# Synthetic Drug Threats in the United States

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### **Overview of Synthetic Drugs**

Synthetic drugs are man-made substances such as:

- Methamphetamine
- MDMA
- PCP









# Overview of Emerging Synthetic Drug Threats







#### SYNTHETIC CANNABINOIDS



#### What are Spice and K2?

"Spice" and "K2" were the earliest brand names of an herbal smoking blend that contained a synthetic cannabinoid.



Other terms used: herbal smoking blends, synthetic smoking blends, herbal incense

#### Synthetic Cannabinoids ≠ Synthetic Marijuana

















### Packaging



#### NOT FOR HUMAN CONSUMPTION.

This product complies with emergency scheduling of JWH 018, JWH 073, JWH 200, CP4, 497, and Cannabicyclohexanol, Lab report available on request.

THIS KILLER INCENSE IS AN EXOTIC BLEND THAT RELEASES A SUPERBLY RICH AROMA WHEN BURNED. ENJOY THE ENCHANTING AROMA OF THIS KILLER INCENSE.

THE INGREDIENTS IN THIS KILLER INCENSE INCLUDE EXTRACTS AND PLANT MATERIAL FROM THE FOLLOWING HERBS: PUKATEA, NZ LIVERWORT, DAMIANA, LEONOTIS, BLUE LOTUS EXTRACT, VERBASCUM THAPSUS, RED CLOVER, VANILLA AND HONEY.



- Not for human consumption
- "Lab Tested"
- Keep out of reach of children
- Retailers take no responsibility...
- For aromatherapy only...
- DEA Compliant
- Legal in all 50 states



# Synthetic Cannabinoid Processing











#### Synthetic Cannabinoid Processing









#### **Dosing the Plant Material**

# The process can result in "hot spots" and inconsistent dosing





### A little history...

- 1980s-1990s: Developed as part of medicinal research
- 2006: First smoking blend seen in 2006\*
- 2008: TC Pharma reports JWH-018 in a blend
- 2009: CP-47,497 reported in a blend
- 2009: European countries begin controlling
- 2009: K2 enters the market
- 2011: DEA emergency scheduling of 5 cannabinoids
- 2012: Synthetic Drug Abuse Prevention Act takes effect
- 2013: DEA emergency scheduling of 3 additional cannabinoids
- 2014: DEA emergency scheduling of 4 more cannabinoids
- 2015: DEA emergency scheduling of 3 other cannabinoids



#### Cannabinoids by Year

2009/2010 2011 2012		2013	2014	2015	
JWH-018 JWH-073 JWH-250 CP-47,497	JWH-019 JWH-081 JWH-122 JWH-200 AM2201 AM694 RCS-4 RCS-8	JWH-203 UR-144 A 796,260 5F-UR-144 2NE1 STS-135 AKB48 AB-001	MN-24 (NNE1) AB-FUBINACA ADB-FUBINACA AB-PINACA 5F-AB-PINACA PB-22 FUB-PB-22 THJ-018	AB-CHMINACA FDU-PB-22 NM2201 SDB-005 5F-AMB 5F-NPB-22 UR-144 Indazole EG-018	PX-2 MAB-CHMINACA MDMB-CHMICA APP-CHMINACA 5F-MDMB-PINACA MDMB-FUBINACA



#### **Evolution of Cannabinoids**



# What are all these letters and numbers?!?

- Developer/institution
- JWH = John W. Huffman
- AM = Alexandros Makriyannis
- o Website
- RCS-4 (SR-19, BTM-4)
- RCS-8 (SR-18, BTM-8)
- o Pharmaceutical companies
- A = Abbott Laboratories
- WIN = Sterling Winthrop

- Pop culture references
- 2NE1
- AKB48
- STS135
- XLR-11
- BB-22
- o Chemical names
- QUPIC (PB-22)
- AB-FUBINACA
- AB-PINACA

N-(1-Amino-3-methyl-1-oxoButan-2-yl)-1-(Pentyl-1H-INdAzole-3-CarboxAmide)



