

AN UPDATE ON THE PRESENCE OF BTMPS IN THE DRUG SUPPLY AND THE DISCOVERY OF TETRAMETHYLFENTANYL-RELATED SUBSTANCES

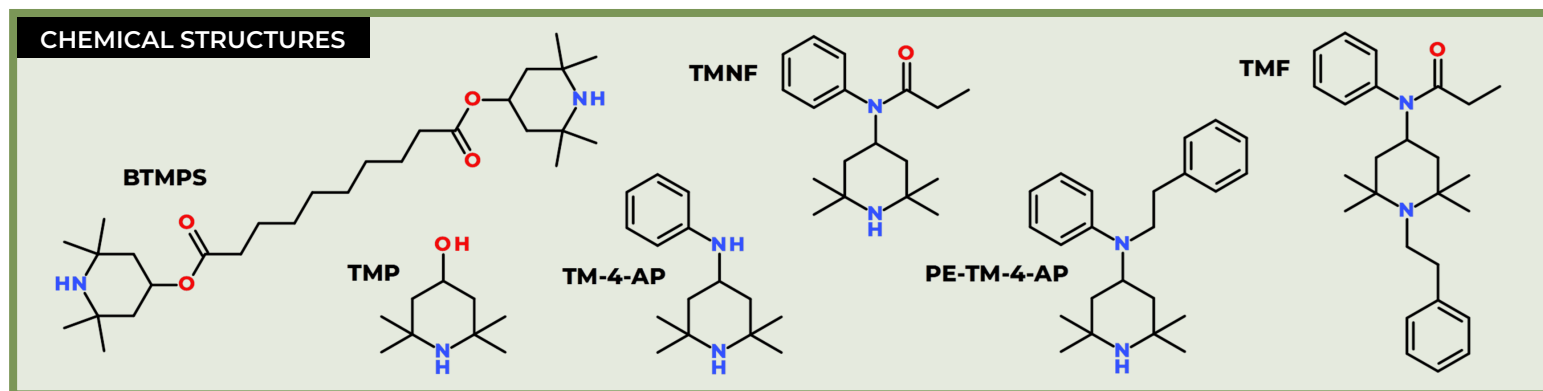
PURPOSE: In collaboration with the Drug Enforcement Administration (DEA), the Center for Forensic Science Research and Education (CFSRE)'s NPS Discovery program has developed this report to notify public health, public safety, forensic and clinical laboratories, clinicians, medical examiners and coroners, and all other related communities about new information surrounding the emergent adulterant **BTMPS** and newly discovered **fentanyl-related substances**.

BACKGROUND: BTMPS, also referred to as bis(2,2,6,6-tetramethyl-4-piperidyl)sebacate or Tinuvin 770, is an industrial chemical that began appearing in June 2024 in the recreational opioid supply as an adulterant alongside fentanyl. BTMPS is used as a light stabilizer and was initially evaluated for use in plastic materials. Early on, the presence of BTMPS in the drug supply was perplexing to forensic scientists and chemists. Some suggested its use could be related to perceived enhancement of pharmacological effects of fentanyl or more simply as a cutting or bulking agent. The chemical structure of BTMPS is dissimilar from most forensically relevant drugs; however, it contains substituted piperidine rings — a similar core moiety to fentanyl. In early to mid-2025, forensic laboratories began detecting substances with chemical linkages to BTMPS, including tetramethyl-4-piperidinol, and soon after substances with ties to fentanyl, including 4-AP and norfentanyl variants. The emergence of these substances and relevant intelligence information indicate the manufacture of fentanyl-related precursors, byproducts, and perceived intermediates from BTMPS.

SUMMARY: BTMPS has been detected in all regions across the United States, demonstrating vast prevalence. BTMPS has appeared in more than 600 drug materials tested by our laboratory. Tetramethyl-4-piperidinol (TMP) was first detected in August 2024 and since has appeared in more than 20 drug materials. Tetramethyl-4-AP (TM-4-AP) and tetramethylnorfentanyl (TMNF) were first detected in April 2025 and since have appeared in more than ten drug materials, often together. To date, a substance suspected of being tetramethylfentanyl (TMF) has been identified in only small (or trace) amounts alongside these other related substances; however, confirmation of this substance is pending acquisition of a standard reference material.



SUBSTANCE	FORMULA	MOLECULAR ION [M+]	EXACT MASS [M+H] ⁺	GC-MS FRAGMENT IONS
BTMPS	C ₂₈ H ₅₂ N ₂ O ₄	480	481.4000 [2 ⁺ : 241.2036]	342, 140, 124*, 98, 58
Tetramethyl-4-Piperidinol (TMP)	C ₉ H ₁₉ NO	157	158.1539	142*, 124, 98, 86, 58
Tetramethyl-4-AP (TM-4-AP)	C ₁₅ H ₂₄ N ₂	232	233.2012	217, 175, 160, 140, 124, 98*, 77, 58
Tetramethylnorfentanyl (TMNF)	C ₁₈ H ₂₆ N ₂ O	288	289.2274	273, 140, 124*, 98, 77, 58
N-Phenethyl Tetramethyl-4-AP (PE-TM-4-AP)	C ₂₃ H ₃₂ N ₂	336	337.2638	245, 140*, 115, 98, 77, 58
2,2,6,6-Tetramethylfentanyl (TMF)	C ₂₆ H ₃₆ N ₂ O	392	393.2900	301, 160, 105, 70 <i>[Pending confirmation by standard]</i>



