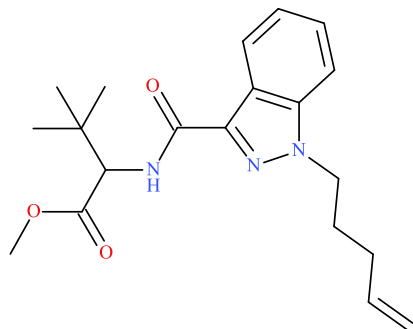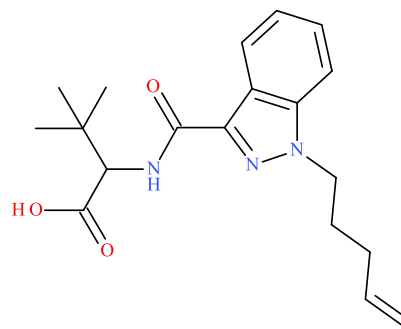# Trend Report: Q4 2019

Synthetic Cannabinoids in the United States

MDMB-4en-PINACA Increasing in Prevalence
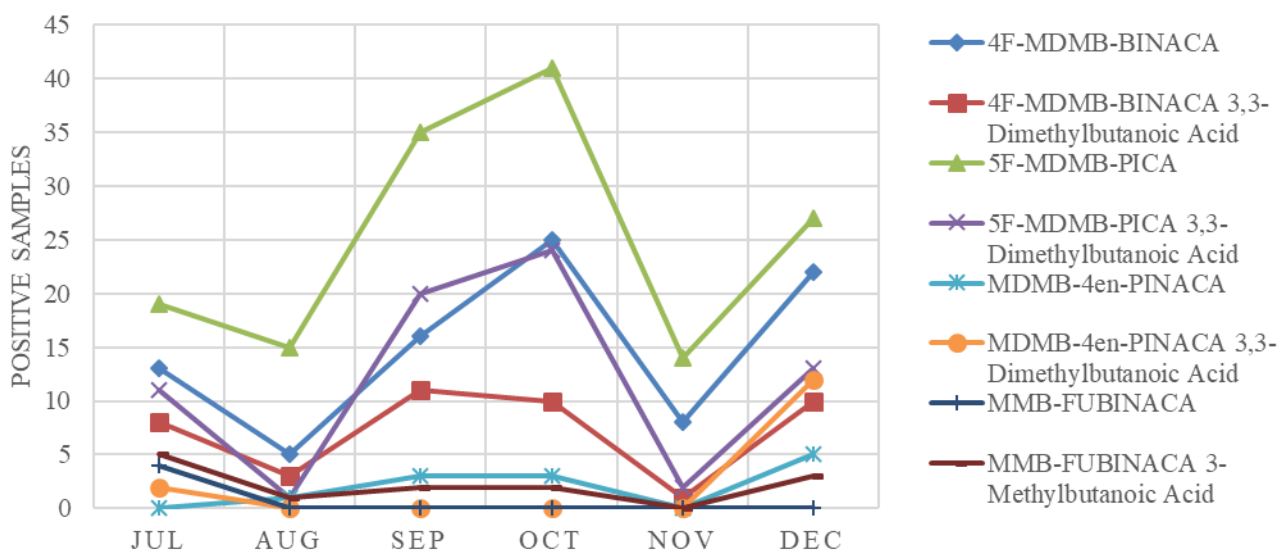
MDMB-4en-PINACA
First Identification: August 2019

MDMB-4en-PINACA
3,3-Dimethylbutanoic Acid

Synthetic Cannabinoid Positivity: July to December 2019 (by Month Analyzed)

Reduced number of samples analyzed in November 2019

Purpose

The objective of this report is to provide up-to-date information regarding the status of synthetic cannabinoid prevalence, positivity, and discovery within the United States.

Project Overview

Novel psychoactive substances (NPS), including synthetic cannabinoids, continue to provide great challenges for forensic scientists, clinicians, and public health and safety personnel. Synthetic cannabinoids have been implicated in an increasing number of emergency room admissions, death investigations, and intoxication events in corrections populations. Maintaining a current scope of analysis can be challenging, often requiring availability of comprehensive analytical methodologies and reference materials for identifications.