### Forensic Analysis of Scooby Snax



Date Seized	Substance Identified
6/18/2013	5F-UR-144
6/18/2013	5F-PB-22
6/20/2013	PB-22 5F-UR-144 5F-PB-22
2/21/2014	5F-UR-144 PB-22
3/27/2014	5F-UR-144 AB-FUBINACA



#### **E-Cigarettes**



**AB-PINACA** and nicotine



**AB-FUBINACA** 





**AB-FUBINACA** 



#### **Cannabinoid Adulteration**

Date Seized	Location of Seizure	Substances Identified
01/2015	South Central	THJ-2201, dimethyl sulfone
01/2015	Southeast	5F-AMB, nicotine
01/2015	South Central	AB-FUBINACA, 5F-AB-PINACA, dimethyl sulfone
02/2015	North Central	FDU-PB-22, PB-22, lidocaine
02/2015	Mid-Atlantic	5F-UR-144, 5Cl-UR-144, dimethyl sulfone
02/2015	Southeast	5F-UR-144, AB-CHMINACA, nicotine
03/2015	Southeast	UR-144, AB-PINACA, dimethyl sulfone
03/2015	Western	AB-CHMINACA, caffeine
04/2015	Southeast	AB-FUBINACA, dimethyl sulfone
05/2015	South Central	AB-FUBINACA, caffeine



This data was compiled from analytical results entered in the DEA LIMS. It encompasses exhibits seized 01/01/2015 through 06/30/2015 that were analyzed by 06/30/2015. This data is subject to change as the laboratory system obtains reference materials and analyzes exhibits in the backlog.



#### 2015 National Trends – Cannabinoids Identified



Notes:

1) This data was compiled from analytical results from the DEA laboratory system. It encompasses exhibits seized 01/01/2015 through 12/31/2015 that were analyzed by 12/31/2015. This data is subject to change as the laboratory system obtains reference materials and analyzes exhibits in the backlog.



#### 2015 National Trends – Cannabinoids Identified



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#### SYNTHETIC CATHINONES



#### What are "bath salts"?

"Bath salts" are a designer drug typically containing synthetic cathinones or phenethylamines.

Like smoking blends, "bath salts" are often marketed as "legal highs" and are labeled with "Not for Human Consumption" and "Does Not Contain" statements.





Also called: plant food, glass cleaner, bug repellant, and research chemicals





### Synthetic Cathinones



- "Bath salt" phenomenon has diminished
- Compounds are still found, but no longer in commercial packaging



### **Bulk Packaging**

The synthetic cathinone is imported into the US

Packages are often mislabeled to get through Customs







#### **Bulk Powder**

- Currently no known domestic synthesis
- Typically powders enter the country pure and are cut here







### A little history...

- 1920s: Cathinones, such as mephedrone, were first synthesized
- 2007: Mephedrone (followed soon by others) first appeared in Israel, then later in the UK and Australia
- 2009: Use becomes popular in Europe (from drug dealers or websites)
- 2010: Use becomes prevalent in the US (from convenience stores, head shops, or websites)
- 2010: European countries begin controlling
- 2011: DEA emergency scheduling of 3 cathinones
- 2012: Synthetic Drug Abuse Prevention Act takes effect
- 2013: Methylone permanently scheduled
- 2014: DEA emergency scheduling of 10 additional cathinones



#### **Common Components**

Mephedrone Methylone MDPV Ethcathinones Methcathinones Fluoroamphetamines Fluorocathinones MXE

Butylone Naphyrone Pentedrone Pentylone Buphedrone Alpha-PVP Alpha-PBP MPPP Dimethylone Dibutylone 5-APB 6-APDB Alpha-PVT PV8 5-IAI MDAI

The use of adulterants/diluents such as inositol, benzocaine, lidocaine, caffeine, etc. is common



