



Classes and Structures of Emerging Cannabimimetics and Cathinones

Arthur Berrier

Senior Research Chemist

Special Testing and Research Laboratory

Drug Enforcement Administration

Herbal Smoking Blends - SPICE

- SPICE and other herbal blends have been sold in head shops and on the Internet since 2006 for their cannabis-like intoxication
- The herbal blends sometimes have a fragrance which could include vanilla, potpourri, spice, blueberry, caramel, and strawberry
- The plant materials for the different blends have a wide variation in appearance



Herbal Smoking Blends - SPICE

- In late 2008, THC Pharma reported the presence of JWH 018, a synthetic cannabimimetic indole in some blends
- In early 2009, analogues of CP 47,497 (another synthetic cannabinoid) were also found in some blends by the U. of Freiburg
- In early 2009, several European Countries control Herbal Blends/JWH 018/CP 47,497



Herbal Smoking Blends - SPICE

- K2 enters market in April, 2009
- Interest booms in herbal smoking blends in 2009
- Many new products appeared, typically with JWH 018 and JWH 073
- States begin to control the blends/synthetic cannabinoids



Herbal Smoking Blends - SPICE

- Products quickly reformulated with new, non-controlled synthetic cannabimimetics
- Five of the synthetic cannabimimetics controlled at the Federal level in 2011
- Synthetic Drug Abuse Prevention Act of 2012

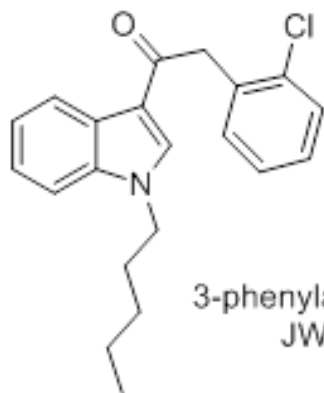


Classes of Synthetic Cannabinoids Observed on Smoking Blends

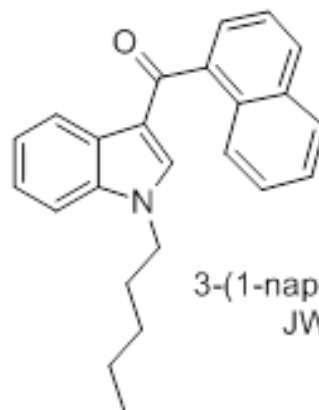
- i) 2-(3-hydroxycyclohexyl)phenol (CP 47,497)
- ii) 3-(1-naphthoyl)indole (JWH 018)
- iii) 3-(1-naphthoyl)pyrrole
- iv) 1-(1-naphthylmethylene)indene
- v) 3-phenylacetylindole or 3-benzoylindole



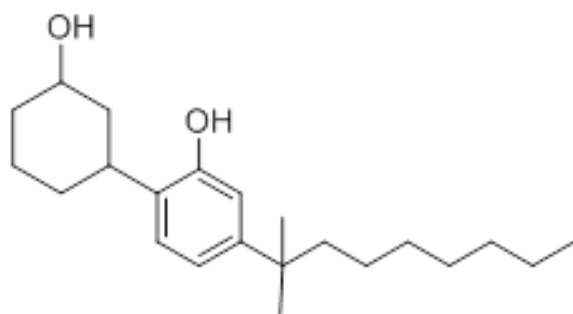
Structures of the Major Cannabimimetic Classes Detected



