Designer Drugs –
(Spice/K2, Bath Salts, & Beyond - 2012 Update)

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University of Missouri
Synthetic Cannabinoids & Designer Stimulants (Novelty Powders)

- history designer drugs
- two primary categories of designer drugs
- drug testing challenges
- legal status
- court’s response
March 1, 2011 DEA “Banned” Five Synthetic Cannabinoids

- synthetic cannabinoids covered under the DEA’s new rule includes the following:
  - JWH-018 *
  - JWH-073 *
  - JWH-200
  - CP-47,497
  - CP-47,497 (C-8 homologue)
<table>
<thead>
<tr>
<th>K2 blonde</th>
<th>JWH-018 (mg/g)</th>
<th>JWH-073 (mg/g)</th>
<th>CP47,497 (n=8) (mg/g)</th>
<th>JWH-250 (mg/g)</th>
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<tr>
<td></td>
<td>12</td>
<td>13</td>
<td>-</td>
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<tr>
<td>K2 standard</td>
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<td>K2 Citron</td>
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<tr>
<td>K2* (Unknown)</td>
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<td>6</td>
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<tr>
<td>K2 Summit</td>
<td>11</td>
<td>9</td>
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<tr>
<td>K2 Blue</td>
<td>15</td>
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<tr>
<td>K2 Pink</td>
<td>11</td>
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<tr>
<td>K2 Latte</td>
<td>16</td>
<td>0.28</td>
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<td>14</td>
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<td>K2 Mint</td>
<td>19</td>
<td>0.30</td>
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<td>K2 Silver</td>
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<td>Spike Gold</td>
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<tr>
<td>Spike Maxx</td>
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<td>Spike Diamond</td>
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<tr>
<td>Spike Silver</td>
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<td>16</td>
<td>-</td>
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<td>Space</td>
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<tr>
<td>Herbal blends*</td>
<td>2.0 – 35.9</td>
<td>-</td>
<td>1.1 – 16.9</td>
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</table>
Bath Salts

On October 21, 2011, the Drug Enforcement Administration (DEA) “banned” three synthetic cathinones by placing them into Schedule I of the Controlled Substances Act (CSA)

- mephedrone
- 3,4 methylenedioxyxypyrovalerone (MDPV)
- methylone
DEA Actions:

- DEA took action - imminent hazard to the public safety
- imposes criminal sanctions and regulatory controls of Schedule I substances under the CSA
- covers the manufacture, distribution, possession, importation, and exportation
- RAMIFICATIONS?
Synthetic Cannabinoid Data from Poison Control Centers

<table>
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<tr>
<th>Year</th>
<th>Number of Calls</th>
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<td>2010</td>
<td>2,906</td>
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<tr>
<td>2011</td>
<td>6,959</td>
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<tr>
<td>2012</td>
<td><strong>1,261 (7,566)</strong></td>
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<td>As of Feb. 29, 2012</td>
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![2011 Synthetic Marijuana Exposure Calls](chart.png)
## Bath Salt Data from Poison Control Centers

<table>
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<th>Year</th>
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<td>304</td>
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<tr>
<td>2011</td>
<td>6,138</td>
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<table>
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<th>2011 by Month</th>
<th>Number of Calls</th>
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<td>January 2011</td>
<td>301</td>
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<td>February 2011</td>
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<td>March 2011</td>
<td>639</td>
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<td>April 2011</td>
<td>600</td>
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<td>May 2011</td>
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<td>June 2011</td>
<td>743</td>
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<td>July 2011</td>
<td>680</td>
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<td>August 2011</td>
<td>602</td>
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<td>September 2011</td>
<td>512</td>
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<td>October 2011</td>
<td>401</td>
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<tr>
<td>November 2011</td>
<td>231</td>
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<td>December 2011</td>
<td>222</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>6,138</strong></td>
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The Story of Designer Drugs
Designer Drugs:

drugs, which are created (or reformulated, if the drug already existed) to get around existing drug laws (CSA), usually by modifying the molecular structures of existing drugs to varying degrees
An agonist is a chemical that binds to a receptor and triggers a response – often mimicking the action of a naturally occurring substance.
Why Change the Key?