#	DATE	REGION	BTMPS	TMP	TM-4-AP	TMNF	PE-TM-4-AP	TMF	OTHER NOTABLE SUBSTANCES
1	Aug. 2024	East	X	X					Fentanyl, Tetracaine, Medetomidine
2	Aug. 2024	Midwest	X	X					Fentanyl
3	Oct. 2024	East	X	X	X	X	X		Heroin, Cocaine
4	Dec. 2024	East	X	X					Fentanyl, Xylazine, Lidocaine
5	Dec. 2024	West	X	X					Fentanyl, pFF
6	Dec. 2024	Southwest	X			X			Fentanyl, Lidocaine
7	Jan. 2025	East		X	X	X	X		N/A
8	Jan. 2025	Midwest	X	X	X	X	X		Fentanyl, Lidocaine
9	Feb. 2025	East		X					N/A
10	Mar. 2025	Southwest	X		X	X	X	X	Fentanyl, Lidocaine
11	Apr. 2025	East		X	X	X			Fentanyl, Lidocaine
12	Apr. 2025	East	X		X	X			Fentanyl, Lidocaine
13	Apr. 2025	East	X		X	X			Fentanyl, Xylazine, Lidocaine
14	Apr. 2025	West			X	X			Fentanyl, Lidocaine
15	May 2025	East	X	X					Fentanyl, pFF, Xylazine, Lidocaine
16	May 2025	East	X		X	X	X	X	Fentanyl, Carfentanyl, Lidocaine
17	May 2025	East			X	X			Fentanyl, Tetracaine, Medetomidine

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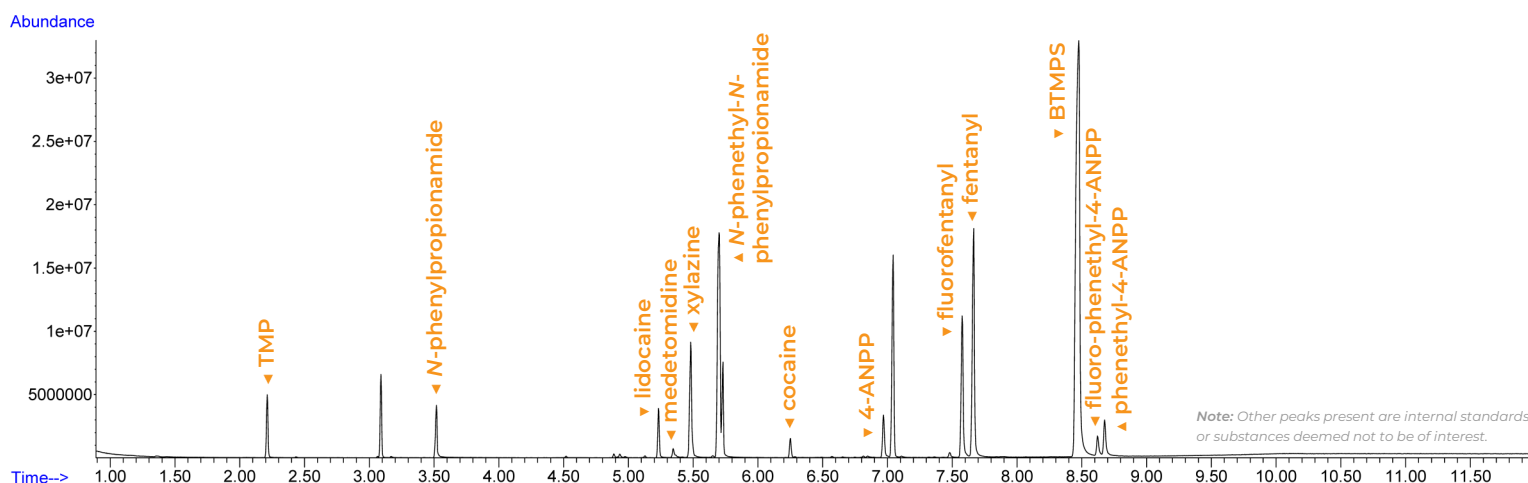
The opinions, findings, conclusions and/or recommendations expressed in this publication are those of the author(s) and do not necessarily represent official position or policies of the NIJ, DEA, DOJ, DOS, INL, or any other entity.

FOR ADDITIONAL INFORMATION: Contact our laboratory via npsdiscovery@cfsre.org or visit www.npsdiscovery.org.

