

**K2, JWH, AM-2201, MDPV:  
the Alphabet Soup of  
Synthetic Drugs**



Partnership between Iowa Health System  
and University of Iowa Hospitals and Clinics

**Linda B. Kalin, RN, BS, CSPI**  
Director  
KalinLB@ihs.org  
24/7 Hotline: (800) 222-1222  
Office: (712) 279-3710




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**Poison Control Centers**



- Network of 57 PCCs
- Open 24/7
- Staffed by nurses, pharmacists and physicians trained in toxicology
- National near real-time data collection
  - Data is unloaded to national database every 19 mins
  - Ability to detect new public health threats and quickly notify appropriate authorities at the local, state and federal levels




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**National 800 Phone Number**



Works just like 911



24 hours a day- 7 days a week  
Federally funded by HRSA

Program your  
cell phone!



iPhone app is  
now available




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## New Synthetic Drugs



- Man-made chemicals designed for recreational use to mimic the effects of various illegal substances particularly marijuana and amphetamines/hallucinogens
- To disguise their intended use and circumvent the law, drugs are sold and advertised as:
  - Bath salts, plant food, glass remover, herbal incense, potpourri, novelty powders, pipe cleaner
  - “Not intended for human consumption”
  - “Not to be sold to minors”



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## New Synthetic Drugs



- **Synthetic Cannabinoids**
  - aka K2, Spice, synthetic marijuana
  - Marketed as “fake weed” or “legal marijuana”
- **Synthetic Stimulants/Hallucinogens**
  - Phenethylamines: class includes synthetic cathinones (aka “bath salts”), synthetic hallucinogens (2C series), amphetamines, methamphetamines
  - Marketed as meth, cocaine, or ecstasy substitute
- **Use has skyrocketed**



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## Contents Often Unknown



- Advertising/packageing is often misleading
- No regulatory oversight or quality control
  - One product may contain several different chemicals
  - Combination of synthetic cannabinoids and synthetic hallucinogens have been detected in same sample
  - No consistency in purity or potency
  - Websites promise to protect customers by shipping products in discreet or unmarked packages

***Buyers don't know what chemicals they're taking***



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## Synthetic Cannabinoids



- Created for scientific research
  - Dr. John W. Huffman, chemist at Clemson University, to identify the receptor and MOA of marijuana
  - Bind to same receptors in the brain as active ingredient in marijuana tetrahydrocannabinol (THC)
- Early compounds JWH-018, JWH-073, JWH-200
  - First synthesized 1995; research published 1998
  - Banned by DEA in 2011 (also HU-210, CP47,497)
  - 450+ other JWH formulations (2012 Act incl analogs)



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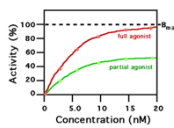
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## Pharmacology



THC is a **partial** agonist of CB1; Synthetic cannabinoids are **full agonists**

- Agonist: A drug that binds to and activates a receptor of a cell
- Both THC and JWH bind to the cannabinoid receptors (CB1 and CB2) to activate them
  - JWH-018 has a much higher cannabinoid receptor binding affinity than THC
  - Much more potent effects than THC
- **SynCann is NOT cannabis!**



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## Appearance



- Typically found in a powder form, dissolved in solvents, such as acetone, and sprayed onto “plant materials”
  - Varying amounts/potencies in different products
  - “Hot spots”
- Plant material may be potpourri, plants, herbs (oregano, parsley, damiana) and even grass cuttings sprayed with SynCanns then smoked
- Finished product looks like crushed grass



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## David Mitchell Rozga

- K2 implicated in Iowa teen suicide
  - Purchased K2 at local head shop
  - Smokes with friends, develops severe paranoia
  - Commits suicide with shotgun
- DEA/Congress Takes Action
  - 11/24/10 DEA bans 5 chemicals used to make K2
  - 03/27/11 S 605 David Mitchell Rozga Act (Grassley-IA)
  - 09/07/11 DEA bans chemicals in bath salts
  - 12/15/11 HR 1254 *Synthetic Drug Control Act of 2011*
  - 07/09/12 S 3187 *Synthetic Drug Abuse Prevention Act of 2012*
    - Expanded ban; controls 26 synthetic drugs under the CSA



David M. Rozga  
Died 06/06/10



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## Routes of Administration

- Usually smoked to provide marijuana-like high
  - Often smoked in bong
  - Rolled in papers and smoked
  - Packed into a blunt
  - Hookah pipes
  - Inhaled after burning as incense
- May be ingested or snorted, rare IV use
- Some users make it into a tea



Looks like marijuana  
or potpourri



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## Why Aren't These Drugs Illegal?



