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Full article

Determination of ocfentanil and W-18 in a suspicious, heroin-like powder in Belgium

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BACKGROUND

Since the early 2010s, synthetic opioids have been on the rise in the illicit drug markets of Europe and North America, often as adulterants in or substitutes for heroin. Ocfentanil, an early-onset fentanyl analogue, has been implemented in several fatalities, predominantly in Europe. [1] W-18 is more prevalent in Canada and the United States, but has recently been found not to contain any noteworthy opioid receptor activity. [2]

An unknown brown powder (Figure 1), advertised and purchased as heroin, was sent to the Toxicological Centre at the University of Antwerp for analysis in the framework of the Belgian Early Warning System on Drugs.

Figure 1. Unknown powder.

GENERAL TOXICOLOGICAL ANALYSIS – METHODOLOGY & RESULTS

LC-DAD SCREENING

- Agilent 1200 series LC + G1315C DAD
- Zorbax Eclipse Plus C8 column (3.0 x 150 mm, 3.5 µm) @ 40 °C
- MP A = 10 mM phosphate buffer pH 2.3, B = ACN:10 mM phosphate buffer pH 2.3 (80:20)
- Start 5% B, to 100% B in 19 min, 4 min @ 100% B + re-equilibration
- DAD = λ 200-380 nm

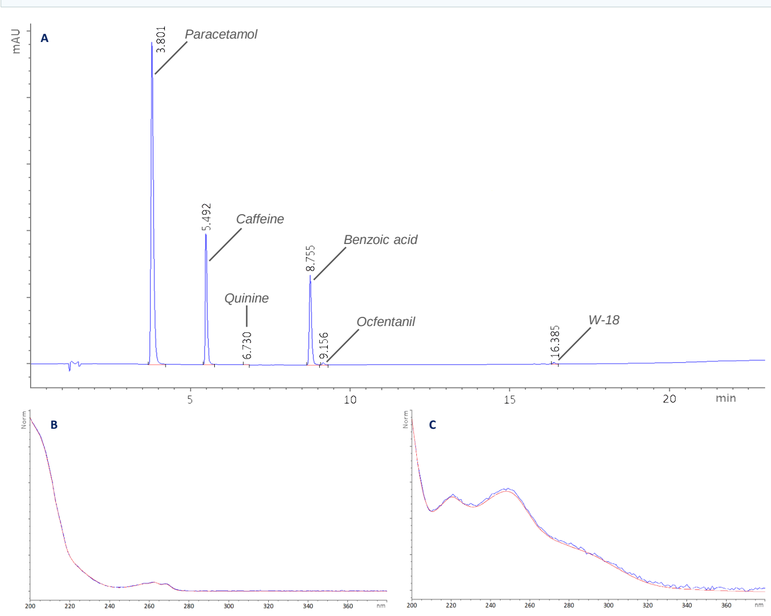

Figure 2. LC-DAD results (A), including the UV spectra (λ 225 nm) for ocfentanil (B) and W-18 (C).

Two new psychoactive substances were detected (Figure 2): the synthetic opioid ocfentanil and W-18. Four common cutting agents were also identified: paracetamol, caffeine, quinine and benzoic acid.

Table 1 describes the semi-quantitative sample composition.

Table 1. Semi-quantitative composition of the unknown powder.

Compound	Retention time	Concentration (*m/m*)
Paracetamol	3.8 min	56%
Caffeine	5.5 min	24%
Quinine	6.7 min	trace amounts
Benzoic acid	8.8 min	9.5%
Ocfentanil	9.2 min	1.6%
W-18	16.4 min	0.3%

GC-MS SCREENING

- Agilent 6890N GC + 5973N MS
- DB-5ms column (30 m, 250 µm internal diameter, 0.25 µm film thickness)
- 2 min @ 70 °C, to 250 °C @ 15 °C/min, to 315 °C @ 5 °C/min, 15 min @ 315 °C
- MS = continuous mode *m/z* 50-660