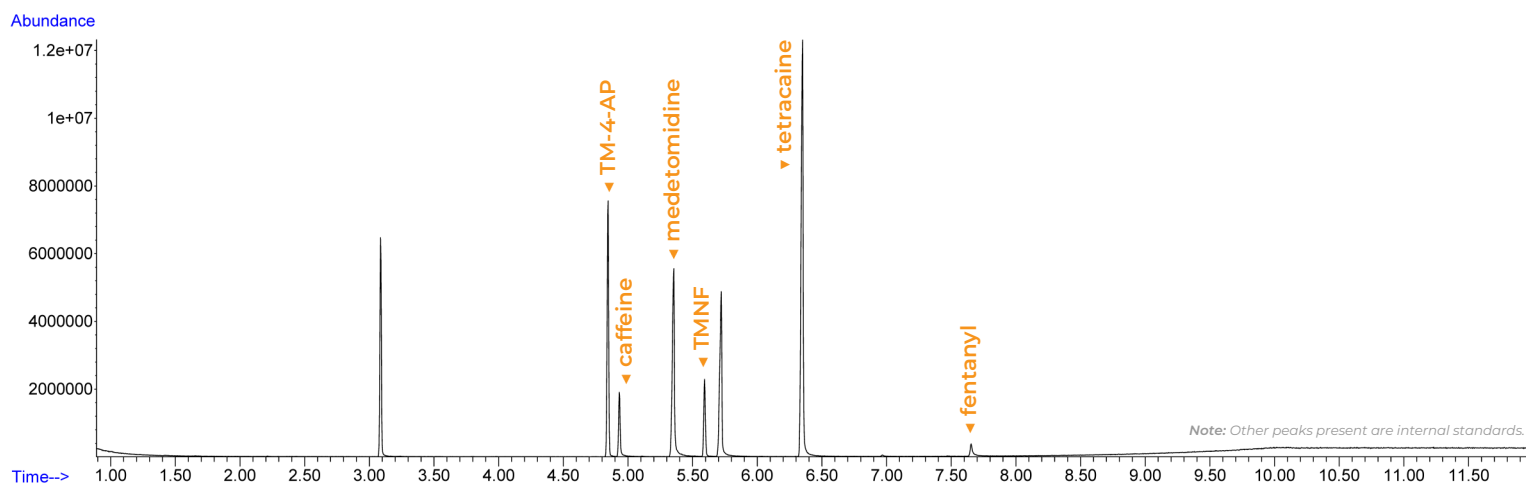
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EXAMPLE CHROMATOGRAM OF A DRUG MATERIAL CONTAINING BTMPS, TMP, AND OTHER SUBSTANCES (MAY 2025)



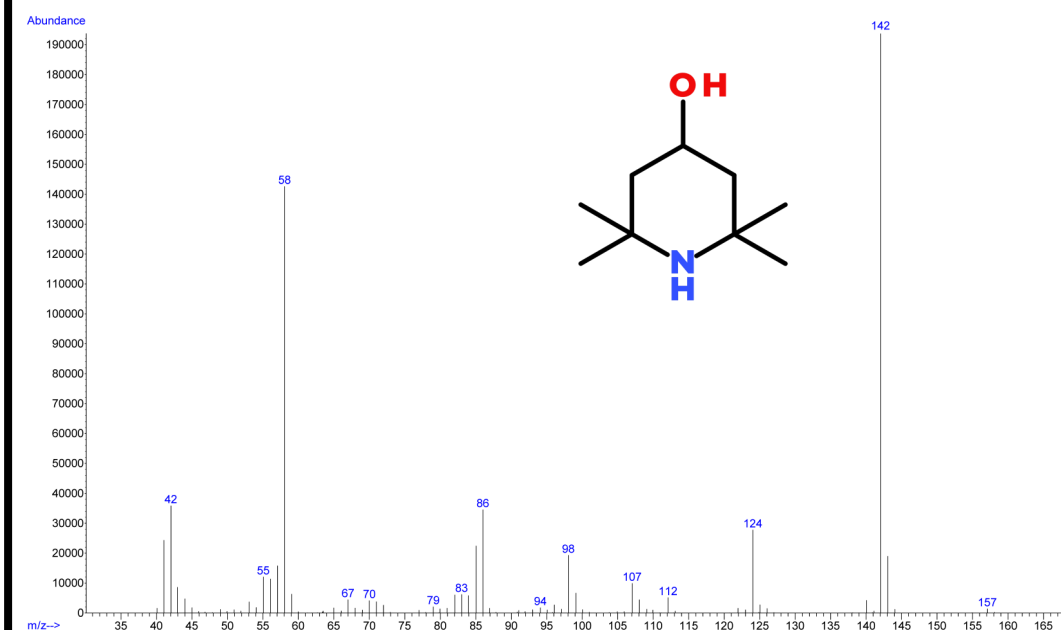
EXAMPLE CHROMATOGRAM OF A DRUG MATERIAL CONTAINING TM-4-AP, TMNF, AND OTHER SUBSTANCES (MAY 2025)



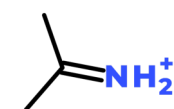
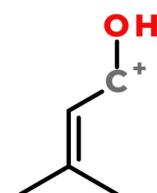
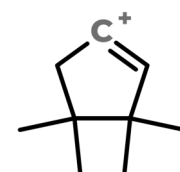
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Tetramethyl-4-Piperidinol (TMP)

