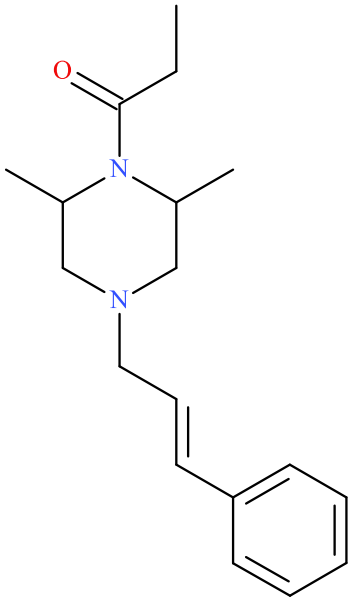
NPS Discovery at CFSRE
2300 Stratford Avenue
Willow Grove, PA 19090

AP-238

Sample Type: **Biological Fluid**



Latest Revision: **November 11, 2020**

Date of Report: **November 11, 2020**

1. GENERAL INFORMATION

IUPAC Name:	1-[4-[(E)-cinnamyl]-2,6-dimethyl-piperazin-1-yl]propan-1-one
InChI String:	InChI=1S/C18H26N2O/c1-4-18(21)20-15(2)13-19(14-16(20)3)12-8-11-17-9-6-5-7-10-17/h5-11,15-16H,4,12-14H2,1-3H3/b11-8+
CFR:	Not Scheduled (11/2020)
CAS#	Not Available
Synonyms:	None Available
Source:	NMS Labs – Toxicology Department

***Important Note**: All identifications were made based on evaluation of analytical data (LC-QTOF-MS) in comparison to analysis of acquired reference material.*

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2. CHEMICAL AND PHYSICAL DATA

2.1 CHEMICAL DATA

Form	Chemical Formula	Molecular Weight	Molecular Ion $[M^+]$	Exact Mass $[M+H]^+$
Base	$C_{18}H_{26}N_2O$	286.4	286	287.2118

3. SAMPLE HISTORY

AP-238 has been identified in at least one toxicology case since November 2020. The geographical and demographical breakdown are below:

Case Type: Postmortem (n=1)

Geographical Location: Indiana (n=1)

Biological Sample: Femoral Blood (n=1)

Date of First Collection: August 2020

Additional Findings: Flualprazolam (n=1), 8-Aminoclonazolam (n=1)

4. BRIEF DESCRIPTION

AP-238 is classified as a synthetic opioid and member of the cinnamylpiperazine sub-class. Cinnamylpiperazines are structurally distinct from fentanyl and its analogues. Synthetic opioids, including cinnamylpiperazines, have been linked to adverse events and death. AP-238 is the fourth analogue in this series to be reported by NPS Discovery. AP-238 is structurally similar to AP-237 (bucinnazine), 2-methyl AP-237, and *para*-methyl AP-237. AP-237 is an opioid used therapeutically, although not prescribed within the United States. AP-238, 2-methyl AP-237, and *para*-methyl AP-237 are structural isomers, sharing the same formula and parent mass; however, their chemical behaviors and mass fragmentation patterns differ, allowing for differentiation during analytical testing. AP-238, AP-237, 2-methyl AP-237, *para*-methyl AP-237 and other analogues in this sub-class are not explicitly scheduled in the United States.

5. ADDITIONAL RESOURCES

https://www.caymanchem.com/product/31128/ap-238-(hydrochloride)

https://www.policija.si/apps/nfl_response_web/0_Analytical_Reports_final/AP-238-ID-2185-20_report.pdf