This project employs a novel approach to analysis of biological samples and extracts by comprehensive non-targeted data acquisition using liquid chromatography high resolution quadrupole time-of-flight mass spectrometry (LC-QTOF). The scope of analysis contains more than 250 synthetic cannabinoid parent compounds and metabolites. Sample analysis and data processing occur on a weekly basis. In addition, retrospective analysis of datafiles is conducted as new synthetic cannabinoid standards become available. This model allows for real-time identification of novel synthetic cannabinoids and trend analyses.

Our laboratory has paired with various institutions to identify at-risk populations associated with synthetic cannabinoid use. Biological samples have been received from forensic laboratories, clinical partnerships, and/or correctional facilities from individuals involved in death investigations, driving under the influence scenarios, hospitalizations, and/or intoxications.

In collaboration with NMS Labs, sample extracts were received during this reporting period from forensic casework where for cause testing was directed for synthetic cannabinoids using a regularly updated panel. In total, cases were submitted from 39 states and the District of Colombia.

Acknowledgements

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Disclaimer

All positive identifications were made based on extensive review of analytical data in comparison to acquired reference materials. Identifications of all chemically similar isobaric species may not have been achieved; therefore, reported analytes could encompass additional species not distinguishable solely by chromatographic or mass spectral features.

Trend Analysis for Synthetic Cannabinoids

From October to December 2019, seven synthetic cannabinoid parent compounds and nine synthetic cannabinoid metabolites were positively identified in 160 (12.5%) biological specimens or sample extracts after the analysis of 1,284 total samples. 5F-MDMB-PICA (n=82) was detected in the highest frequency, followed by 4F-MDMB-BINACA (n=55) and MDMB-4en-PINACA (n=8). Several samples were positive for more than one synthetic cannabinoid, including parent compounds and/or metabolites. The following tables and figures are based on data from October to December 2019, unless otherwise noted.

Table 1: Positive Findings for Synthetic Cannabinoids (Parent)

Analyte (Parent)	Positive Samples	Positivity (%)
5F-MDMB-PICA	82	6.4%
4F-MDMB-BINACA	55	4.3%
MDMB-4en-PINACA	8	0.6%
ADB-FUBINACA	3	0.2%
ACHMINACA	2	0.2%
APP-BINACA	1	0.08%
EMB-FUBINACA	1	0.08%

Table 2: Positive Findings for Synthetic Cannabinoids (Metabolites)

Analyte (Metabolite)	Positive Samples	Positivity (%)
5F-MDMB-PICA 3,3-Dimethylbutanoic Acid	39	3.0%
4F-MDMB-BINACA 3,3-Dimethylbutanoic Acid	21	1.6%
5OH-MDMB-PICA	16	1.2%
MDMB-4en-PINACA 3,3-Dimethylbutanoic Acid	12	0.9%
2-COOH-MDMB-PICA	5	0.4%
MMB-FUBINACA 3-Methylbutanoic Acid	5	0.4%
4OH-MDMB-BINACA	4	0.3%
5F-ADB 3,3-Dimethylbutanoic Acid	3	0.2%
5F-PB-22 3-Carboxyindole	3	0.2%