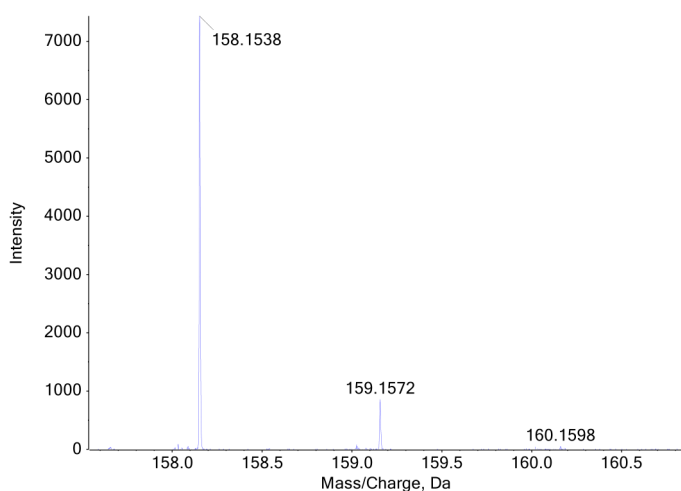
GC-MS: Mass Spectrum (EI 70 eV)



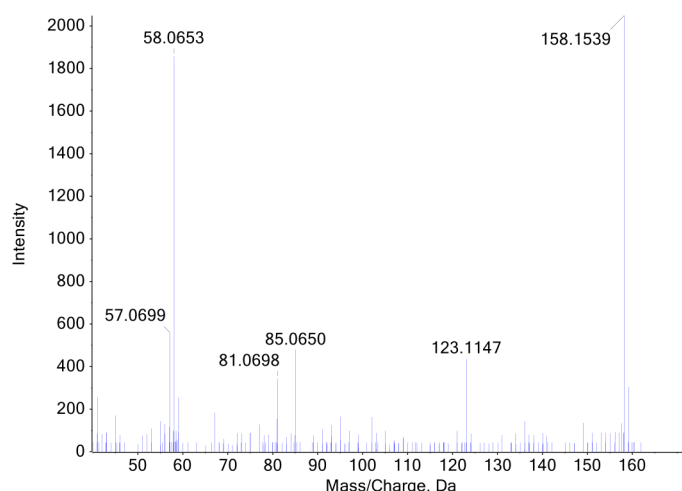
LC-QTOF-MS/MS Fragmentation



LC-QTOF-MS: $[M+H]^+$ TOF-MS



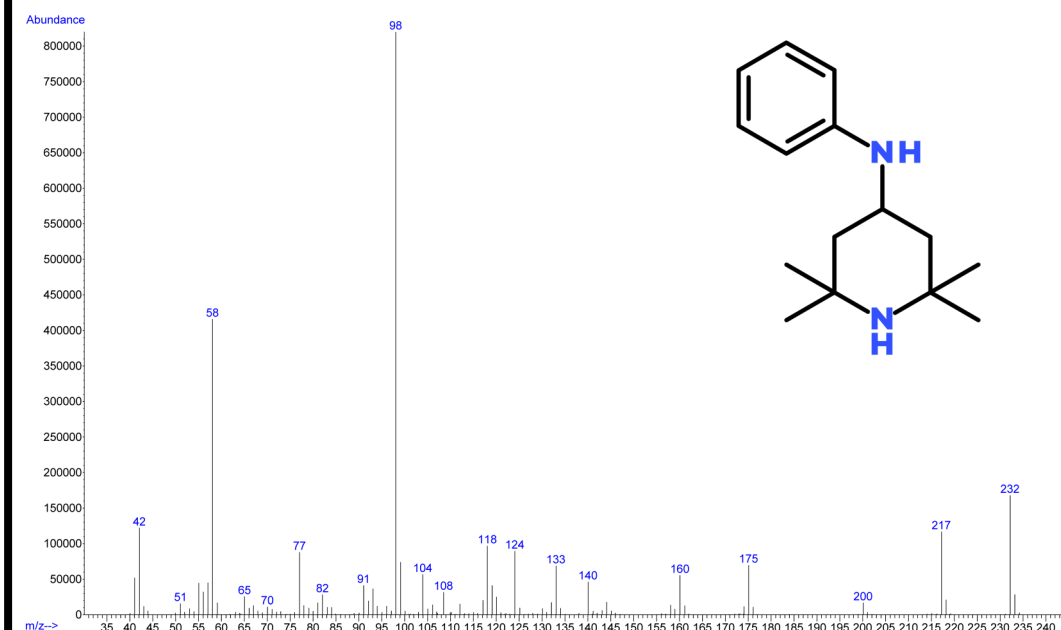
LC-QTOF-MS: $[M+H]^+$ TOF-MS/MS



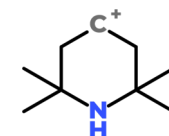
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Tetramethyl-4-AP (TM-4-AP)

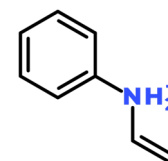
GC-MS: Mass Spectrum (EI 70 eV)