- prolong the effect of the drug
- increase the potency of the drug
- “select” the desired effect
- make the drug more difficult to detect
- avoid patent infringement
- make an illegal drug “legal”
Spice/K2 and Synthetic Cannabinoids
Preparation of the “incense”:

- botanicals are sprayed with liquid preparations of:
  - HU-210
  - HU-211
  - CP 47,497
  - JWH-018
  - JWH-073
Origins of Synthetic Cannabinoids

- HU-210 & HU-211 - synthesized at Hebrew University, Israel in 1988. HU-210 is an anti-inflammatory; HU-211 as an anesthetic
- CP 47,497 - developed by Pfizer in 1980 as an analgesic
- JWH-018 & JWH-073 - synthesize by a researcher at Clemson (1995) for use in THC receptor research - John W. Huffman
- more than 100 different synthetic cannabinoids have been created
Smoking Cannabinoids

What does CB₁ receptor control?

- BG: motor control, learning
- Hippo: memory, spatial navigation
- CB: cognitive functions - attention, language, emotions
Pharmacological Effects of Synthetic Cannabinoids are Similar to THC

- increase heart rate & blood pressure
- altered state of consciousness
- mild euphoria and relaxation
- perceptual alterations (time distortion)
- intensification of sensory experiences
- pronounced cognitive effects
- impaired short-term memory
- reduction in motor skill acuity
- increase in reaction times
Synthetic Cannabinoids: Physical & Social Effects

- increasing reports of adverse effects
  - ER admissions, assaults, homicides, DUID
- effects similar to THC, BUT . . . .
  - increased anxiety, paranoia, panic
  - increased restlessness & aggressive behavior
- leads to untoward consequences
  - contact with law enforcement
  - loss of life (violence & unexplained)
Current state of drug testing for synthetic cannabinoids
Evolutionary Landscape

- appearing & disappearing
- what’s popular today cycles out to be replaced by new synthetic THC analogs
- labs testing for common compounds a few months ago may not be testing for same chemicals now
- on-site, POC devices cannot keep pace
Lab-Based Drug Testing (2010):

- JWH-018
- JWH-019
- JWH-073
- CP 47, 497 (C7)
- CP 47,497 (C8)
- WIN 48,098
- HU-210
- HU-211
Lab-Based Drug Testing (2012):

<table>
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<tr>
<th>Substance</th>
<th>Code</th>
<th>Code</th>
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<td>AM-694</td>
<td>JWH-018 Chloropentyl analog</td>
<td>JWH-018 6-Methoxyindole analog</td>
<td>JWH-018 1-Methylhexyl homolog</td>
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<td>AM-1220</td>
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<td>AM-1241</td>
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<td>AM-2201</td>
<td>JWH-020</td>
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<td>RCS-4</td>
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<td>AM-2233</td>
<td>JWH-022</td>
<td>JWH-022</td>
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<tr>
<td>CB-13</td>
<td>JWH-072</td>
<td>JWH-072</td>
<td>JWH-072</td>
<td>RCS-8 4-Methoxy</td>
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<td>CB-25</td>
<td>JWH-073</td>
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<td>UR-144</td>
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<td>CB-52</td>
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<td>URB-447</td>
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<td>CP47,497 (C8 analog)</td>
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<td>CP55,940</td>
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<td>JWH-122</td>
<td>URB-754</td>
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<td>HU-210/HU-211</td>
<td>JWH-133</td>
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<td>JWH-133</td>
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<td>HU-308</td>
<td>JWH-147</td>
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<td>JWH-147</td>
<td>WIN48,098</td>
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<td>HU-331</td>
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<td>JWH-200</td>
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<td>JWH-018</td>
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Acknowledgment:

