

On-site Analysis of Illicit Drugs by Portable Ion Trap GC/MS

Torion T-9 Portable GC/MS

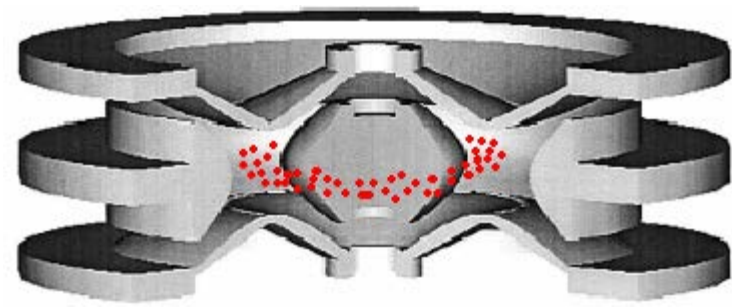
.Charlie Schmidt, Zachary Lawton

HEMS 2019

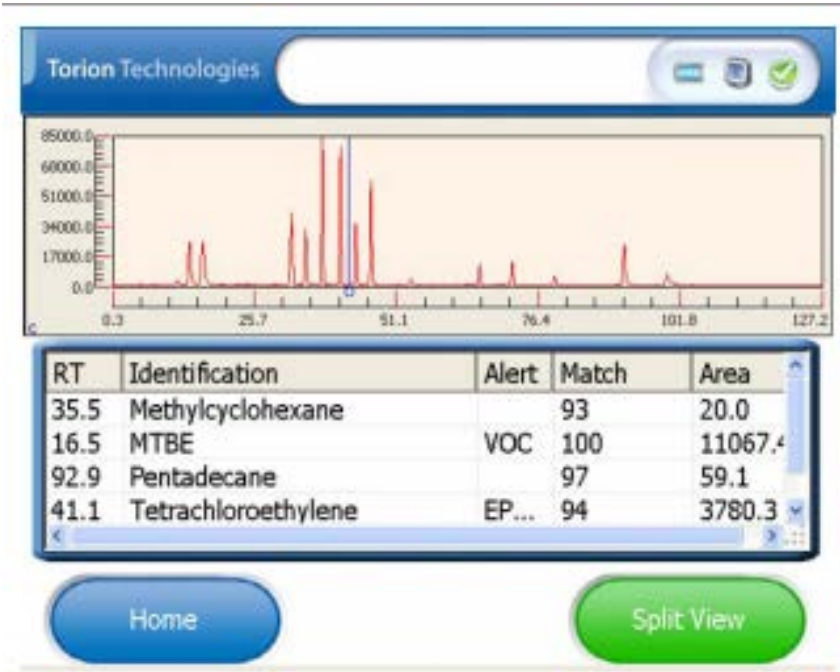


Torion T9 Portable GC/MS

- Key features



Toroidal Ion Trap



Simplified user interface

Drug Adulterants:

Law Enforcement and Public Health Implications

IDEC-Lima

April 2016

Law Enforcement Programs

- **Eradication**
- **Interdiction**
- **Immobilize Illicit Drug Labs**
- **Money Laundering Investigations**
- **Arrest Kingpins**
- **Precursor Chemical Controls**

Some Contemporary Drug Adulterants

PHENACETIN: pain reliever / fever reducer

PARACETAMOL: a pain reliever

AMINOPYRINE: analgesic, anti-inflammatory

BENZOCAINA: a local anesthetic

XYLAZINE: a veterinary tranquilizer

LIDOCAINA: a local anesthetic

LEVAMISOLE: used to expel parasitic worms

ACETAMINOPHEN: pain reliever / fever reducer

METAMIZOLE: pain reliever / fever reducer

During the last decade, many shipments of cocaine seized by U.S. drug authorities have been found to be adulterated with levamisole (a veterinary anti-worming medicine) and Phenacetin (a painkiller).

Why is cocaine adulterated with an animal dewormer?

1. It's easy to mix with cocaine
2. It appears like high quality cocaine
3. It may enhance the effects of cocaine
4. It's relatively **Cheap**
5. It's easy to obtain

Levamisole is Toxic

- Withdrawn from the Canadian (2003) and USA (1999) markets due to toxicity
- Results in a decrease of white blood cells that can lower immunity and increase opportunist infections
- Associated with inflammation of blood vessels that can cause severe damage to skin
- Identified as cocaine adulterant in 2003
- Appeared in U.S., Europe, and Latin America

Levamisole skin toxicity



Chemical Profile of Cocaine Samples in Sao Paulo – Nov. 2014 (1144 samples)

Adulterants	Crack	HCl
Phenacetin	60%	6%
Aminopyrine	25%	1%
Levamisole	1%	50%

- **Adulterants/Cutting Agents traditionally not part of comprehensive strategies & programs**
- **Used to be added to drugs at street level in consumer countries**
- **Now being added in source countries at production stage**