6. QUALITATIVE DATA

6.1 GAS CHROMATOGRAPHY MASS SPECTROMETRY (GC-MS)

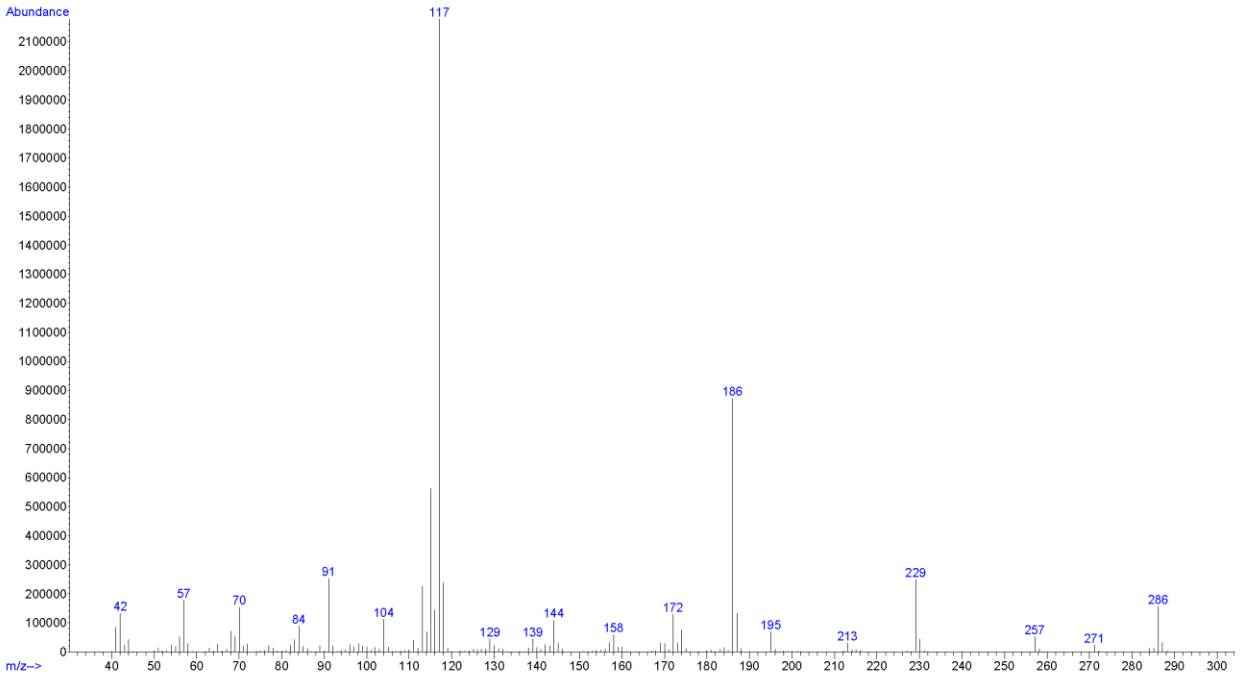
Testing Performed At: The Center for Forensic Science Research and Education at the Fredric Rieders Family Foundation (Willow Grove, PA)

Sample Preparation: Standard diluted in methanol

Instrument: Agilent 5975 Series GC/MSD System

Standard: Reference material for AP-238 (Batch: 0592812-2) was purchased from Cayman Chemical (Ann Arbor, MI, USA). (https://www.caymanchem.com/product/31128/ap-238-(hydrochloride))