Dr. Barry Logan
National Medical Services
Willow Grove, PA
Prevalence – 2010

July – December 2010

- JWH073: 28%
- JWH250: 11%
- JWH-018: 61%
Prevalence – 2012

Oct 2011 – April 2012
Evolutionary Landscape

- **JWH-018/073** arrived early and have largely come and gone.
- **JWH-250** arrived a little later and as also cycling out.
- **JWH-081** was part of a second wave that has already completed its cycle.
- **JWH-122** was part of the same wave but has persisted in popularity and is part of the current scene.
- **AM-2201** was part of the same second wave and has gained in popularity, probably currently the most prevalent.
- **JWH-022** and **JWH-210** are showing signs of increasing popularity.
Ingenuity of Designer Chemists:

![Chemical structures of JWH-018 and AM-2201]
### JAT July/August – AIT Labs

<table>
<thead>
<tr>
<th></th>
<th>Pre Federal Ban (12)</th>
<th>Post Federal Ban (52)</th>
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<tr>
<td>JWH-018</td>
<td>11</td>
<td>AM 2201</td>
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<tr>
<td>JWH-073</td>
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<td>JWH-210</td>
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<td>OTHERS</td>
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<td>JWH-073</td>
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<td>JWH-018</td>
</tr>
<tr>
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</table>
Drug Testing for Synthetic Cannabinoids
Drug Testing – On-Site:

- rapid, instant, POC tests
- testing for JWH-018/JWH-073
- cutoff 50-75 ng/mL
- lab testing - cutoff 0.5 ng/mL
- false negatives
Drug Testing – Laboratory:

- rapidly changing landscape
- constantly updating menus
- lack of standards
- some labs developing screening tests
- not all lab-based testing is equal
Unresolved Issues of Concern:

- what synthetic compounds (or metabolites) are being tested by these laboratories?
- no standardized urine cutoff levels
- no standardized methods (LC/MS/MS)
- tests detect metabolites
- no independent quality control materials
- no proficiency testing
- detection window unknown
More dangerous than we first thought?

Coroner: Lamar Jack ingested chemical found in fake marijuana before he died

Synthetic Marijuana Blamed in Central Iowa Teen's Death


Teen seriously injured in fall from parking garage

Case Report

Cardiotoxicity associated with the synthetic cannabinoid, K9, with laboratory confirmation☆☆☆
Designer Stimulants
(Novelty Powders)
Designer Stimulants:

- bath salts/bath bubbles
- plant foods/plant vitamins
- glass cleaners/pond cleaners
- soft drink additive
- “novelty collectors item”
MDPV:

- Methylenedioxypyrovalerone (MDPV) - a psychoactive drug with stimulant properties which acts as both a norepinephrine-dopamine reuptake inhibitor (NDRI).
- Often snorted - similar to cocaine
- Considered extremely addictive
- Adverse medical/psychiatric ramifications
Methylenedioxymethcathinone (Mephedrone)

- designer drug chemically similar to cathinone
- first synthesized in 1929
- amphetamine-like properties
- powerful synthetic stimulant
- adverse medical/psychiatric ramifications
Pharmacological Effects of “Bath Salts”:

- increase heart rate & blood pressure
- pupil dilation
- hyperactivity, arousal & over stimulation
- increased energy & motivation
- euphoria - agitation
- dizziness
- nausea
- breathing difficulties
- diminished perception of the requirement for food and sleep
Health Hazard?

Ivory Wave drug implicated in death of 24-year-old man
Drug bought online as legal high following ban on mephedrone causing several hospitalisations and possibly one death

The bride killed by bath salts - the new 'legal high' Ivory Wave drug that's sweeping Britain

How 'bath salts' led to suicide

Police consider buying Tasers to deal with bath salts users

One death in Blaine drug overdose case confirmed

Sheriff: Scott County man high on bath salts fires 30 shots inside trailer

'Bath salts' legal high lands 20 in hospital in a week
Adam Morris - Evening News - 9th August 2010
Pravalance – Designer Stimulants

- MDPV (20%)
- Mitragynine (11%)
- Pentedrone (6%)
- Methylone (5%)
- alpha-PVP (5%)
- 4-Methyl-alpha-Pyrrolidinopropiophenone (5%)
- Pentedrone (4%)
- DMAA (4%)
Growth of Designer Drugs

What’s different today then in the 1970’s when the drug Ecstasy (MDMA) was popularized?