Levamisole – Colombia

Phenacetin - Bolivia

Welcome to Lima



Buying Street Drugs



Checking out the Score

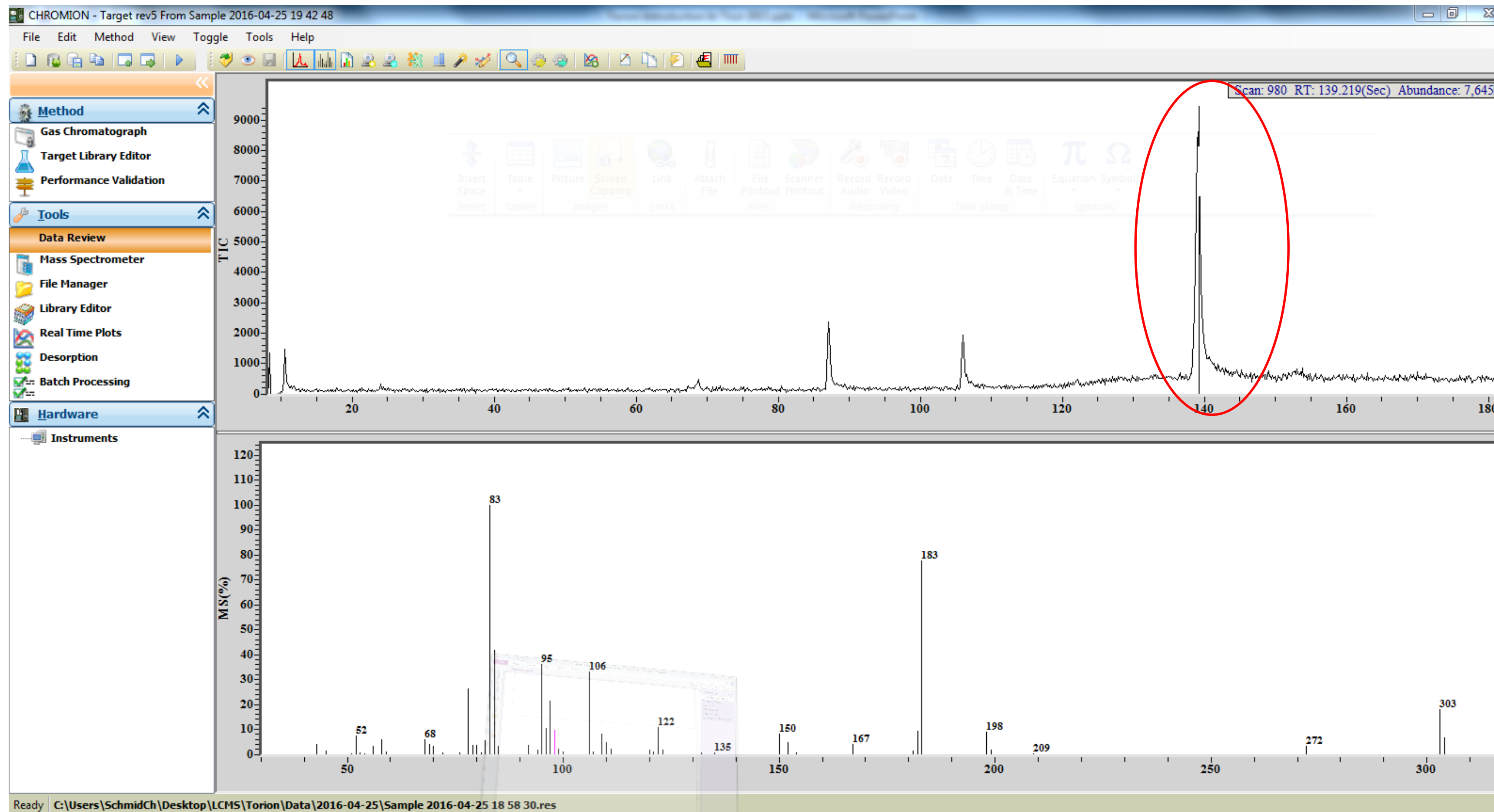


Field Testing

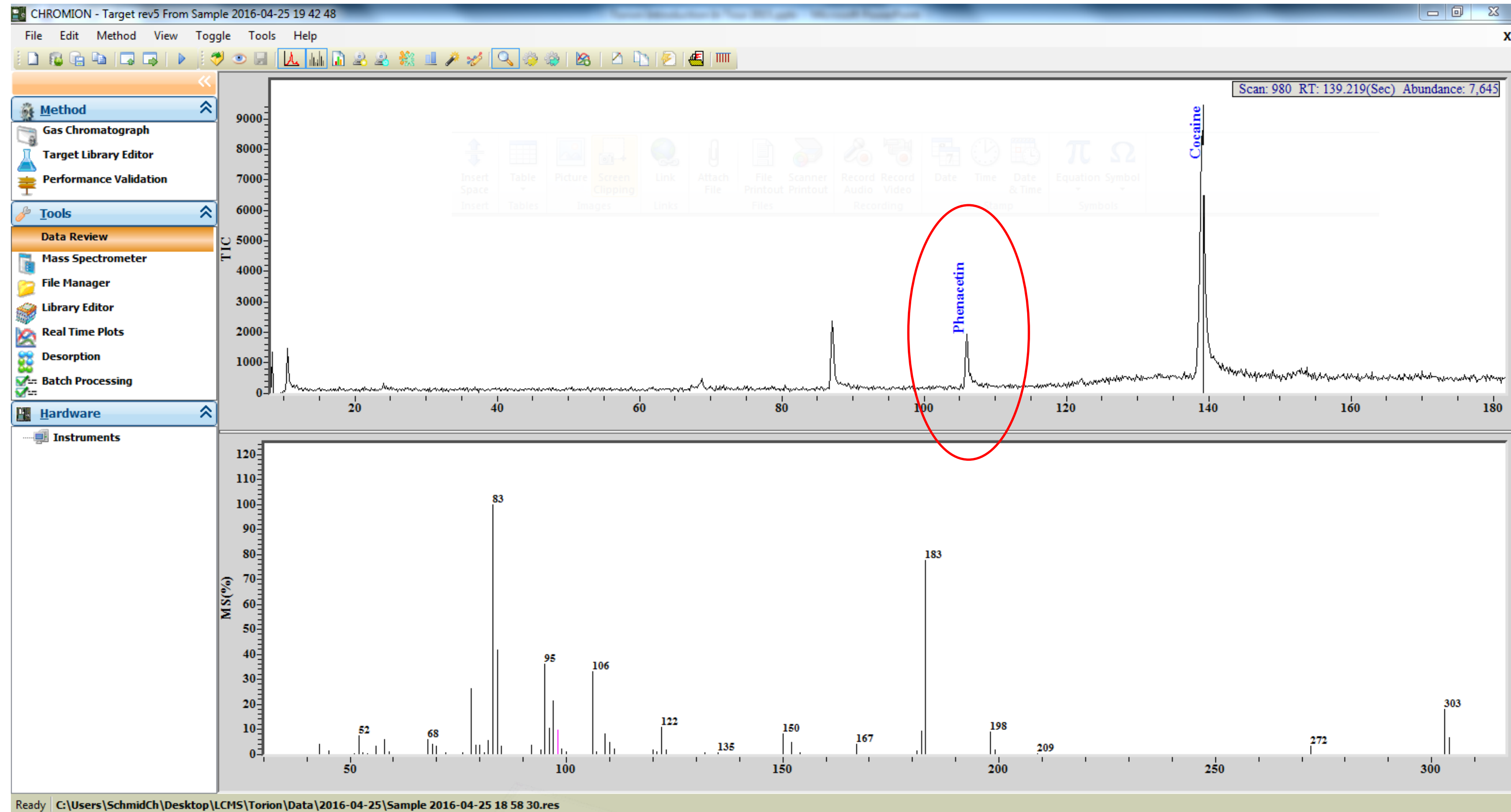




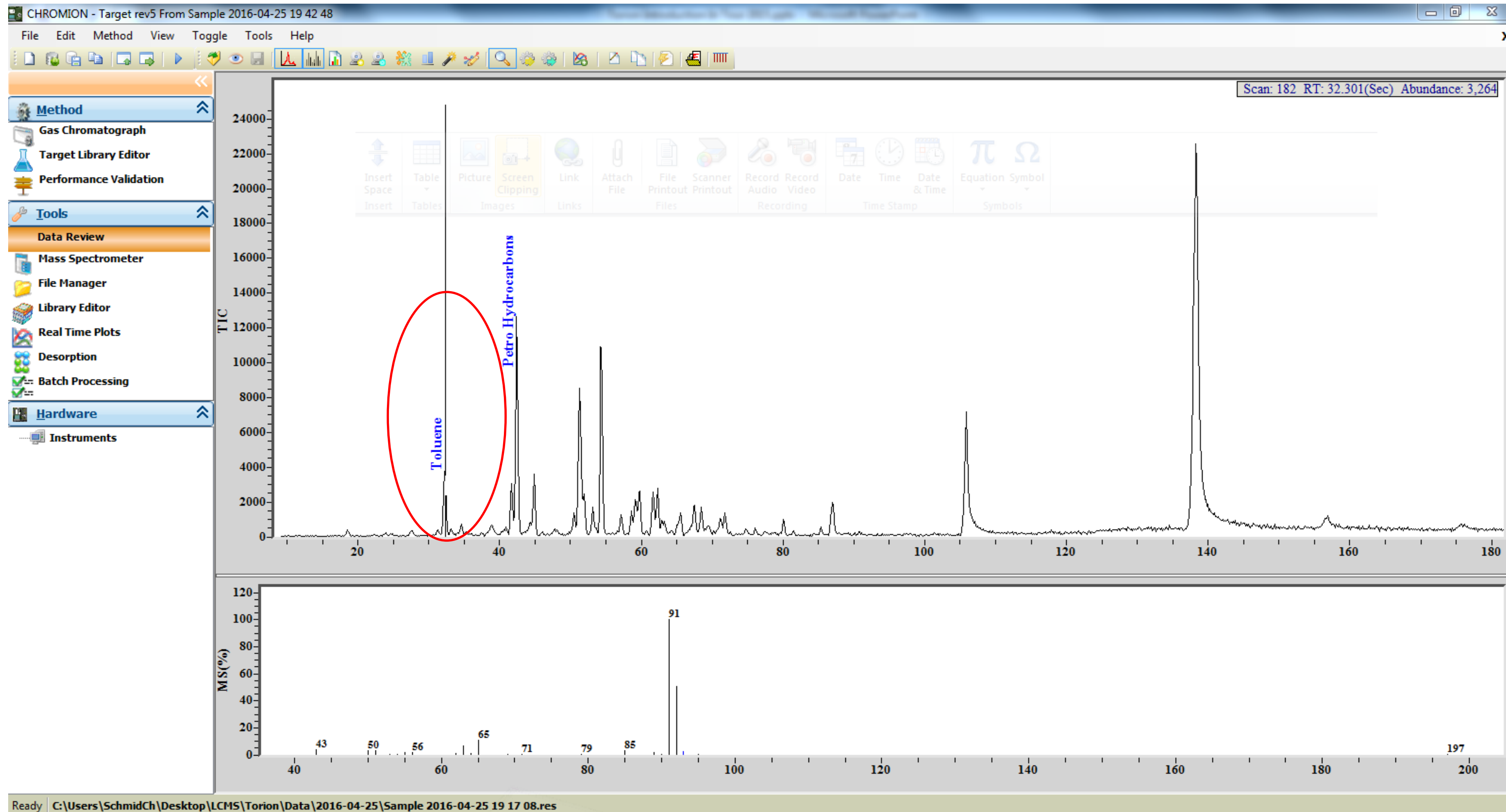
Cocaine Sample (Peru)



Cocaine cut with Phenacetin (Peru)



Hydrocarbons in Cocaine sample (Peru)



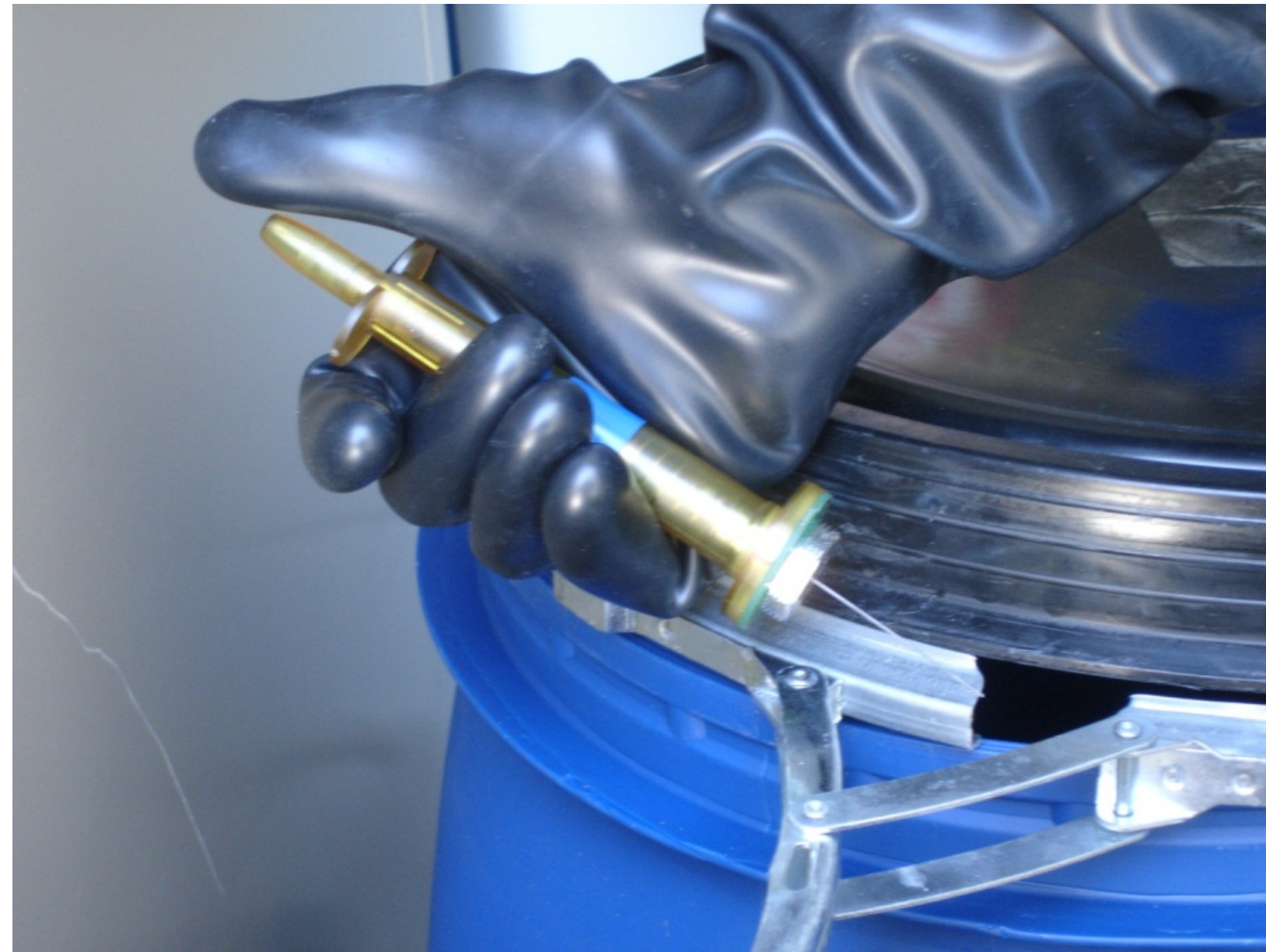
Primary Factors resulting in the need of Field Portable Devices

- There is an alarming rise in the incidence of dangerous substances (i.e. **fentanyl**)
 - This emphasizes the need for increased safety measures
 - New field testing techniques could address and minimize hazards to individuals in the field
- New drugs, such as NPS, are hitting the streets every day. Development of color-based tests may not keep up with these type of drugs, but alternative, more robust techniques may improve the process of rapidly identifying these substances
- Multiple types of portable field drug testing devices are available in the market, which makes it difficult for decision makers to choose the most appropriate instrument.