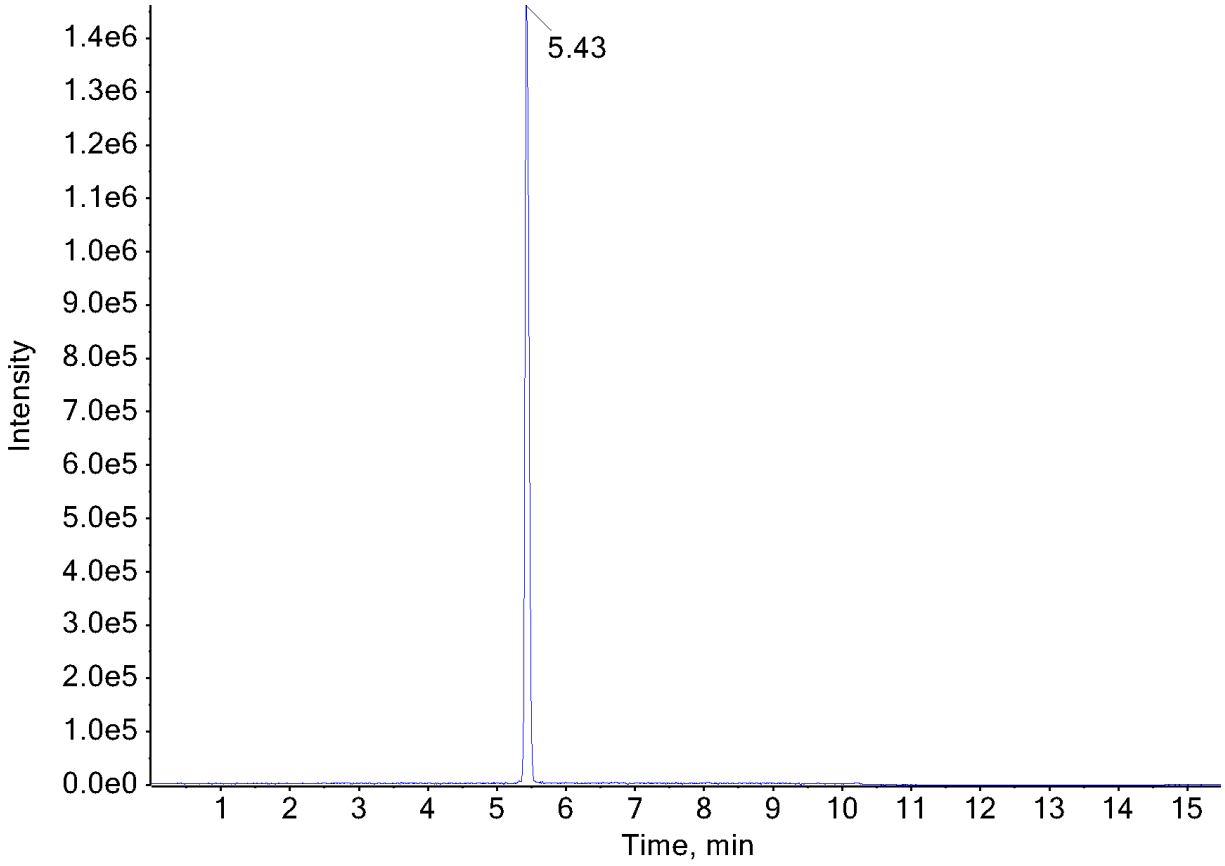
EI (70 eV) Mass Spectrum: AP-238



6.2 LIQUID CHROMATOGRAPHY QUADRUPOLE TIME-OF-FLIGHT MASS SPECTROMETRY (LC-QTOF-MS)

Testing Performed At:	The Center for Forensic Science Research and Education at the Fredric Rieders Family Foundation (Willow Grove, PA)
Sample Preparation:	No additional preparation - direct analysis of sample extract
Instrument:	Sciex TripleTOF® 5600+, Shimadzu Nexera XR UHPLC
Column:	Phenomenex® Kinetex C18 (50 mm x 3.0 mm, 2.6 µm)
Mobile Phase:	A: Ammonium formate (10 mM, pH 3.0)
	B: Methanol/acetonitrile (50:50)
	Flow rate: 0.4 mL/min
Gradient:	Initial: 95A:5B; 5A:95B over 13 min; 95A:5B at 15.5 min
Temperatures:	Autosampler: 15 °C
	Column Oven: 30 °C
	Source Heater: 600 °C
Injection Parameters:	Injection Volume: 10 µL
QTOF Parameters:	TOF MS Scan Range: 100-510 Da
	Precursor Isolation: SWATH® acquisition (27 windows)
	Fragmentation: Collison Energy Spread (35±15 eV)
	MS/MS Scan Range: 50-510 Da
Retention Time:	5.43 min
Standard Comparison:	Reference material for AP-238 (Batch: 0592812-2) was purchased from Cayman Chemical (Ann Arbor, MI, USA). Analysis of this standard resulted in positive identification of the analyte in the extract as AP-238, based on retention time (5.53 min) and mass spectral data. (https://www.caymanchem.com/product/31128/ap-238-(hydrochloride))

Extracted Ion Chromatogram (XIC): AP-238



TOF MS (Top) and MS/MS (Bottom) Spectra: AP-238