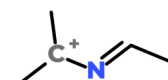
LC-QTOF-MS/MS Fragmentation



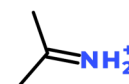
Exact Mass: 140.1439



Exact Mass: 120.0813

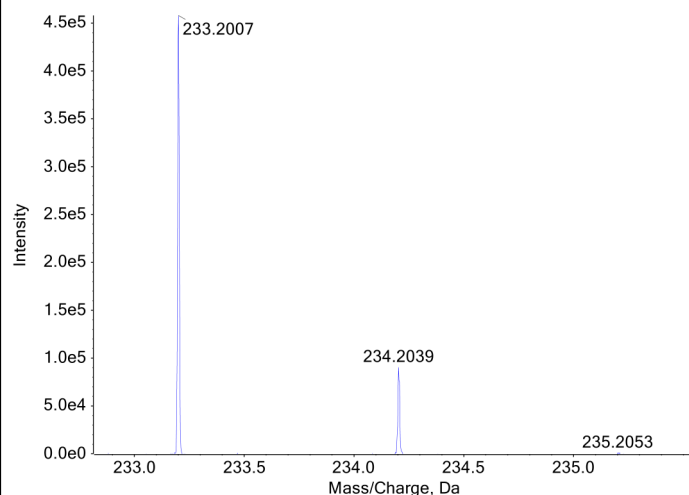


Exact Mass: 84.0813

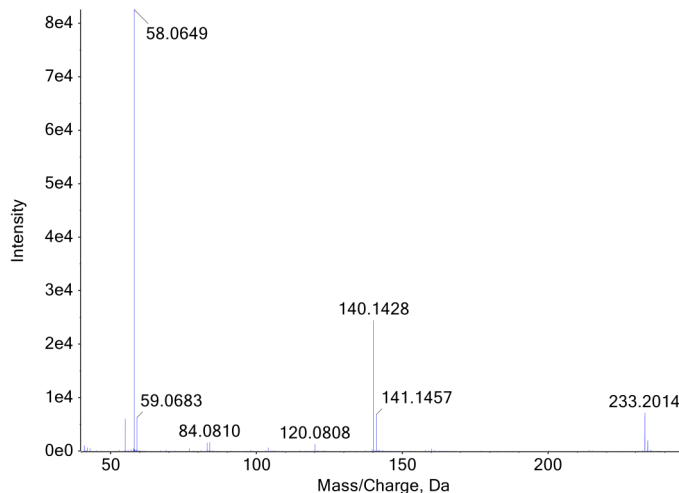


Exact Mass: 58.0657

LC-QTOF-MS: $[M+H]^+$ TOF-MS



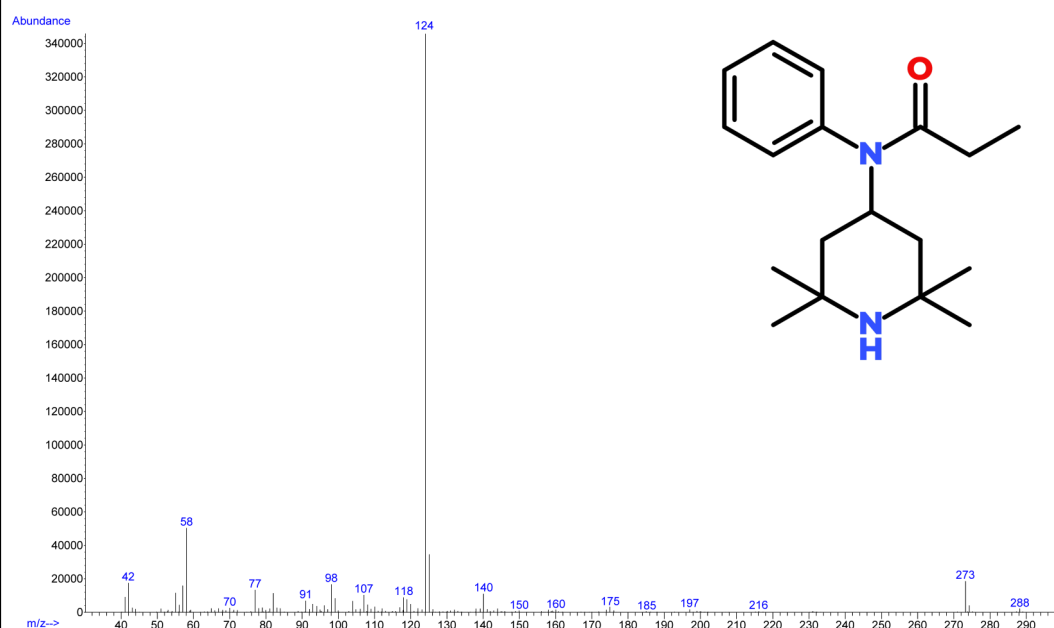
LC-QTOF-MS: $[M+H]^+$ TOF-MS/MS



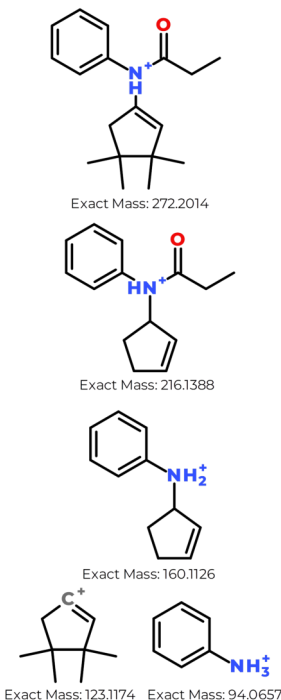
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Tetramethylnorfentanyl (TMNF)