Drug Testing in Vancouver BC



Solid Phase Microextraction (SPME) Sample Collection



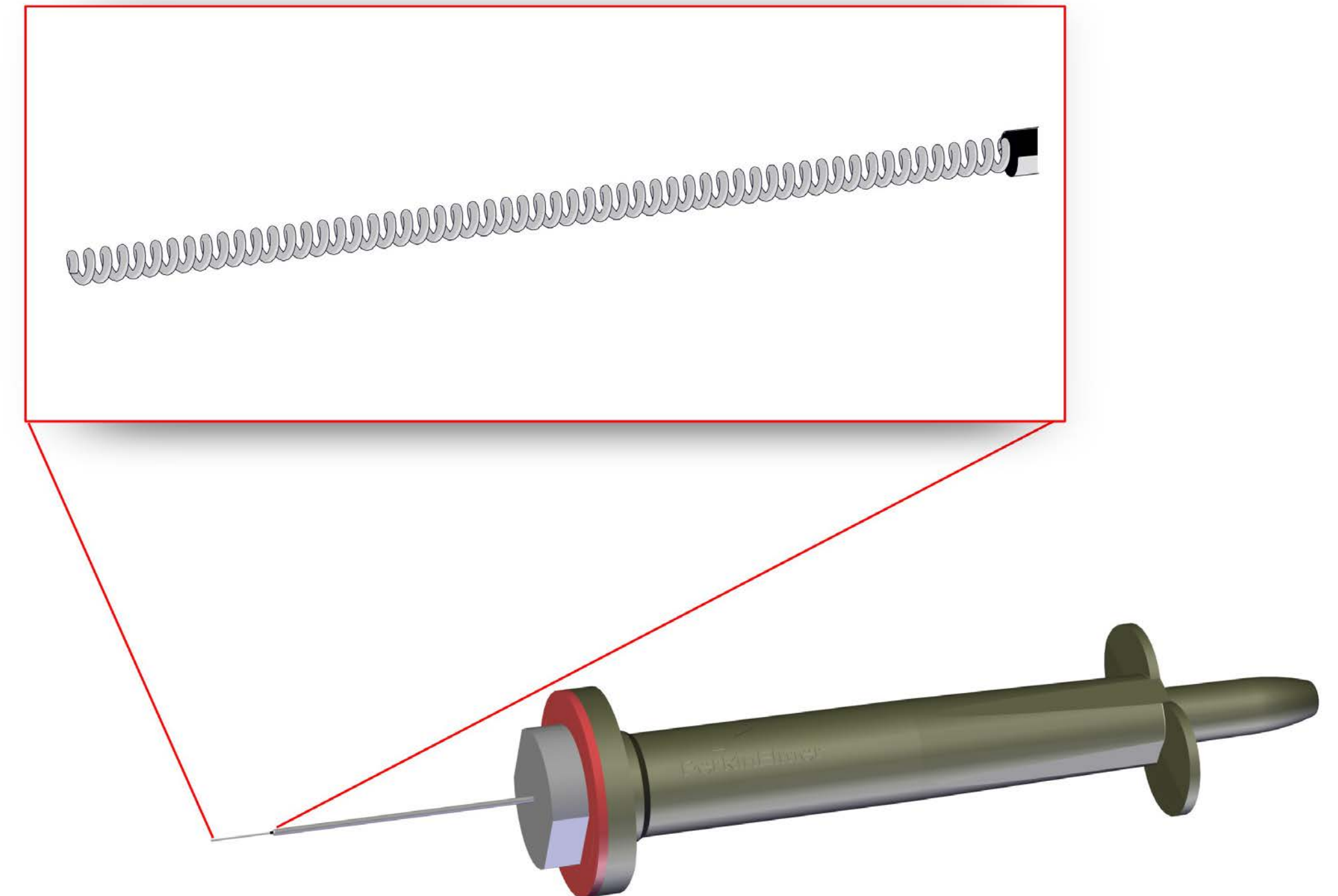
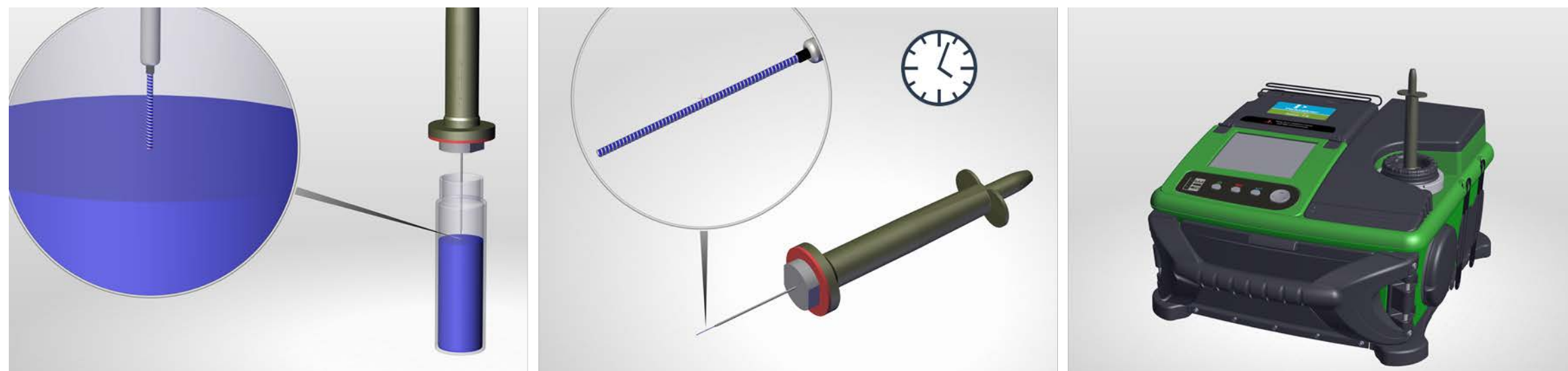
Sampling Techniques

- Headspace
- Direct Immersion
- Direct Contact

Must be easy to use!

Coiled Microextraction (CME)

- Liquid Collection & Injection Device
- Ideal Semi-volatile compounds
 - Drugs of abuse, fentanyl analogues, explosives pesticides, etc.
- Capillary action pulls liquid into coils
- Solvent evaporates, analytes left behind
 - MeOH used for drug screening