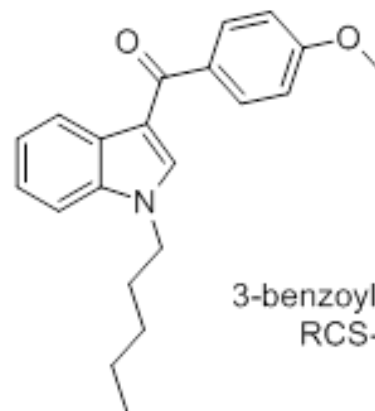
3-phenylacetylindole
JWH 203



3-(1-naphthoyl)indole
JWH 018



2-(3-hydroxycyclohexyl)phenol
CP 47,497 C8



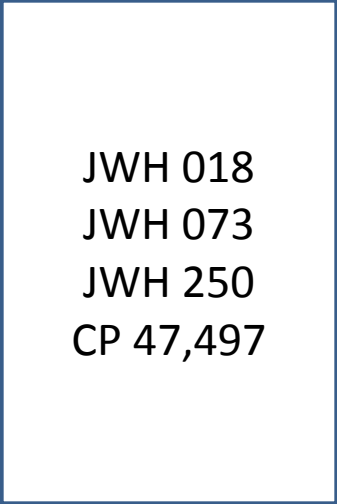
3-benzoylindole
RCS-4



Cannabinimimetics Observed in 2009 and 2010 – First Appearance of JWH Compounds



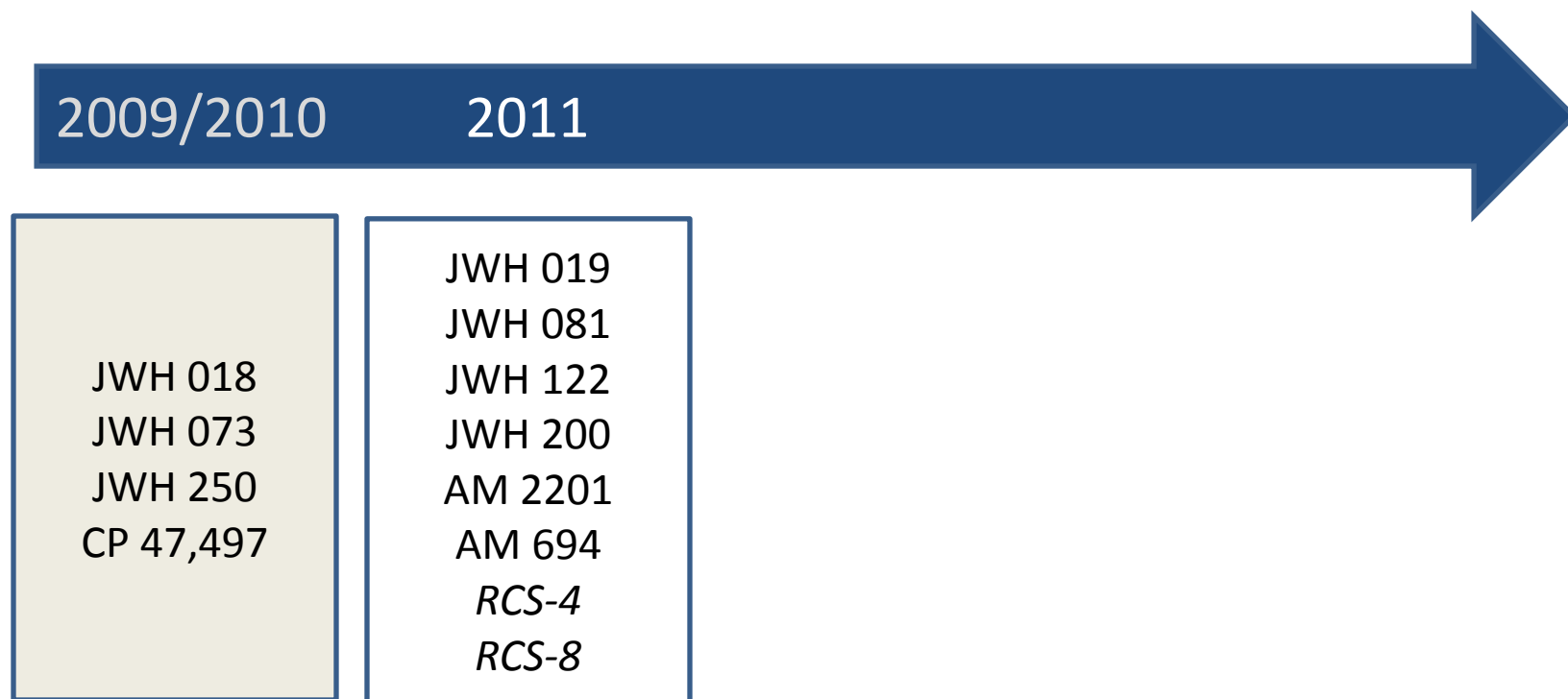
2009/2010



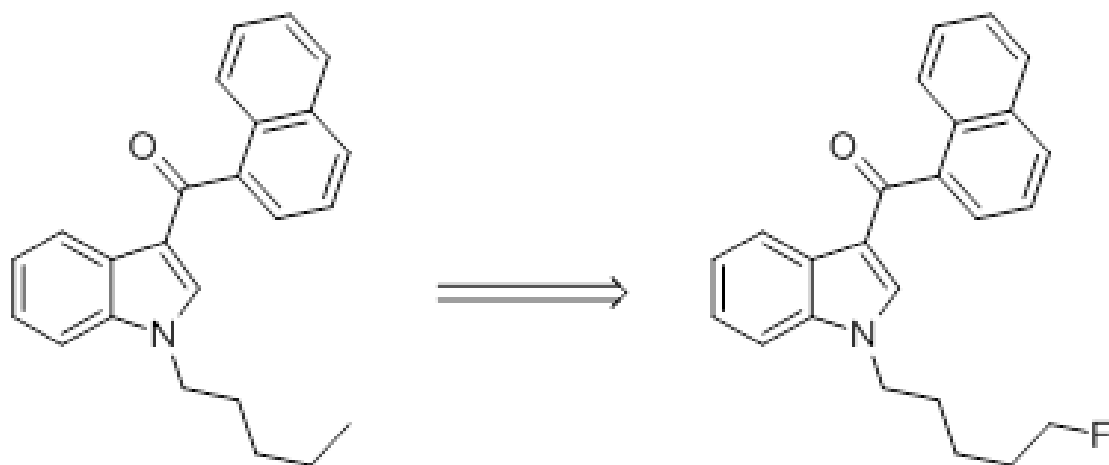
JWH 018
JWH 073
JWH 250
CP 47,497



Cannabimimetics Observed Starting in 2011 – More JWH's, Introduction of Fluoroalkyls and the Beginning of Novel Materials



