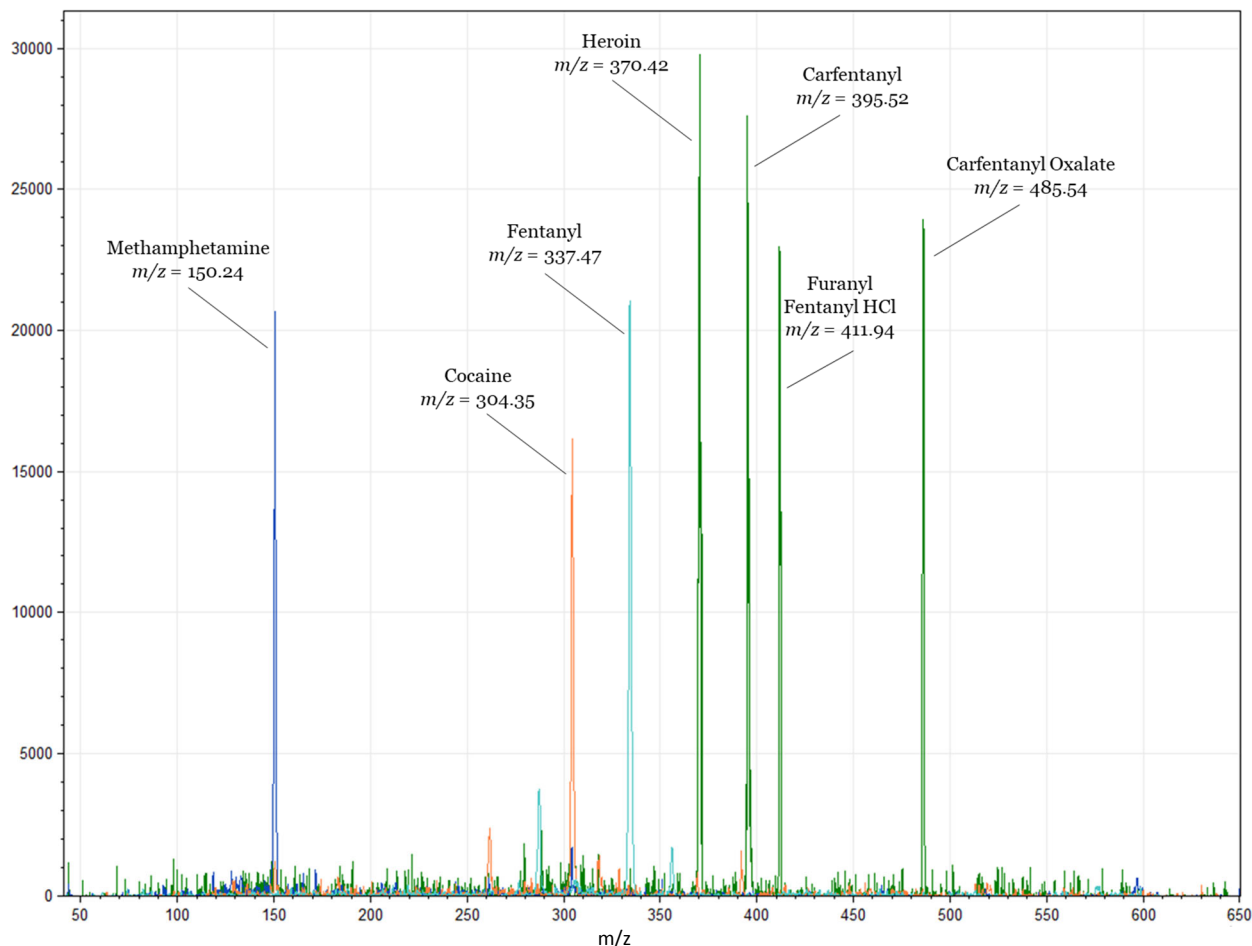


Figure 3 - Composite mass spectrum of multiple drugs that might be screened by an SIS using the Portability™ Mass Spectrometer.

SIS staff members operate the Portability™ Mass Spectrometer to screen patients' drugs to identify molecular content by comparing against a mass spectral library. The library contains entries for drugs commonly sold in the unregulated market. Figure 3 shows a composite of mass spectra of multiple drugs that might be tested by staff members at an SIS. As illustrated, the Portability™ has positively identified several target drugs over multiple scans. This compact, simple device is suitable for bulk and trace analysis with little to no sample preparation needed. Staff members test samples directly by a simple swipe using the direct sampling probe specially designed for all BaySpec mass spectrometers. This portable device is capable of measuring analytes at a concentration below 10 parts per billion.

BaySpec's Portability™ Mass Spectrometer is an optimal solution for SISs, because it is compatible with *in situ* and direct analysis techniques. The front inlet allows direct connection with electrospray, thermal-desorption electrospray and atmospheric pressure chemical ion-

ization. This atmospheric pressure inlet (API) system is compatible with direct injection through electrospray as well as with most other ambient ionization techniques such as DESI (desorption electrospray ionization) or DART (direct analysis in real time). The side port allows access to the internal electron impact ionization source; a membrane inlet or a gas chromatograph may also be coupled to this port. The Portability™ Mass Spectrometer can operate in positive or negative ion mode and can be made in multiple deployment configurations based on customer specified application needs.

References:

1. U.S. Department of Justice • Drug Enforcement Administration. (2017). *2017 National Drug Threat Assessment: October 2017: DEA-DCT-DIR-040-17*. DEA Strategic Intelligence Section, 2017. P. 45-66.
2. Data Overview. Drug Overdose. CDC Injury Center, Centers for Disease Control and Prevention 2016.