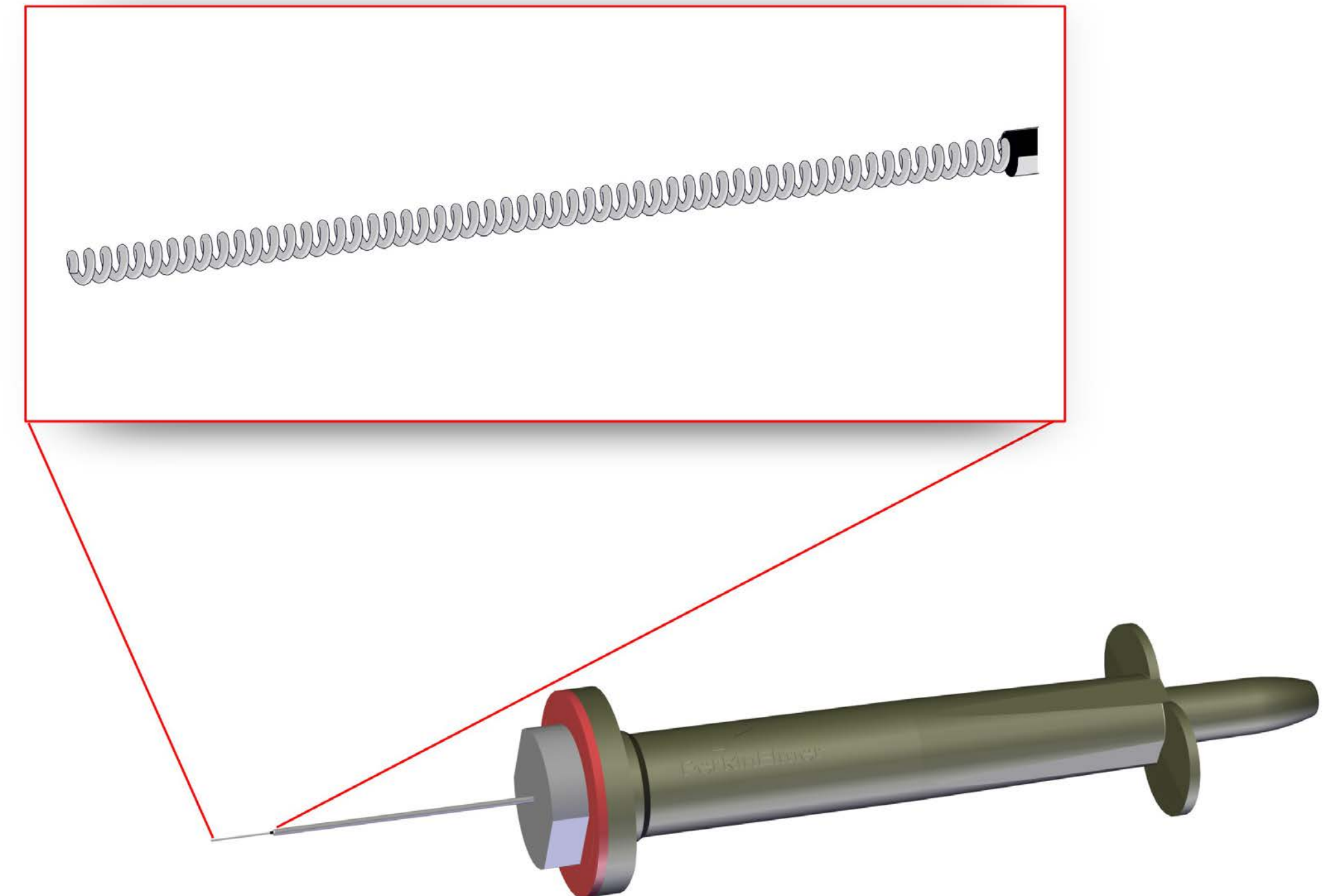
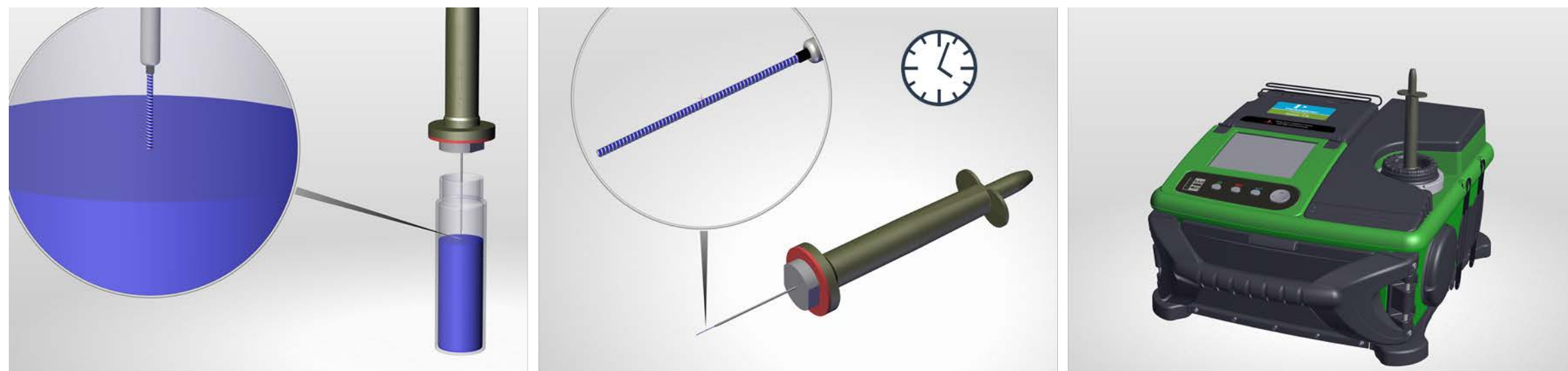






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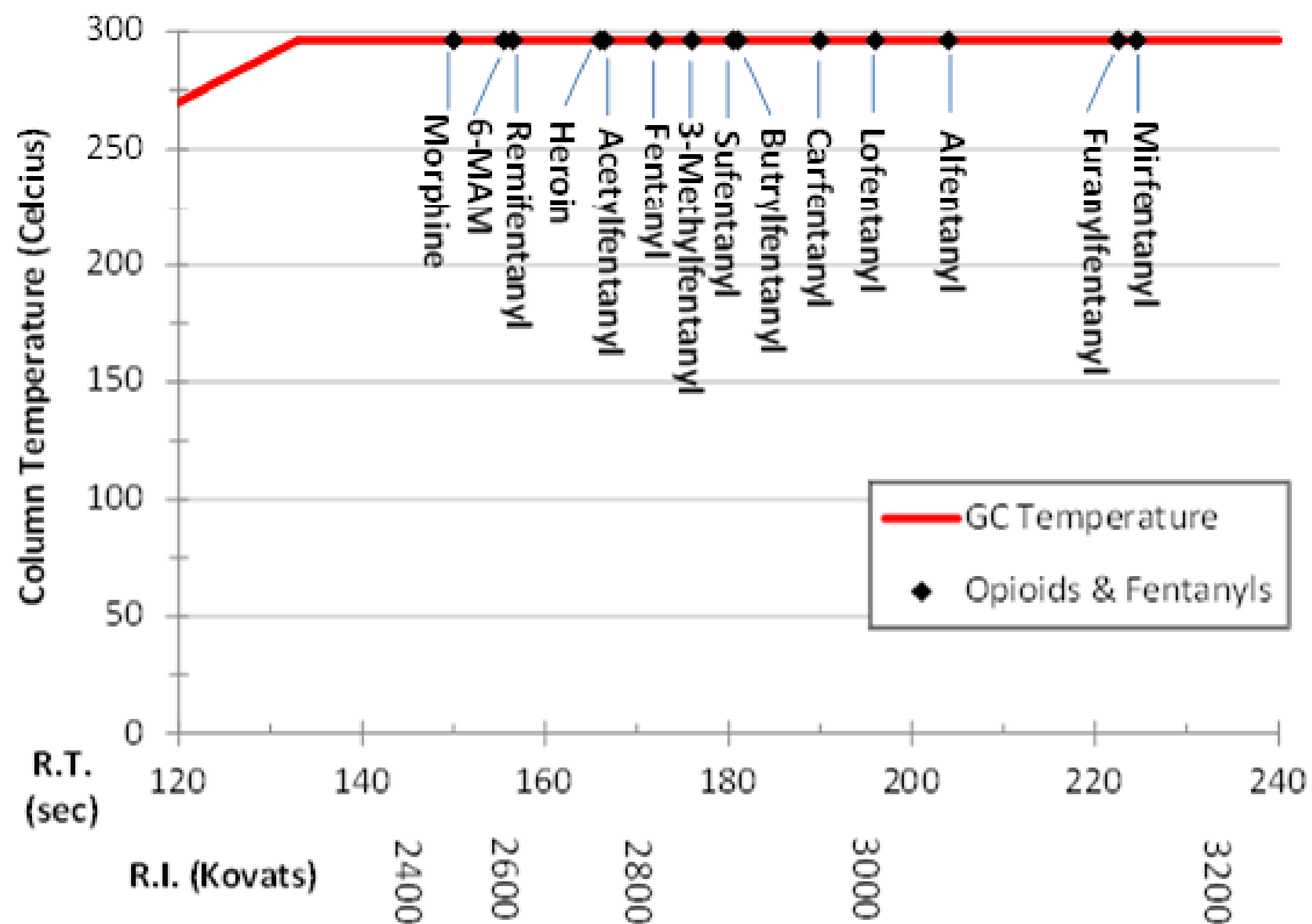
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Onboard Library and Unknown Library options and capabilities