What has changed to fuel the rapid development and distribution of designer drugs?
Internet!
Internet Users in the World
Growth 1995 - 2010

over 100 million

over 2 billion

over 800 million users

Tweets per Day

over 100 million

Copyright © 2008, MilliWatts Marketing Group
What does the Internet offer?

- improved accessibility
- increased affordability
- enhanced anonymity
Legal Status of Control Strategies
Federal Law:

Federally Scheduled Drugs

JWH-018 *
JWH-073 *
JWH-200
CP-47,497
CP-47,497 (C-8 homologue)

Federal Analog Status

- substantially chemically similar
- equivalent pharmacological activity
- intended for human consumption
State Law (patchwork):

- State Scheduled Drugs - varies
- State Analog Status - varies

- substantially chemically similar
- equivalent pharmacological activity
- intended for human consumption
Unfortunate Truisms:

- legal controls that prohibit designer drugs will always lag behind their production
- drug detection methods for the identification of designer drugs may also not be available when these compounds become popular
Are There Other Control Strategies (other than Legal)?
Alternative Control Strategies:

- community supervision
- search & seizure
- deterrence (client contract)
Field Visits:

- frequent
- random
- announced & unannounced
- non-governmental hours
Court’s Response:

- place specific design drugs prohibition in your client contract
- establish sanction severity
- perform testing if available
- select participants for testing where there are indications of use
- identify positive participants in court & sanction openly to enhance deterrent effect
- provide opportunity for participants to self-report
Client Prohibition Guidance:

- Any and all “designer drugs” that can be purchased legally, over the counter without a physician’s prescription are strictly prohibited.

- Any and all “smoking mixtures” (other than products specifically designated to contain only tobacco) are strictly prohibited.

- Any and all products sold or marketed under false pretenses with the warning “Not for Human Consumption” are strictly prohibited.
Outlook for the Rest of 2012 and Beyond
More of the Same
Synthetic Cannabinoids

- evolving analogs
- redesigned molecules
- new products
- evolving mixtures/cocktails
- increased difficulty in detection
- increased legal strategies
Pump-it! Powder:

- methylhexanamine
- source - found naturally in the geranium plant
- it is not scheduled by the DEA - legal
- banned in athletics
- stimulant
- not widely studied
Bromo-DragonFLY

- psychedelic hallucinogenic drug
- related to the phenethylamine family
- extremely potent hallucinogen
- similar to LSD
- extended duration of action up to several days
- dosage is in micrograms
Good News . . . . ?
Brand New Law:

- signed by the President on July 10, 2012
- S. 3187: Food and Drug Administration Safety and Innovation Act
  - TITLE XI--OTHER PROVISIONS
  - Subtitle D--Synthetic Drugs
  - Sec. 1151-1153
  - Synthetic Drug Abuse Prevention Act of 2012
- Bans several dozens designer drugs
Operation Log Jam:

- Operations in 30 states were raided
- 90 arrests at 29 manufacturing facilities
- 36 million in cash seized
- 4.8 million packets of synthetic cannabinoids
- Confiscated chemicals sufficient to make 13.6 million additional packets
- 53 weapons seized
- 6 million in other assets
Designer Drugs:

- designer drugs are here to stay
- rapid evolving landscape
- testing will nearly always lag behind
- legal controls will be challenging and delayed
- growing evidence of adverse effects
- BE PROACTIVE!
- design client contract specifically address designer drugs
- build community supervision/expand search & seizure efforts
This is a race we can't win, but a challenge we can't ignore.
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