2011 – Introduction of Fluoroalkyl Derivatives



JWH 018

AM2201

Fluoro version of JWH 018



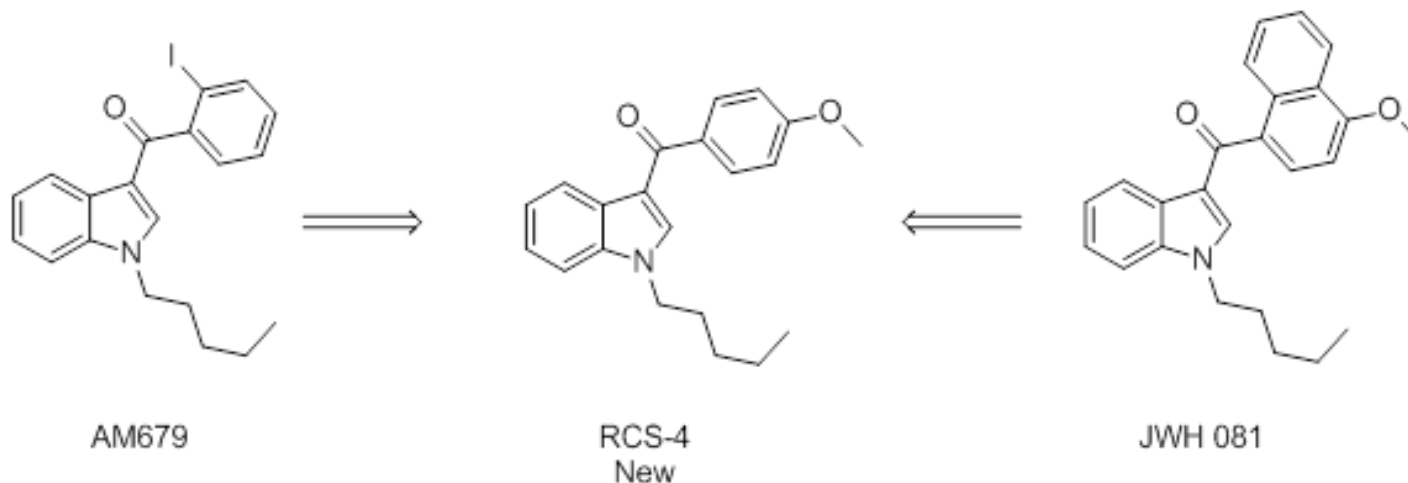
2011 – Introduction of Novel Materials

- Materials identified never reported in scientific or patent literature
- Initially named after the website selling it
 - RCS-4
 - RCS-8
- Made by changing/modifying known material



