Assessment of Drugs in Syringes from NYC Syringe Exchange Programs

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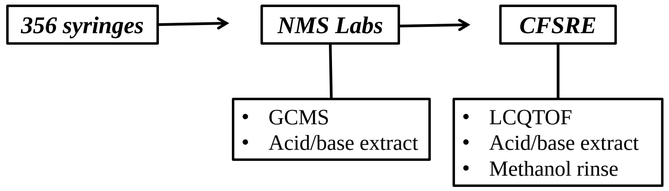
Introduction

Syringe Exchange Programs (SEPs) are a service that provides hypodermic syringes and associated injection equipment to injecting drug users at no cost. The aim of the program is a reduction in potential harm to the users including risks of infection from non sterile drug injection equipment, and transmission of blood borne pathogens, such as HIV and HCV. In addition to their pharmacoepidemiological value as an index of patterns of drug use, drug paraphernalia is frequently submitted to forensic science laboratories for analysis. These exhibits may contain important information regarding the presence of controlled substances, helping in the investigation of crimes, in addition to helping characterize the drug abuse scenario and the cutting agents in a specific population. We conducted this study to evaluate the adulterants and highly potent substances, such as fentanyl, present in injected drugs, through the analysis of methanolic rinses and acid/basic extracts from syringes collected from intravenous drug users in New York City between May 2017 to July 2107.

Methods



GCMS Parameters

- Gas chromatograph model 6890N coupled with a mass selective detector model 5975B
- Electron impact mode
- Full scan acquisition (40-550 m/z)
- ZB35HT column (15 m x 250 µm x 0.25µm)
- Injection volume: 1 µL, splitless mode
- Injection temperature: 265 ºC
- Detection temperature: 300 ºC
- Helium at 1.2 mL/min (constant flow)
- Oven program temperature: 60 ºC for 0.5 min, heating rate of 35 ºC/min and hold at 340 ºC for 6.5 min
- Total run time: 15 minutes

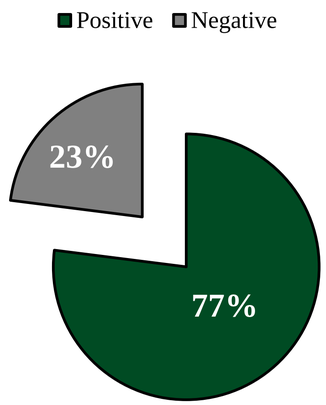
LCQTOF Parameters

- Shimadzu Nexera XR UHPLC coupled with a Sciex TripleTOF® 5600+ mass spectrometer
- Reverse phase gradient: NH_4HCO_2 (10 mM, pH 3) (MPA) and MeOH/ACN 50:50 (MPB)
- Phenomenex®Kinetex C18 (50 mm x 3.0 mm x 2.6 µm)
- Flow at 0.4 mL/min
- Precursor ions acquired by TOFMS scan (100-510 m/z) via positive electrospray ionization
- Precursor isolation using SWATH™ Acquisition
- Data processing by PeakView®

Table 1: LC Gradient

Time (min)	% MPA	% MPB
0	95	5
13	5	95
15.5	95	5

Results



➢ ***Substances present at 10% or greater than the most prominent substance based on relative peak area.***

Table 2. Percentage of drugs found by prevalence order

Substance	*n*	*%*
Heroin	95	26.6
6-MAM[1]	182	51.0
Morphine[1]	116	32.5
Codeine[1]	23	6.4
Acetylcodeine[1]	106	29.7
Noscapine[1]	83	23.2
Papaverine[1]	53	14.8
Cocaine	92	25.8
Benzoylecgonine[2]	35	9.8
Fentanyl	36	10.1
4-ANPP[3]	3	0.8
Methamphetamine	20	5.6
Amphetamine[4]	4	1.1
Furanylfentanyl	10	2.8
Tramadol	5	1.4
Fluoroisobutyrylfentanyl (FIBF)	5	1.4
Cotinine	3	0.8
Dextromethorphan	3	0.8
Methadone	2	0.6
N-Ethyl Pentylone	2	0.6
Quetiapine	2	0.6
Alprazolam	1	0.3
Clonazepam	1	0.3
Olanzapine	1	0.3
Gabapentin	1	0.3

[1]Heroin related [2]Cocaine related [3]Fentanyl related [4]Methamphetamine related

Results

Table 3. Percentage of cutting agents found by prevalence order.

Substance	*n*	*%*
Quinine/Quinidine	51	14.3
Levamisole	33	9.2
Caffeine	32	9.0
Lidocaine	32	9.0
Phenacetin	19	5.3
Xylazine	6	1.7
Diltiazem	6	1.7
Hydroxyzine	6	1.7
Diphenhydramine	2	0.6

Table 4. Percentage (%) of major adulterants by drugs

	Quinine/Quinidine	Levamisole	Caffeine	Lidocaine	Xylazine	Diltiazem	Hydroxyzine	Diphenhydramine	Phenacetin	*Fentanyl present**
Heroin/related (n=198)	18	4.5	7.6	4.5	1.5	1.5	-	0.5	3.0	*16*
Cocaine/related (95)	7.4	26	8.4	24	1.1	3.2	6.3	-	9.5	*6.3*
Fentanyl/related (n=37)	14	-	8.1	62	-	-	-	-	-	*n/a*
Furanylfentanyl (n=10)	40	-	20	-	-	-	-	-	10	*30*

➢ ***Cutting agents were not present at 10% or greater relative to peak intensity of the most prominent drug, for the remaining drugs listed in Table 2.***

Fentanyl may or may not have originated from the main drug.

Conclusion

The cutting agents and toxic adulterants used in the street drug supply are constantly changing over time and they may contribute to the toxic effects of the drugs on users. Knowledge about the drugs and cutting agents found in paraphernalia from a select drug using population can help to inform patterns of drug use and associate health risk to users, including the rates of exposure to toxic adulterants or highly potent substances (fentanyl, Furanylfentanyl, FIBF). The presence of drug combinations, cutting agents and adulterants may assist in determining common origin from drugs in the possession of different users. Analysis of drug residue in syringes from this population can contribute to better informed public policy that helps reduce risk for people who inject drugs.

Acknowledgements

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