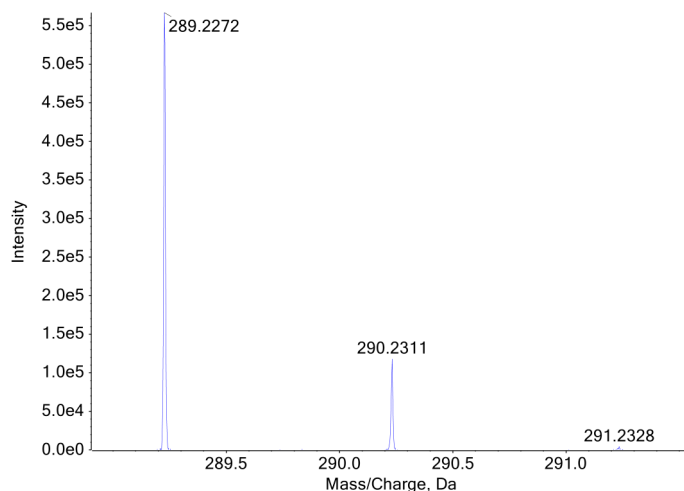
GC-MS: Mass Spectrum (EI 70 eV)



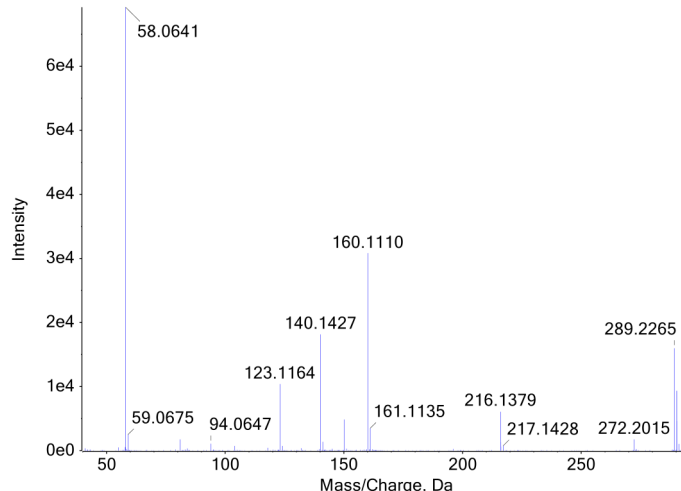
LC-QTOF-MS/MS Fragmentation



LC-QTOF-MS: [M+H]⁺ TOF-MS

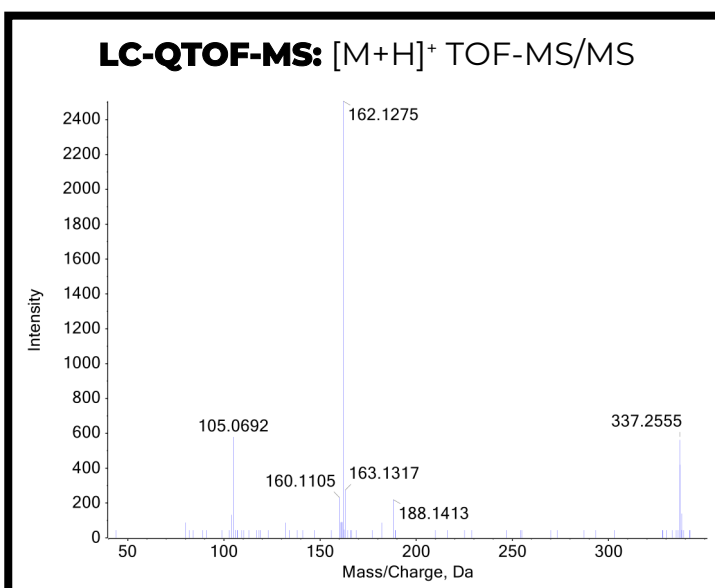
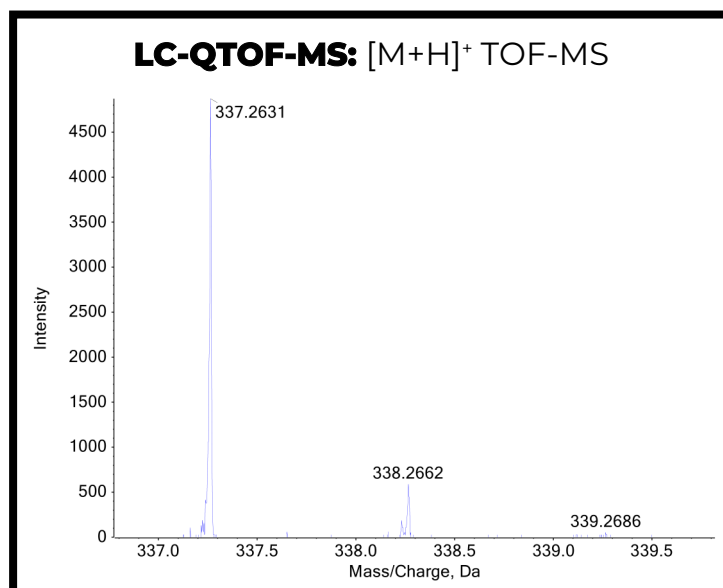
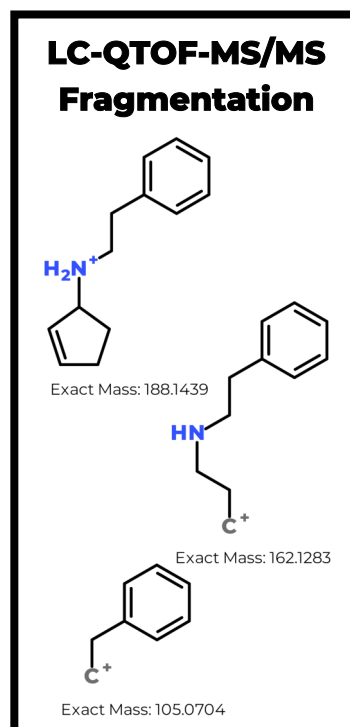
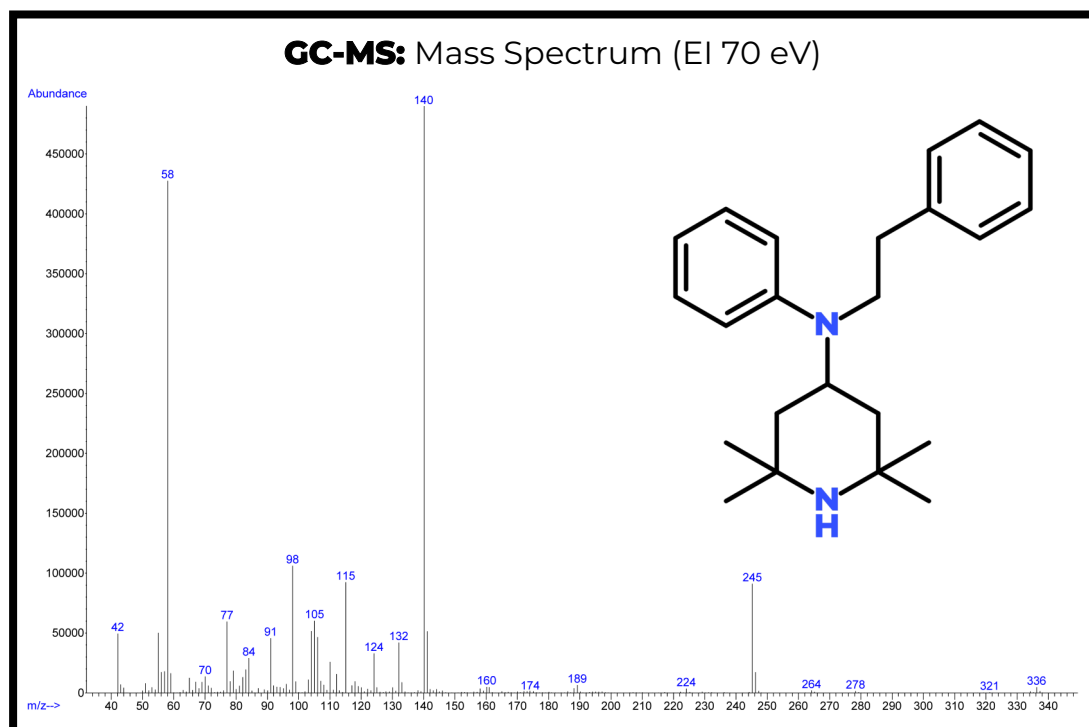