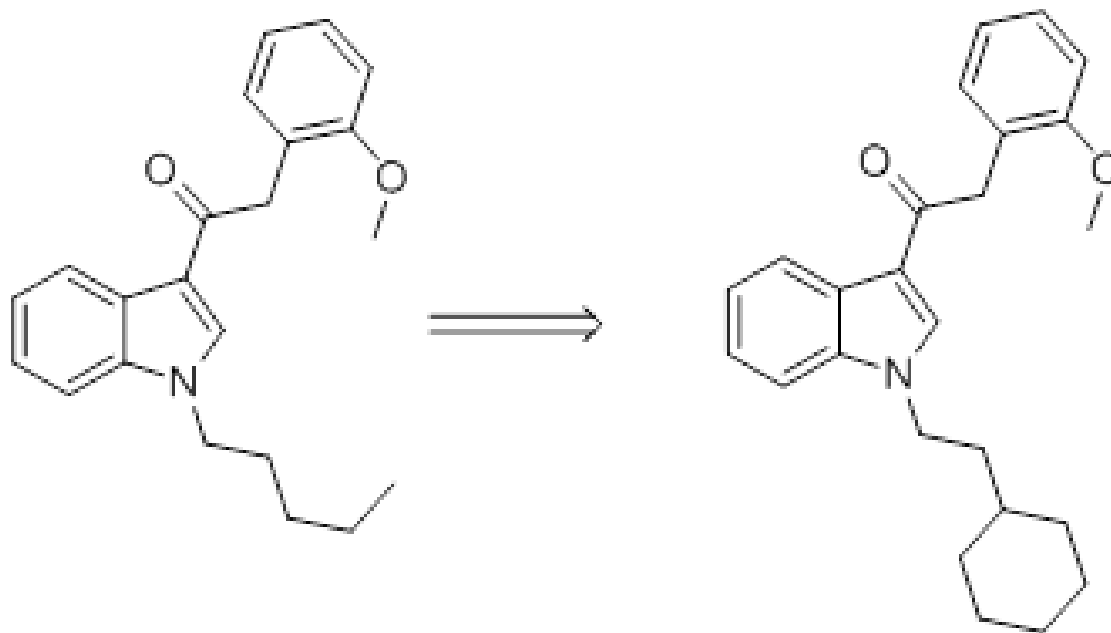
2011 – Introduction of Novel Materials

RCS-4



2011 – Introduction of Novel Materials

RCS-8

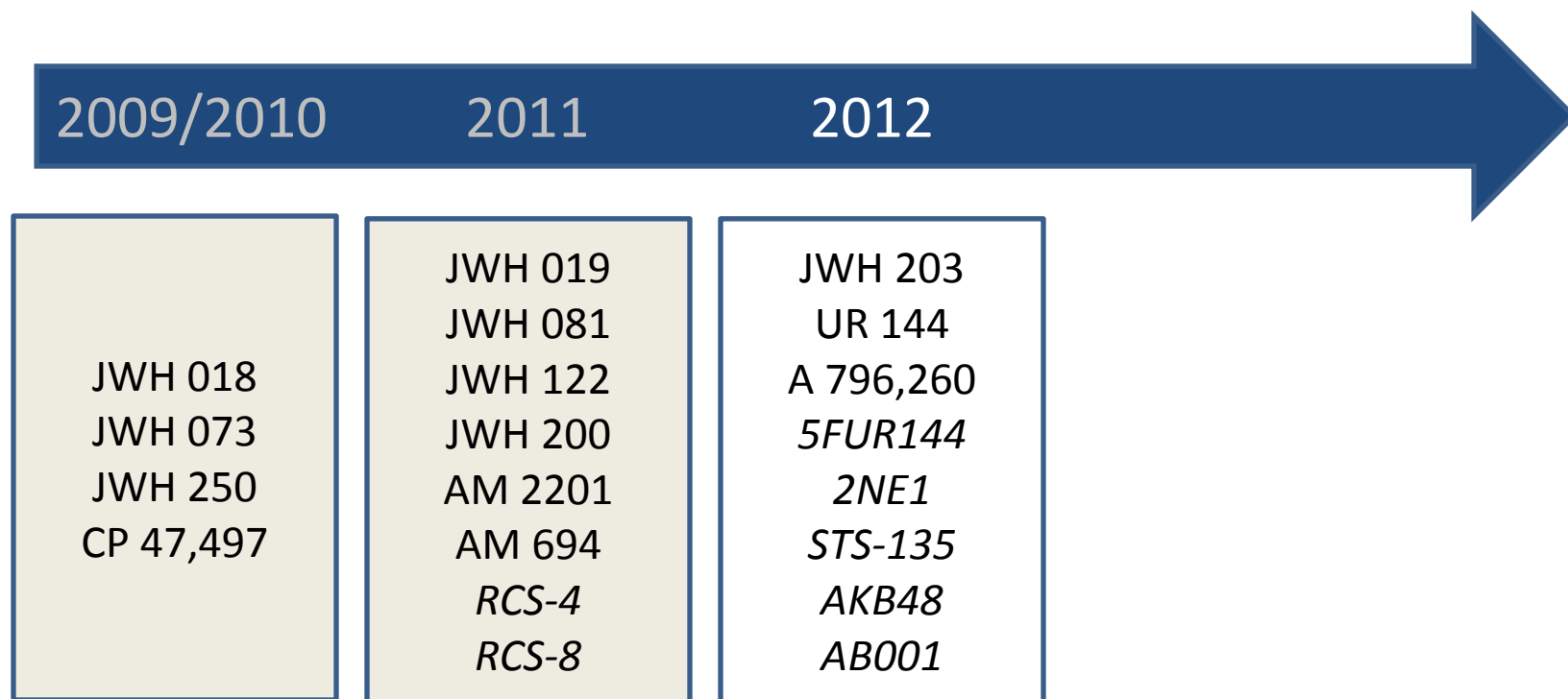


JWH 250

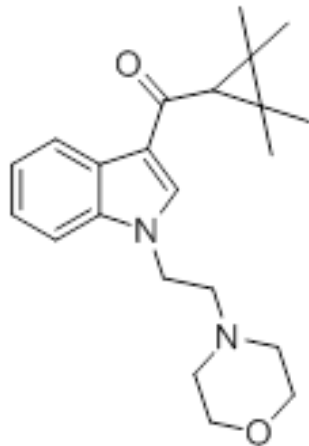
RCS-8
New



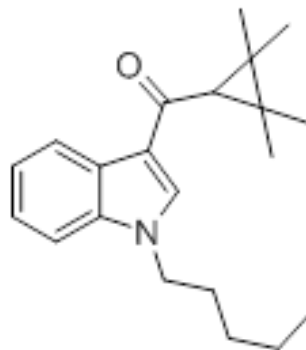
Cannabimimetics Observed Starting in 2012 – Continuation of New Materials and New Classes



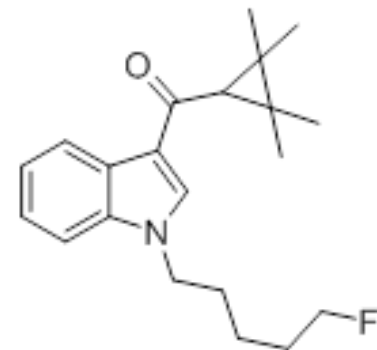
2012 – Introduction of Tetramethylcyclopropyl Materials



A-796,260
Abbott Labs

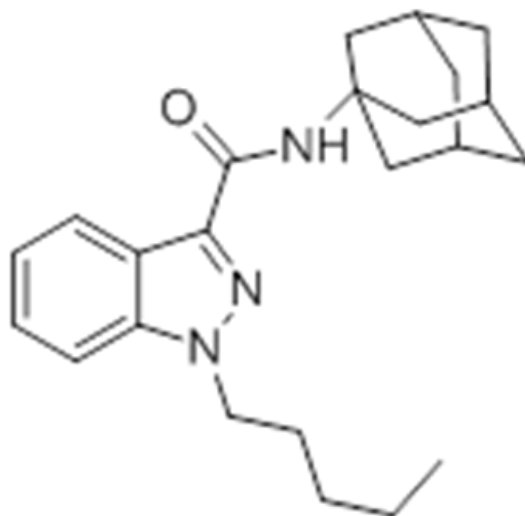


UR-144
Abbott Labs



5FUR144
New

AKB48 – New Material in 2012

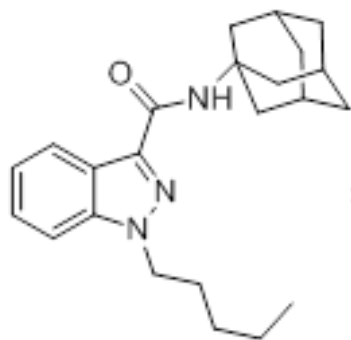


AKB48

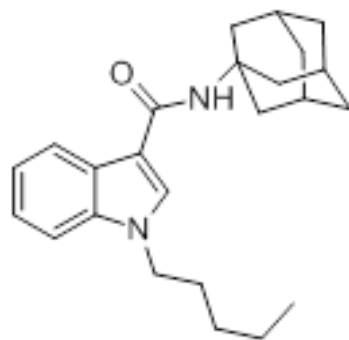
Falls within claims of 2003 World Patent
but not given as example