Table 3: Synthetic Cannabinoid Combinations

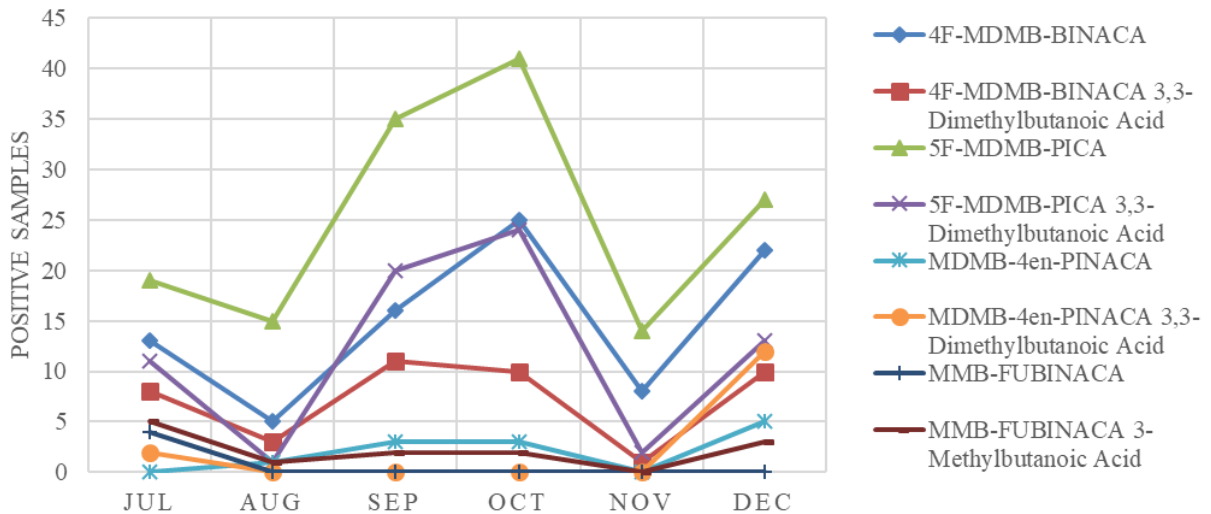| Analyte Combinations	Positive Samples
5F-MDMB-PICA + 4F-MDMB-BINACA	15
5F-MDMB-PICA + 4F-MDMB-BINACA + MDMB-4en-PINACA	3
4F-MDMB-BINACA + MDMB-4en-PINACA	2
5F-MDMB-PICA + ADB-FUBINACA	2
5F-MDMB-PICA + MDMB-4en-PINACA	2
4F-MDMB-BINACA + EMB-FUBINACA	1
5F-MDMB-PICA + 4F-MDMB-BINACA + APP-BINACA	1
5F-MDMB-PICA + 4F-MDMB-BINACA + MMB-FUBINACA + ACHMINACA	1
5F-MDMB-PICA + ACHMINACA	1

Figure 1: Synthetic Cannabinoids Positivity Trend Plot

(Plotted by Month Analyzed; July to December 2019)

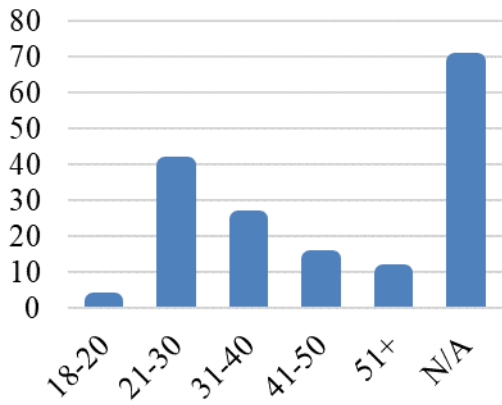**Reduced number of samples analyzed in November 2019*
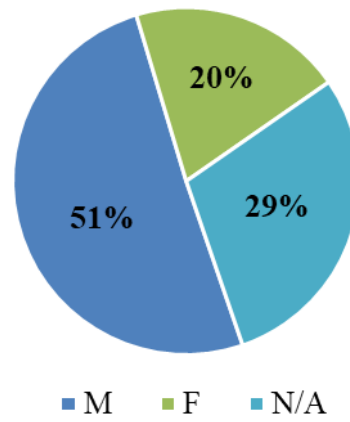
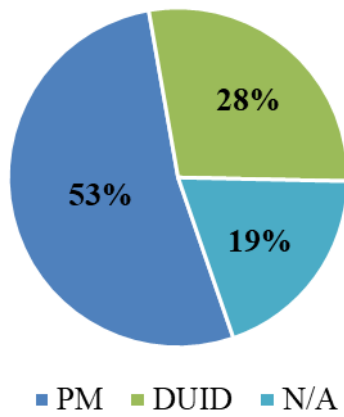*Figure 2: Age (n=160)*