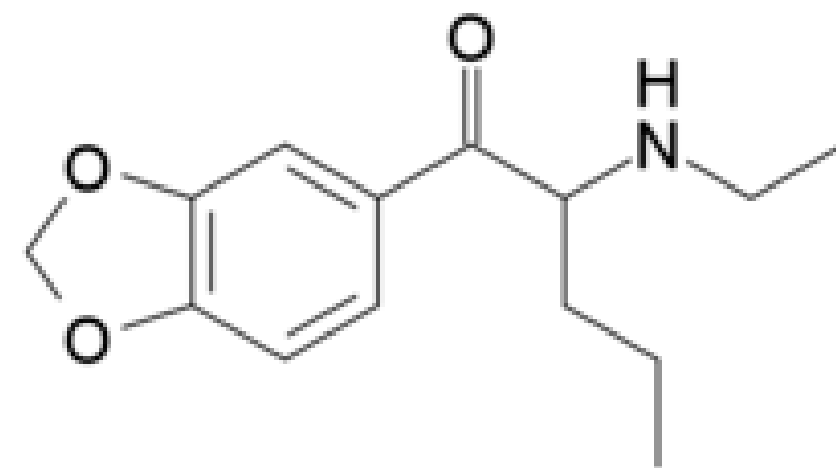
- On-board customizable libraries
- NIST searchable spectra
- WILEY 2017 Designer Drug library (over 100,000+ compounds)
- Slight limitations toroidal MS vs GC/MS

Synthetic opioids collected on Torion T9



Synthetic Opioids		~R.T. (sec)	~R.I. (calc)
Compound Name	CAS RN		
Morphine	57-27-2	150.0	2575
6-Monoacetylmorphine	2784-73-8	155.5	2635
Remifentanyl	132875-61-7	156.5	2645
Diacetylmorphine (Heroin)	561-27-3	166.0	2745
Acetylfentanyl	3258-84-2	166.5	2750
Fentanyl	437-38-7	172.0	2805
3-Methylfentanyl (3-MF)	42045-86-3	176.0	2840
Sufentanyl	56030-54-7	180.5	2880
Butyrfentanyl (Bu-F)	1169-70-6	181.0	2885
Carfentanyl	59708-52-0	190.0	2955
Lofentanyl	61380-40-3	196.0	3000
Alfentanyl	71195-58-9	204.0	3050
Furanylfentanyl (Fu-F)	101345-66-8	222.5	3145
Mirfentanyl	117523-47-4	224.5	3155

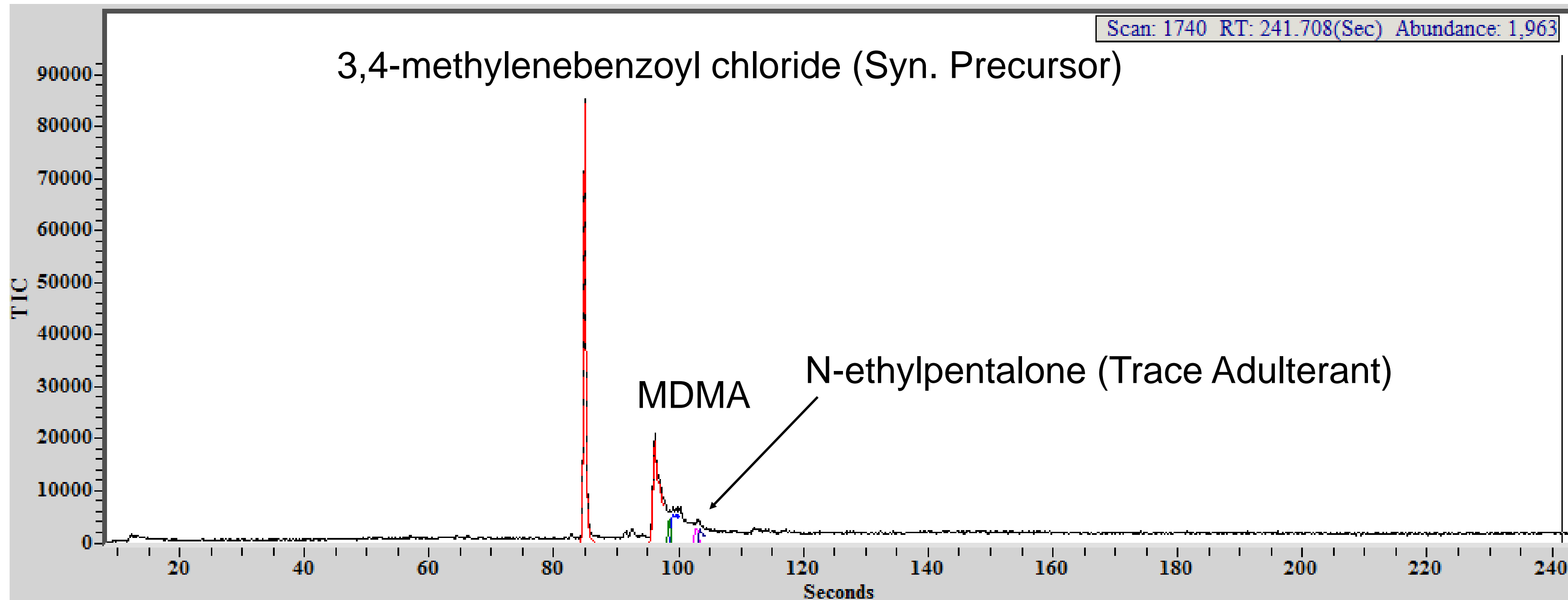
Success Stories: Drug Screening at Groovin' the Moo - Australia