# The Story of "Molly"

- Ecstasy tablets in the 1980s-early 2000s typically contained MDMA
- In ~2006, ecstasy tablets featured mostly BZP/TFMPP combinations
- Rise in crystal or powder MDMA
  - Called "Molly"
- Many <u>current</u> "Molly" investigations have been found to be methylone or other substituted cathinones
  - Low cost and easy to obtain





#### Flakka/Gravel

- White, brown, purple, pink, or blue crystals
- Off-white, brown, or beige powder
- Typically alpha-PVP
- May be cut using a variety of chemicals









#### 2015 National Trends – Stimulants Identified



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#### **Cathinone Adulteration**

Date Seized	Location of Seizure	Substances Identified
01/2015	Southeast	MDMA, ketamine, 4-MeO-MA, ethylone, caffeine
03/2015	Southwest	MDMA, 2C-B, DMT, caffeine, dimethyl sulfone
03/2015	Southwest	MDMA, methylone, cocaine
03/2015	Southwest	MDMA, ethylone
03/2015	Southwest	MDMA, butylone, dimethyl sulfone
04/2015	Southwest	MDMA, ethylone, caffeine, dimethyl sulfone
04/2015	Southwest	MDMA, ethylone, dimethyl sulfone
04/2015	Southeast	cocaine, ethylone, caffeine, lidocaine, PTHIT
04/2015	Southeast	heroin, fentanyl, acetylfentanyl, ethylone, quinine, diphenhydramine, caffeine, ibuprofen
04/2015	Southeast	MDMA, ethylone
05/2015	South Central	ethylone, dimethyl sulfone

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#### **Cannabinoids and Cathinones**

Date Seized	Location of Seizure	Substances Identified
02/2014	Northeast	alpha-PVP, AB-PINACA
02/2014	Northeast	5F-UR-144, alpha-PVP
12/2014	South Central	alpha-PVT, FDU-PB-22
12/2014	South Central	4F-alpha-PVP, lidocaine, MN-24



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#### Phenethylamine Hallucinogens

- Found as powder, tablets, liquids, blotter paper, sugar cubes, window panes, etc.
- Several groups fall in this class
  - 2C-X (such as 2C-I, 2C-B, 2C-C)
  - DOX (such as DOI, DOB, DOC)
  - 25X-NBOMe (25I-NBOMe, 25B-NBOMe, 25C-NBOMe)
    - Placed in Schedule I in November 2013





#### NBOMe

- 4,868 drug reports from January 2011 through August 2015 from 43 states
- Combinations of 25I-NBOMe, 25C-NBOMe, and 25B-NBOMe responsible at least 19 deaths between March 2012 and August 2013.
- Overdoses continuing through 2014-2015
- Also called N-bomb, Smiles, 25I, 25C, 25B





25I-NBOMe, 25C, NBOMe, 25-B-NBOMe DEA Fact Sheet, DEA/OD/ODE, November 2013 2015 National Drug Threat Assessment Summary, October 2015, DEA-DCT-DIR-008-16

#### 2015 National Trends – Hallucinogens

- 25I-NBOMe (10)
- 25C-NBOMe (6)
- 2C-B (3)
- DOC (1)

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- 2) To serve as a frame of reference, DEA reported 30 identifications of LSD during the same time period.





#### FENTANYL



# Fentanyl

- Potent synthetic opioid used in medical practice since the 1960's
- Pharmaceutical preparations diverted or stolen for illicit abuse
- Clandestine manufacture of fentanyl from 2005-2007
  - Originated from a single laboratory in Toluca, Mexico
  - 1,013 confirmed non-pharmaceutical fentanylrelated deaths
  - 20-25% purity at the wholesale level



### Heroin Origin Determination

- The DEA's Special Testing and Research Laboratory provides in-depth chemical analysis to determine the source area origin and purity of heroin found in the United States
- Analysis of seized heroin at wholesale and retail levels
- Provides a snapshot of the US heroin market





### Fentanyl and Heroin

- High purity fentanyl exhibits have not been detected at either the wholesale or retail level (0-6%)
- Street level fentanyl can be found with or without heroin.