LC-QTOF-MS: [M+H]⁺ TOF-MS/MS



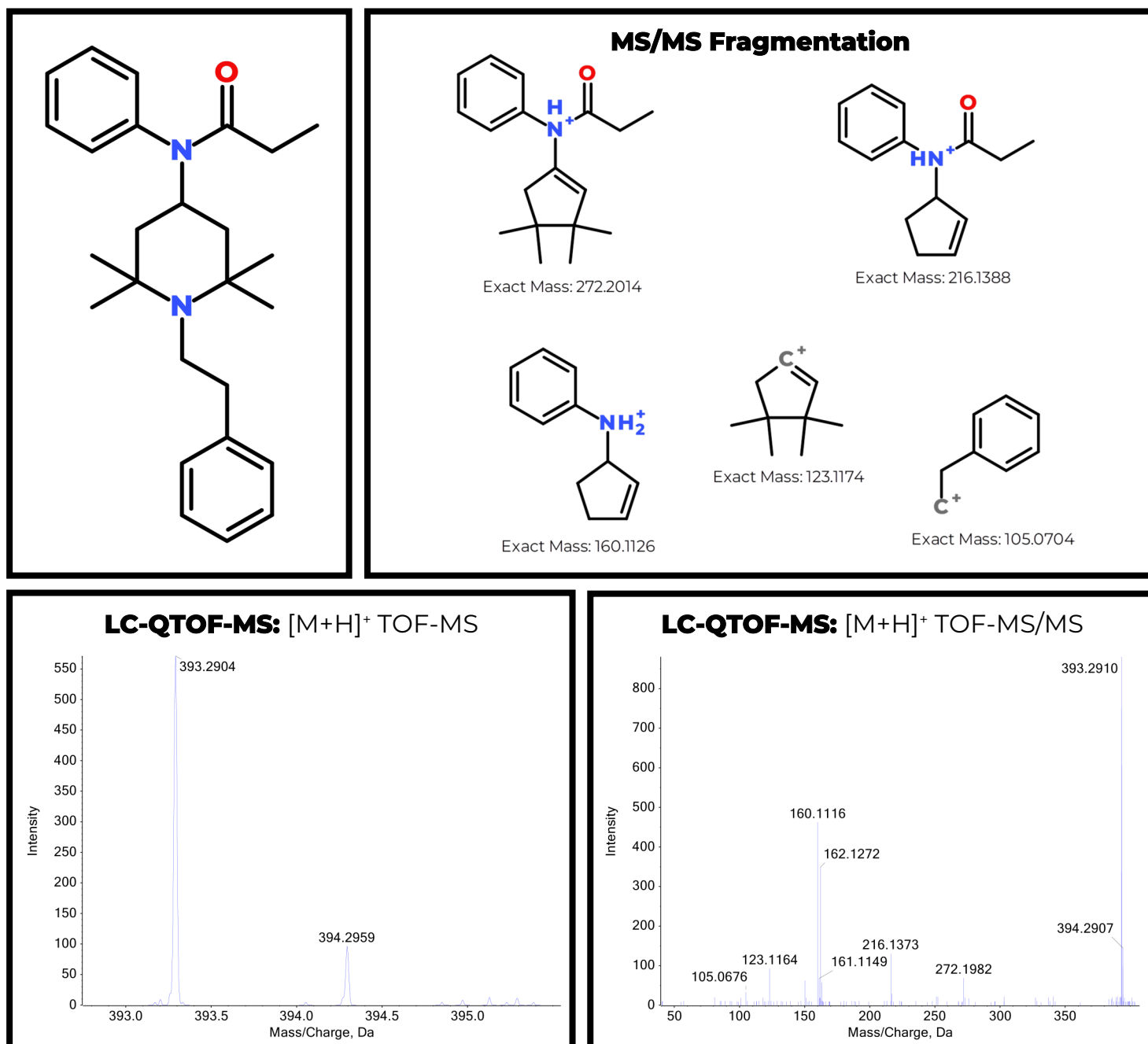
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N-Phenethyl Tetramethyl-4-AP (PE-TM-4-AP)