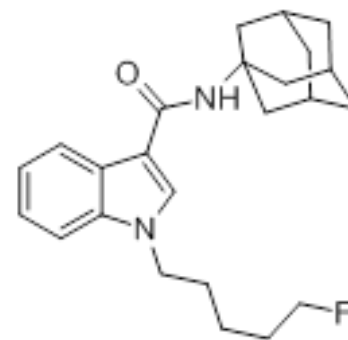
2012 – Continued Introduction of New Materials



AKB48
New



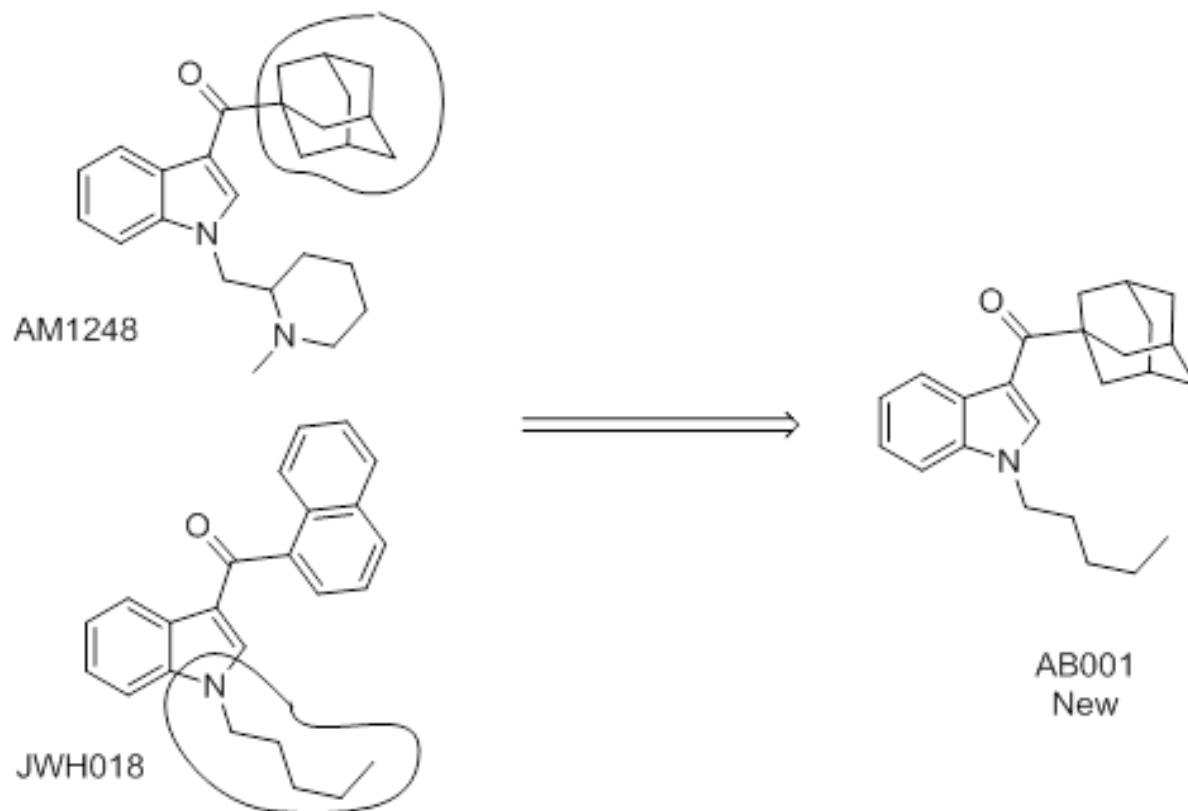
2NE1
Indole version of AKB48
New



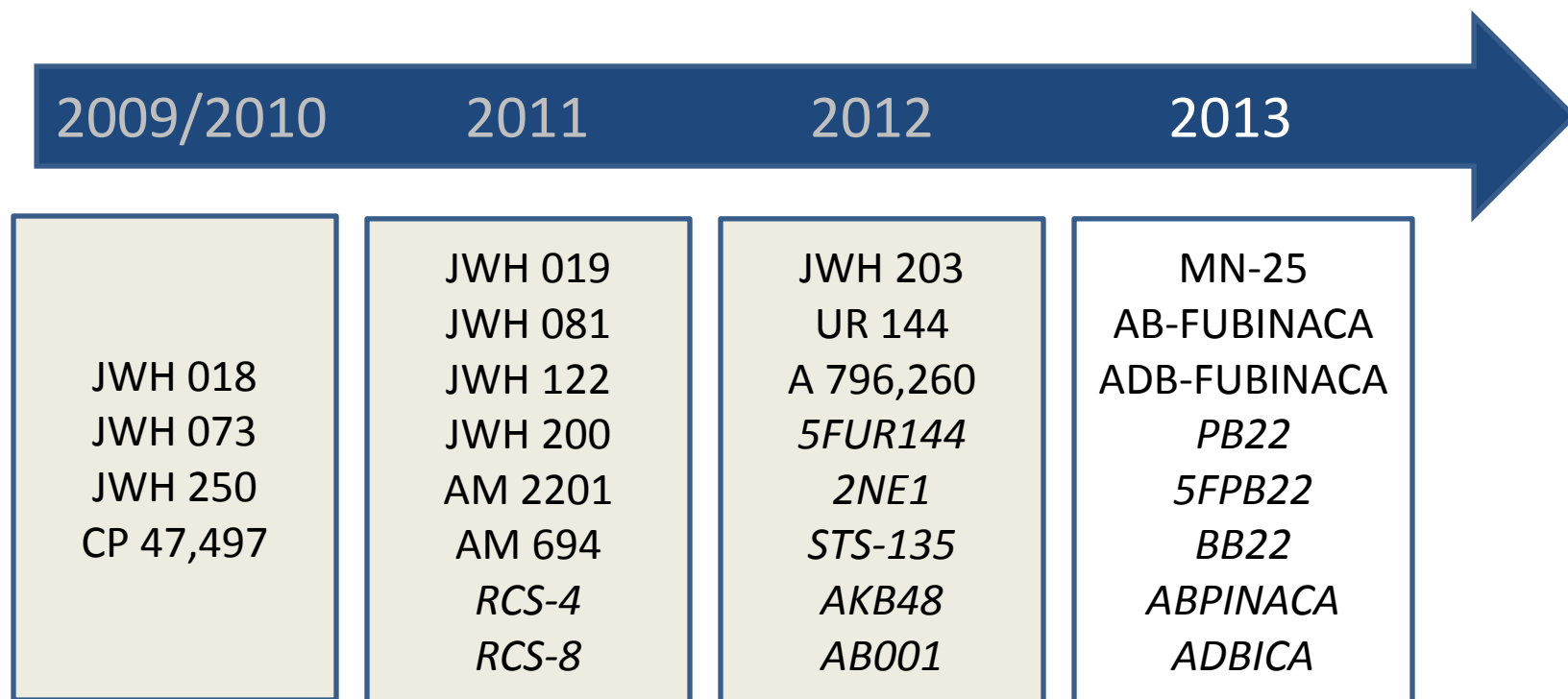
STS-135