N-Ethylpentylone

- Coupled with FTIR, the Torion T9 was used to screen for unknown substances that could not be discerned.
- Festival participants volunteered to have their substances checked.
- FTIR and GC/MS identified n-ethylpentylone adulteration in a collection of “MDMA” samples.
- N-ethylpentylone was tied to recent overdoses at previous music festivals in Australia

Identifying synthetic precursors and adulterants onsite



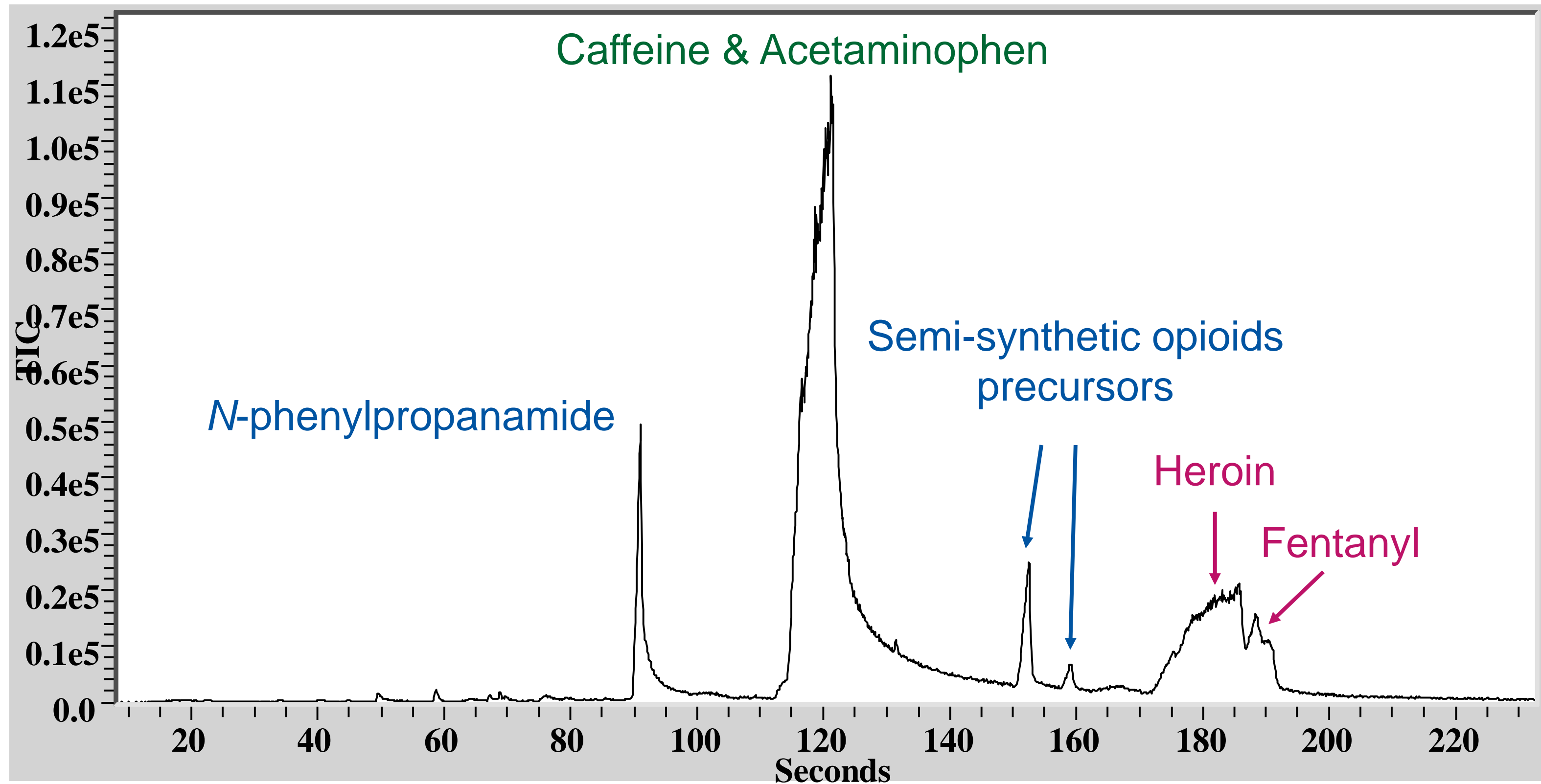
“MDMA” Sample collected at Groovin’ the Moo, Canberra Australia

Success Stories: Safe Injection Sites – Vancouver Island, Canada



- University of Victoria, BC, Canada partnering with the federal government to create a drug checking pilot project.
- Suite of analytical instruments being set up at safe injection sites for heroin users to have their drugs screened for fentanyl analogues.
- On-going research project