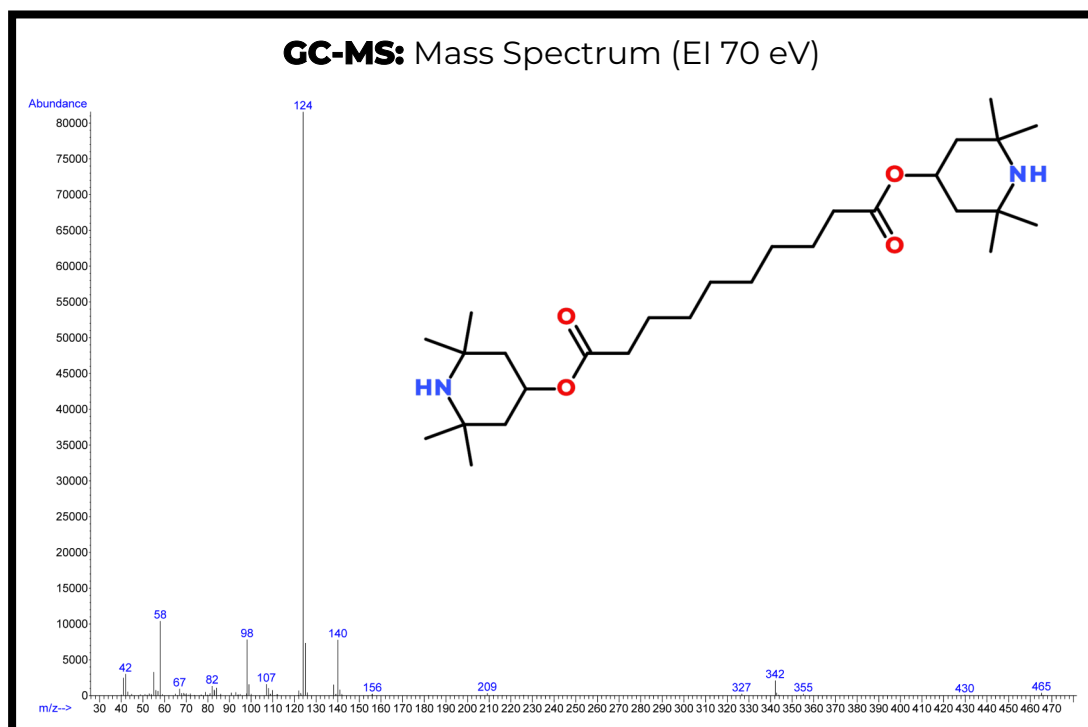
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2,2,6,6-Tetramethylfentanyl (TMF)



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BTMPS



**For More Information
and Data, Access Our
NPS Discovery New
Drug Monograph For
BTMPS (May 2024)**



NPS Discovery – New Drug Monograph

2024

BTMPs



NPS SUBCLASS
Miscellaneous
REPORT DATE
September 5, 2024
SAMPLE RECEIVED
June 12, 2024
SAMPLE TYPE
Drug Material

Preferred Name	BTMPs
Synonyms	BUS2328 (transmorphine-4-epibuprenorphine), Transyn 751, HX16725
Formal Name	BUS2328 (transmorphine-4-epibuprenorphine) decanoate
ICH1 Key	NTBRLQKQKXJGKJBN LHWFYADGSA N
CAS Number	82491-01-9
Chemical Formula	C ₂₈ H ₄₂ O ₆
Molecular Weight	480.7
Molecular Ion [M+]	460
Exact Mass [M+2H+]	461.4000
Exact Mass [M+2H+]	242.2036