Figure 3: Sex (n=160)
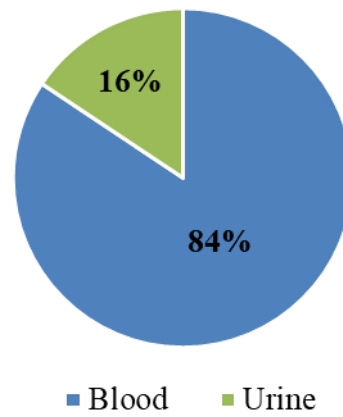

Figure 4: Case Type (n=160)
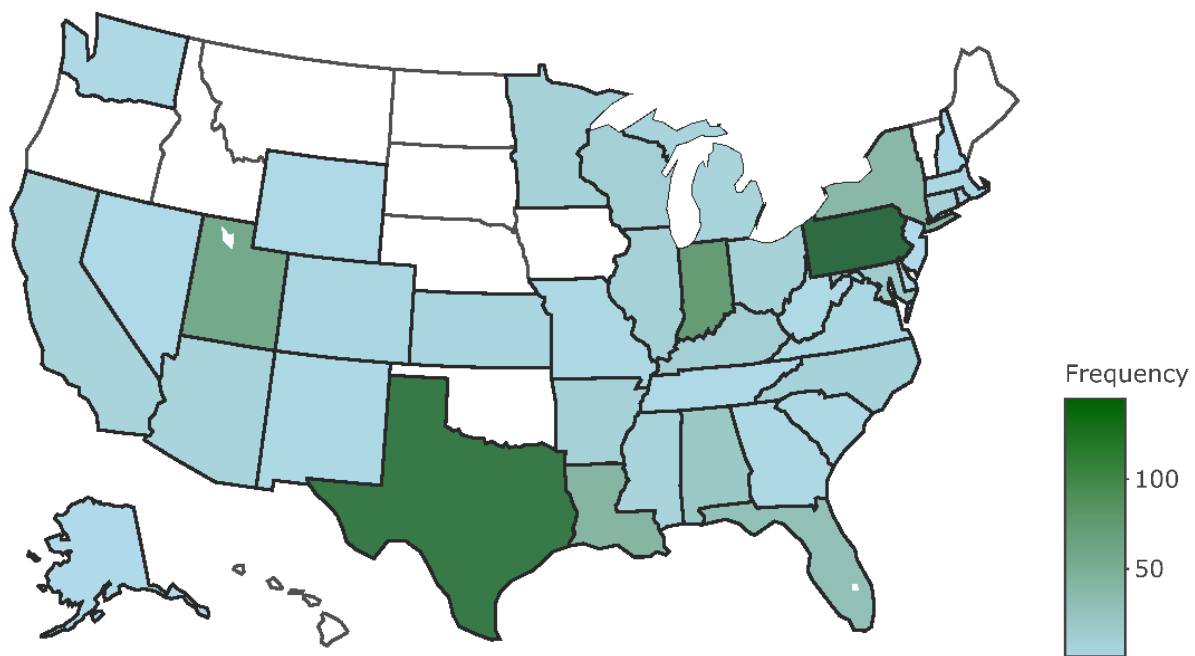

Figure 5: Matrix Type (n=160)

Figure 6: Heat Map of Synthetic Cannabinoid Positivity (July 2018 to December 2019)*

*Geographical distribution may be limited by location of agencies submitting samples and not necessarily representative of all jurisdictions.

Glossary of Synonyms

Reported Name	Synonym(s)
4F-MDMB-BINACA	4F-MDMB-BUTINACA
5F-ADB	5F-MDMB-PINACA
ACHMINACA	Adamantyl-CHMINACA
APP-BINACA	APP-BUTINACA
MMB-FUBINACA	FUB-AMB, AMB-FUBINACA