#### When heroin is present:

- Heroin can be found from trace to high purity (@85%) levels.
- South American (SA) heroin and SA-like heroin are the types typically laced with fentanyl.
- Typical powder heroin adulterants for the east coast markets such as caffeine, quinine, acetaminophen, diphenhydramine, etc. are found in fentanyl-laced heroin exhibits.
- Dipyrone is also identified in many exhibits



### Fentanyl Now

"There have been over 700 deaths in the United States related to fentanyl and its analogs between late 2013 and late 2014. The deaths have continued in 2015."

States Affected by Fentanyl Overdose Incidents and Deaths, 2013 - 2014





2015 National Drug Threat Assessment Summary, October 2015, DEA-DCT-DIR-008-16

#### **Profiling of Fentanyl**

- As the majority of fentanyl submissions displayed only 10% or less fentanyl, the profiling attempts to determine synthetic routes were hindered.
- In addition, only minimal manufacturing impurities were found in the current fentanyl samples indicating skillful production batch after batch.





### Acetyl fentanyl

- Schedule I substance (effective 7/17/2015)
- Not approved for medical use in the United States
- 1<sup>st</sup> identified in Maine in 2013
- More than 50 confirmed fatalities involving acetyl fentanyl in 2013-2015

According to DEA's STARLIMS and National Forensic Laboratory Information System (NFLIS), federal, state and local forensic laboratories reported 10 exhibits identified as acetyl fentanyl in 2013 and 40 exhibits identified as acetyl fentanyl in 2014.



#### 2015 National Trends – Other Substances Identified

#### Opioids

- Fentanyl (239)
- Acetylfentanyl (62)
- Butyryl fentanyl (6)
- W-18 (2)
- β-Hydroxythiofentanyl (2)
- 4-ANPP (1)

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Other

Substance Unconfirmed (83)

# Fentanyl Derivatives and Other Synthetic Opioids

#### **Fentanyl Derivatives**

- Acetyl fentanyl
- Butyryl fentanyl
- β-Hydroxythiofentanyl
- p-Fluoro fentanyl
- Acryl fentanyl
- Furanyl fentanyl
- Valeryl fentanyl

#### **Synthetic Opioids**

- MT-45
- AH-7921
- U-47700
- W-15
- W-18



#### **NDEWS Sentinel Community Sites**



#### Top 5 "Trending" Drug Identifications by Laboratory and NDEWS Sentinel Community Sites



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- 2) 2 = Northeast Laboratory; 3 = Mid-Atlantic Laboratory; 4 = Southeast Laboratory; 5 = North Central Laboratory; 6 = South Central Laboratory; 7 = Western Laboratory; 8 = Southwest Laboratory



### **Closing thoughts**

- Over 300 new drugs in 10 years in the U.S.
- Availability of reference materials has increased
- China banned 116 NPS in 2015
- Continual evaluation of new drugs and drug classes
- Early and frequent communication regarding drug threats



#### Thank You!

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# Fentanyl, Analogs, and Other Synthetic Opioids from 2015 in the DEA Lab System

Fentanyl Analogs:

- Acetyl fentanyl (42 exhibits): 15 X less potent than fentanyl
- Butyryl fentanyl (6 exhibits): 1/4<sup>th</sup> potency of fentanyl
- β-Hydroxythiofentanyl (2 exhibits)
- p-Fluoro fentanyl: 150 to 200 X more potent than morphine
- Acryl fentanyl
- Furanyl fentanyl: Slightly less potent than butyryl fentanyl
- Valeryl fentanyl: Highly less potent than butyryl?

Synthetic Opioids:

- MT-45 (IC-6 exhibits): Almost as potent as morphine
- AH-7921: Almost as potent as morphine
- U-47700: 7 to 8 X more potent than morphine
- W-15: 4 to 5 X more potent than morphine
- W-18 (2 exhibits): 10,000 times more potent than morphine?