Fluoro version of 2NE1
New



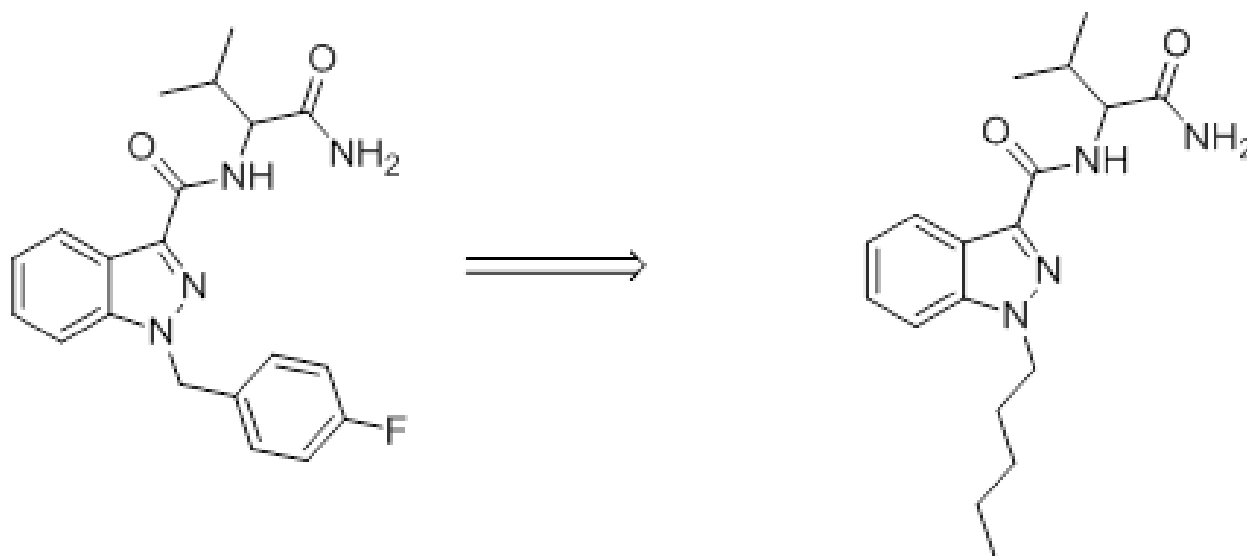
2012 – AB001, A New Material Derived from a Combination of Known Compounds



Cannabimimetics Observed Starting in 2013 – Continuation of New Materials and New Classes