Safe injection site results – Fentanyl laced heroin sample

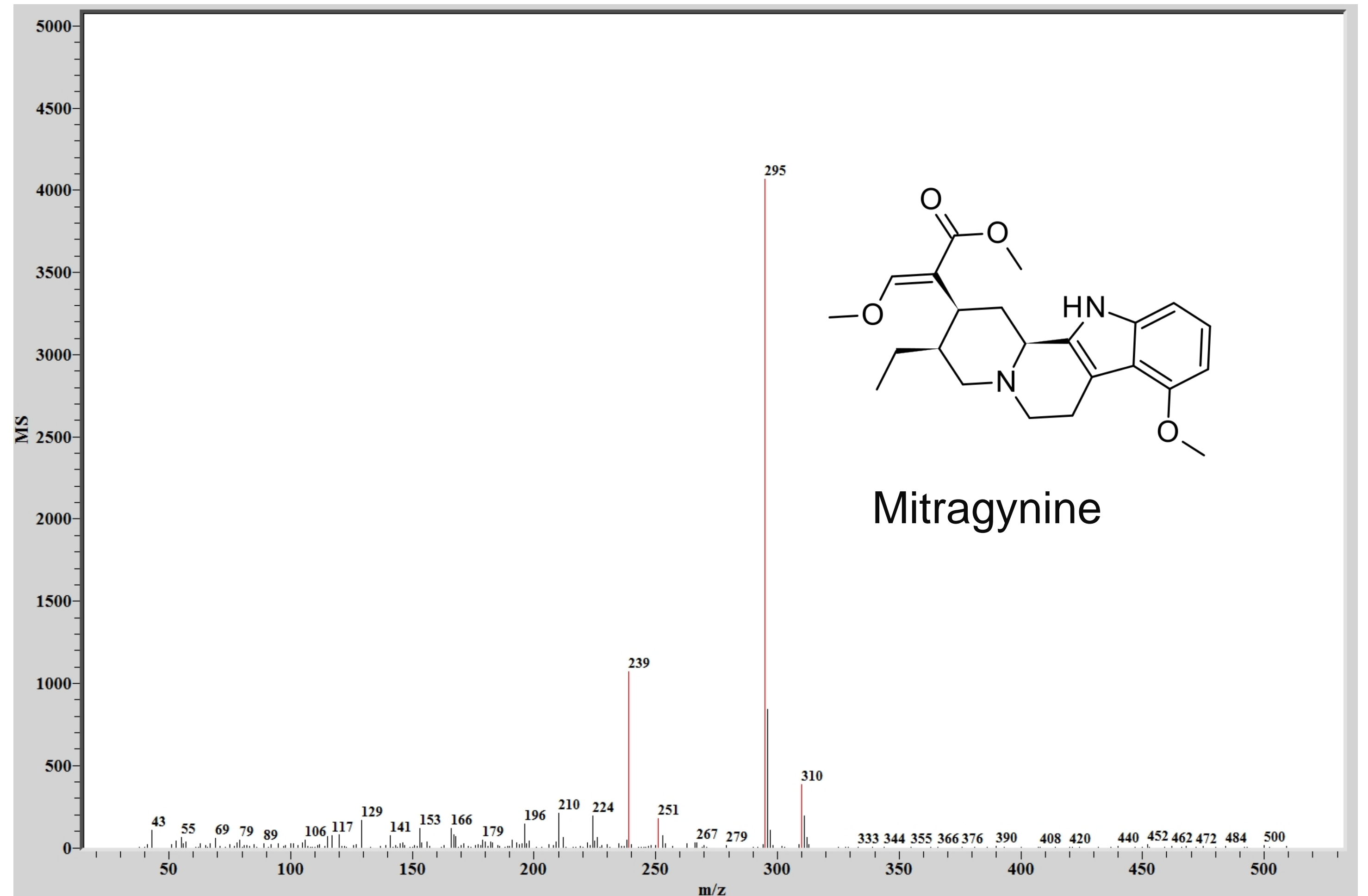


1 mg of sample dissolved in 100 uL of MeOH

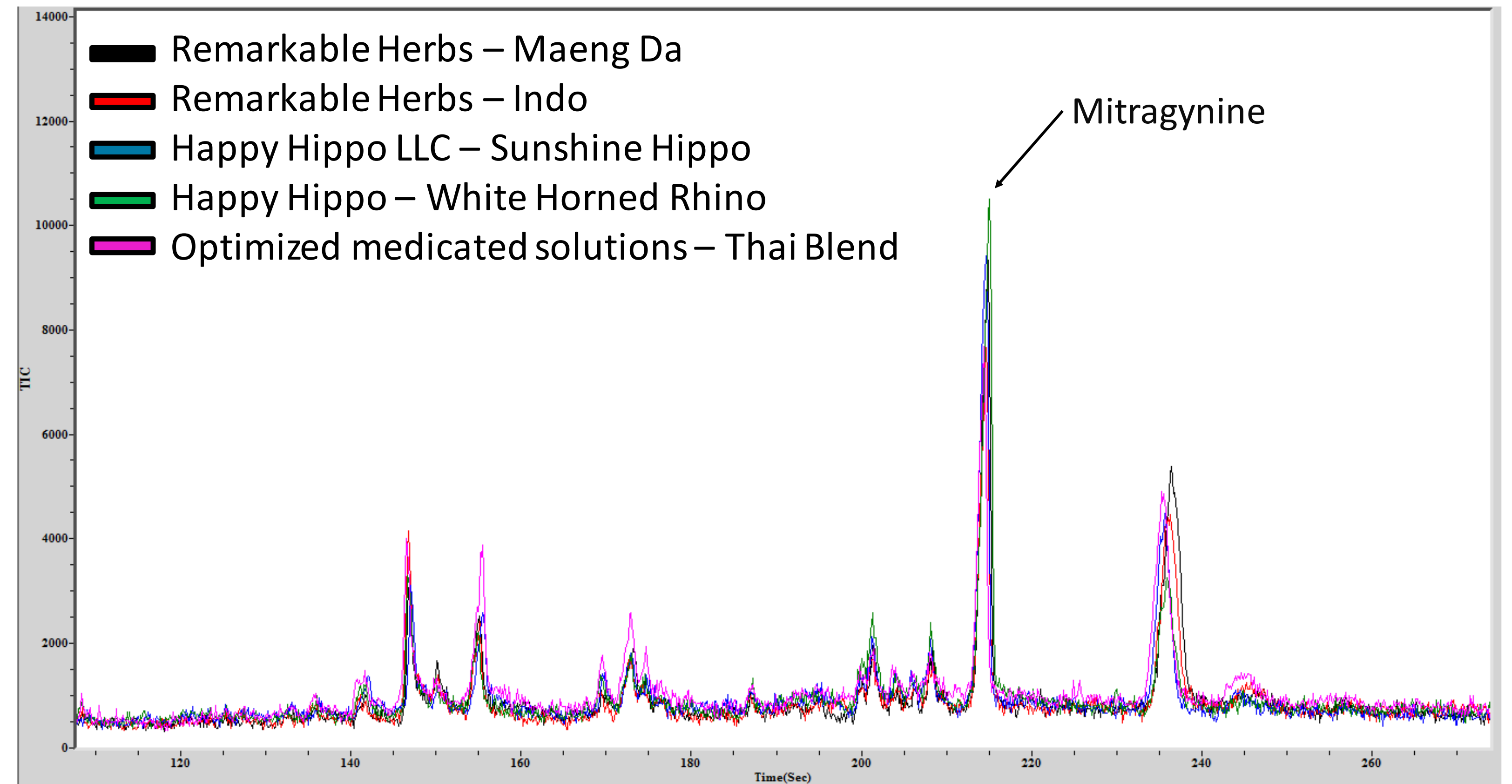
- Typical adulterated heroin / fentanyl samples
- **Opioids**
- **Precursors**
- Indicator of clandestine production
- **Cutting Agents**
- Used to dilute the sample for more street profits

Emerging Opiate Alternatives - Kratom

- Contains alkaloids with opiate properties
- Native to southeastern Asia
- Classified as opiate in 2018



Comparison 5 different Kratom blends using CME-GC/MS



The Benefits of a Portable Gas Chromatograph Ion Trap Mass Spectrometer for the Identification of Controlled Substances in Seized Street Drugs

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Acetylfentanyl	Cocaine	Furanylfentanyl	Methamphetamine	PCP	W-15
Acetaminophen	Cocaine Base	Heroin	Methaqualone	Phenacetin	W-18
AH-7921	Cocaine HCl	Hydroxyzine	Methylphenidate	Phentermine	Xylazine
Amphetamine	Codeine	Levamisole	Morphine	Procaine	4-ANPP
Benzocaine	Desomorphine	Lidocaine	MT-45	Pseudoephedrine	4-methoxyamphetamine
Butyrylfentanyl	Diltiazem	MDEA	Norfentanyl	Theophylline	
Caffeine	Ephedrine	Metamizole	Noscapine	Valerylfentanyl	
Clenbuterol	Fentanyl	Methadone	Papaverine	U-47700	

Drug Screening at Music Festivals

- Screening drugs at music festivals is a relatively new approach for the entertainment industry.
 - Success stories:
 - Shamballa Music Festival (2017)
 - Groovin the Moo (2019)
 - Glastonberry (2019)
- Important to remember that PerkinElmer does not support recreational drug consumption
 - Torion leads related to drug analysis in this scenario is a response to the loss of human life from overdoses, and a modern instrumental analysis approach to complicated and widely varied samples



Thank you!

Questions?



**ANYTIME
ANYPLACE
ANYWHERE**



Thank you!

Questions!