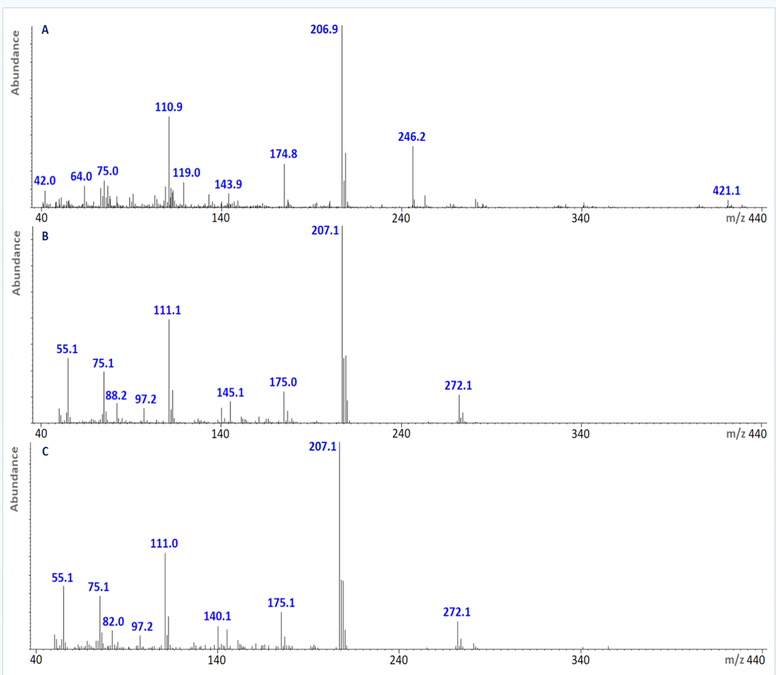

Figure 3. Comparison of the W-18 mass spectra in the Cayman Spectral Library (A), our in-house database (B) and the brown powder (C).

The GC-MS screening results were in agreement with those of the LC-DAD screening. Potential hits were matched against our in-house library and the Cayman Spectral Library (CSL).

W-18 could not be identified by the CSL. Differences in background signal subtraction may have caused a mismatch between spectra of the same compound (e.g. the absence of the molecular ion at *m/z* 421). The in-house library spectrum matched in both ion composition and retention time to the W-18 spectrum for the unknown powder (Figure 3). Despite mimicking the acquisition settings, we were unable to recreate the spectrum recorded in the CSL. Further investigation of this spectral mismatch is needed to avoid potential false negative results for this compound.

LC-QQQ CONFIRMATION

- Agilent 1200 series LC + 6410 QQQ
- Zorbax Eclipse Plus C8 column (2.1 x 150 mm, 3.5 µm) @ 50 °C
- MP A = H_2O + 0.1% FA (*V/V*); B = ACN:H_2O (90:10) + 0.1% FA (*V/V*)
- Start 18% B, to 40% B in 7 min, to 95% B in 10 min + re-equilibration
- QQQ settings = see Table 2.

Table 2. Dynamic multiple reaction monitoring settings.

Parameter	Ocfentanil	W-18
Precursor ion *(m/z)*	371.2	422.1
Fragmentor voltage *(V)*	125	150
Product ions *(m/z)*	188.2 105.1	111.1 273.1 174.9
Collision energy *(eV)*	20 45	50 20 30
Ratio *(%)*	100 98	100 45 26
Retention time *(min)*	4.3	10.5

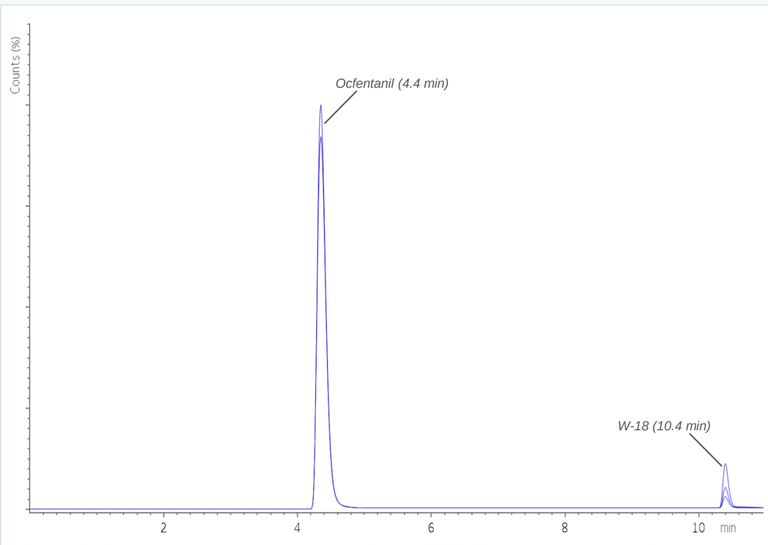

Figure 4. Extracted ion chromatogram of the LC-QQQ analysis for synthetic opioids.

The LC-QQQ method was selective for the detection of fentanyl, 31 of its analogues, W-15 and W-18. Apart from ocfentanil and W-18, no other synthetic opioids were detected (Figure 4).

CASE FINDINGS

The unknown powder tested positive for the synthetic opioid ocfentanil (1.6% *m/m*). Similar brown powders in Belgium and Switzerland were found to contain 2.54% (*m/m*) and 0.91% (*m/m*) ocfentanil, respectively. [3,4] In France a powder meant for sniffing was found to contain 17% (*m/m*) ocfentanil. [5] However, none of these reportedly contained W-18 (for this case 0.3% *m/m*).

The CSL was unable to identify W-18 in the powder, in part due to the absence of the molecular ion at *m/z* 421. We are currently unable to determine the exact origin of this mismatch, which may have caused a significant underreporting of cases.

References

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3. Coopman V, et al. Ocfentanil overdose fatality in the recreational drug scene. Forensic Sci Int. 2016; 266: 469-473.
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