2013 – Introduction of Indazole Carboxamides and Derivatives

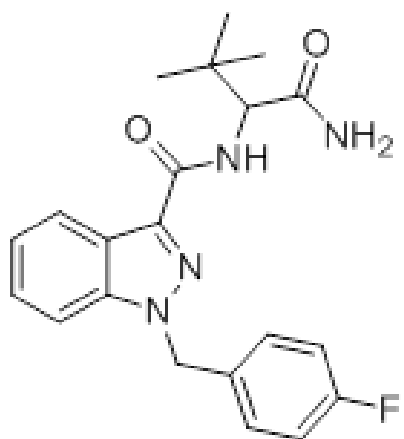


AB-FUBINACA
2009 Pfizer Patent

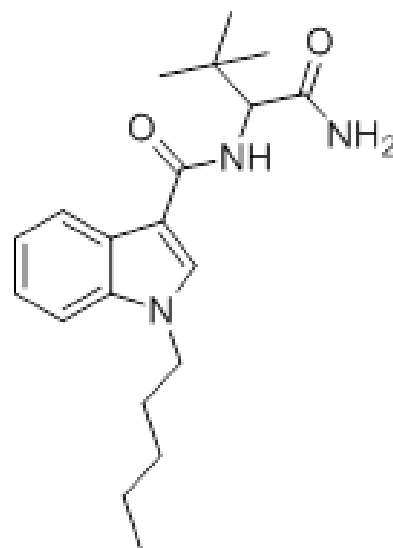
AB-PINACA
New



2013 – Introduction of Indazole Carboxamides and Derivatives



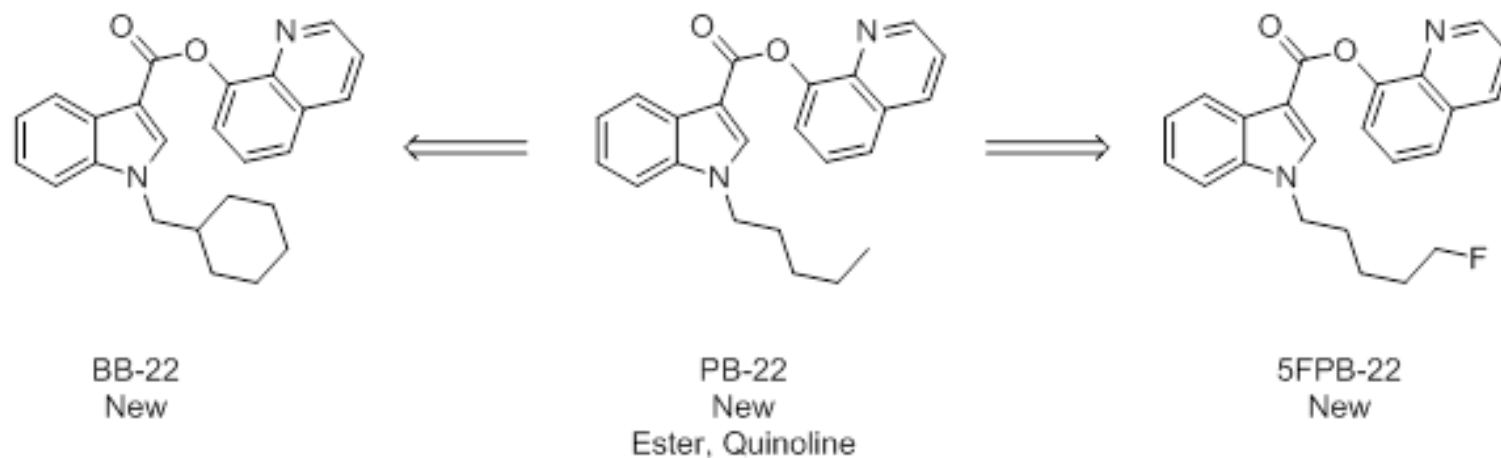
ADB-FUBINACA
2009 Pfizer Patent



ADBICA
New



2013 – New Materials Derived From 8-Hydroxyquinoline



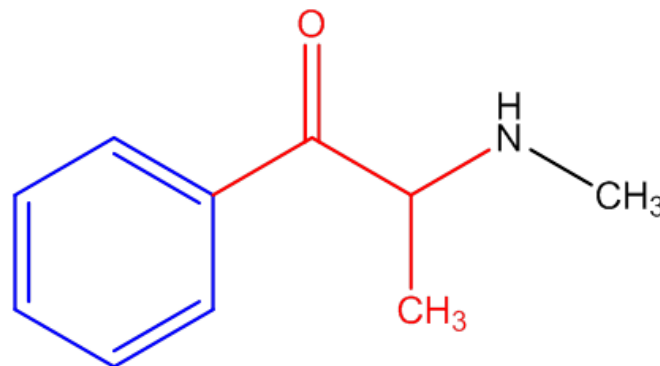
Designer Cathinones

Three parts of methcathinone can be modified:

Aromatic ring

Alkyl group

Amine group



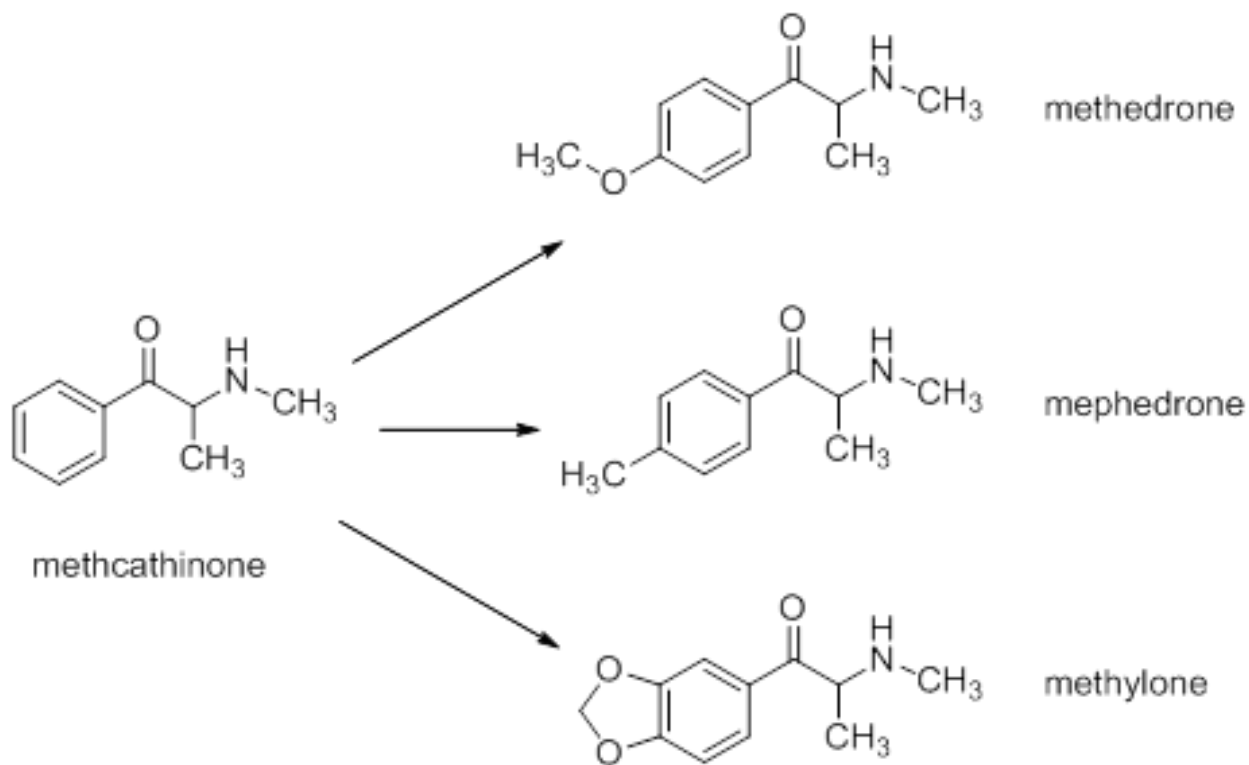
Aromatic

Alkyl

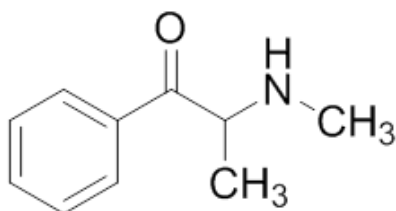
Amine



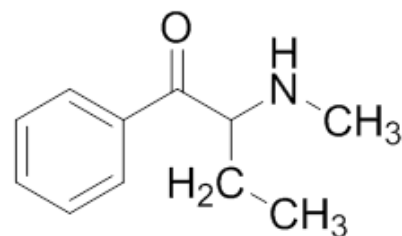
Designer Cathinones – Changes in the Aromatic Ring



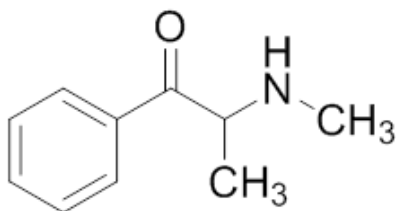
Designer Cathinones – Changes in the Alkyl Group



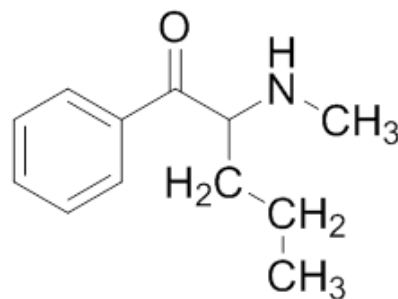
methcathinone



buphedrone



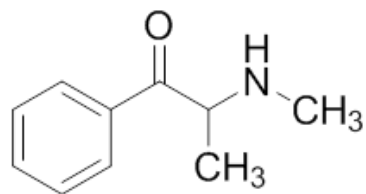
methcathinone



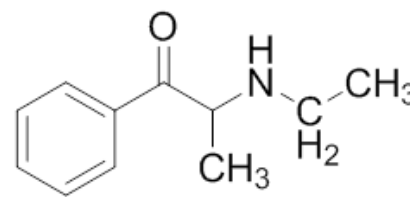
pentedrone



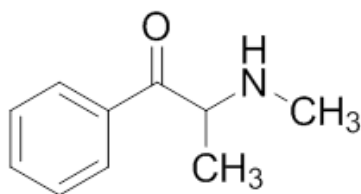
Designer Cathinones – Changes in the Amine Group



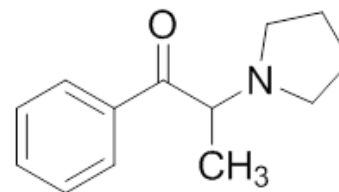
methcathinone



ethcathinone



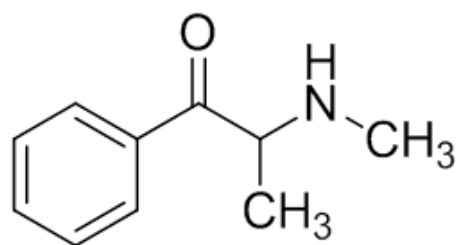
methcathinone



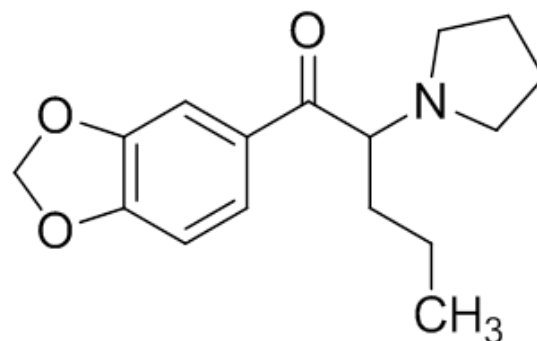
α-PPP



Designer Cathinones – Changes in All Groups



methcathinone



MDPV

Just the changes discussed in the last three slides
can produce 12 different Cathinone derivatives



Questions?



Arthur Berrier

Arthur.L.Berrier@USDOJ.GOV

Drug Enforcement Administration