- States ban specific formulas but drug makers can easily sidestep these regulations
- Manufacturers adapt by replacing the chemical compound of a banned substance with a newer formulation that is not yet known to authorities
- Poses increasing risk as users are unaware of the reactions the new chemicals may cause



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## New Compounds


**UR-144**  
Warning: Research Use Only  
NOT FOR HUMAN CONSUMPTION

**BUY UR-144 RESEARCH CHEMICAL** at [ur-supply.webs.com](http://ur-supply.webs.com)  
Make your own incense blends, and save money!  
This is the new generation of chemicals that replaces the JWH and AM chemicals.




**FUNKY GREEN STUFF**

**HAMMER**

**AM-1248**  
[www.shine-feel.com](http://www.shine-feel.com)

**XLR-11** (5"-fluoro-UR-144) "stand alone" formulation

**AM-1248** (adamantoyl)



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## Effects

- ↑ heart rate
- ↑ blood pressure
- Nausea/Vomiting
- Chest pain
- Disorientation
- Nystagmus
- Severe agitation
- Paranoia
- Hallucinations
- Suicidal thoughts
- Seizures
- Withdrawal effects:
  - Anxiety, depression, psychosis

\*Not all symptoms are consistent with cannabis intoxication



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## "Bath Salts"

- Technical term is "substituted cathinone"
  - Synthetic, concentrated versions of the stimulant chemical found in the leaves of the Khat plant
- Synthetic cathinones:
  - Methcathinone
  - MDPV
  - Mephedrone
  - Methylone
  - Flephedrone
  - Methedrone
  - Butylone
  - Naphyrone
- Bath salts has become an umbrella term for the latest wave of designer drugs



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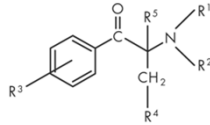
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## Structure of Cathinone Derivative



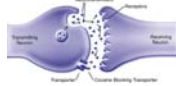
R <sup>1</sup>	R <sup>2</sup>	R <sup>3</sup>	R <sup>4</sup>	R <sup>5</sup>	Name
H	H	H	H	H	Cathinone
Methyl	H	H	H	H	Methcathinone (ephedrone)
Methyl	H	4-Methyl	H	H	Mephedrone (4-MMC; M-CAT)
Methyl	H	3,4-Methylenedioxy	H	H	Methylone (βk-MDMA)
(pyrrolidino)		3,4-Methylenedioxy	Ethyl	H	3,4-Methylenedioxypropylvalerone (MDPV)

Source: <http://www.emcdda.europa.eu/publications/drug-profiles/synthetic-cathinones>

## Mechanism of Action



- Similar to hallucinogenic amphetamines (ecstasy)
- ↑ brain levels of stimulatory neurotransmitters
  - Inhibits uptake of serotonin, norepinephrine, dopamine
    - Serotonin can elevate mood and cause a calming effect
    - Norepinephrine ↑ alertness, concentration and motivation
    - Dopamine signals pleasure; base of the “reward” system
  - Induces psychoactive effects like cocaine, PCP, meth



## Appearance



- Usually a highly pure white or brown powder
- May be compressed into crystal to resemble actual bath salts
  - May be mistaken for Ecstasy or crushed meth crystals
- Can be purchased in pill or capsule form
- Injected, smoked, snorted or ingested
- Little or no odor



Methylone

“bath salt”

## Effects of Synthetic Cathinones



- ↑ Heart rate
- ↑ Blood pressure
- ↑ Temp (monitor closely)
- Dilated pupils
- Headache (common)
- Severe panic attacks
- Paranoia
- Extreme agitation
- Hallucinations
- Bruxism (like ecstasy)
- Hostility
- Violent behaviors
- Suicide attempts
- Self-mutilation
- Rhabdomyolysis
- Seizures
- Death

Long term effects unknown- Parkinson's Disease???



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## Dangerous and Unpredictable



- Without provocation, may lash out
- Several graphic media reports
- May present with extreme anxiety and agitation, combative, self-destructive, suicidal, homicidal
- Need to protect self, staff and patient from harm
- When signs and symptoms begin to resolve, patient may experience depression, withdrawal and suicidal thoughts



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## Drug Testing



- These don't show up on routine UDT
  - DCI labs and private labs have limited capability
- Lack of validated field tests
  - Individual *presumptive* test kits available
  - Very limited on compounds detected
  - False negatives likely
- A moving target
  - New compounds being developed all the time
  - No test can detect all the different compounds



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## Treatment



- First ensure your own safety!
- **Treat the patient, not the poison**
- **Benzodiazepines (may need large doses)**
  - HTN unresponsive to benzos, use vasodilator
    - Avoid use of beta blockers
- Antipsychotics (Geodon most commonly used)
- Propofol
- Aggressive cooling for hyperthermia
- Supportive care



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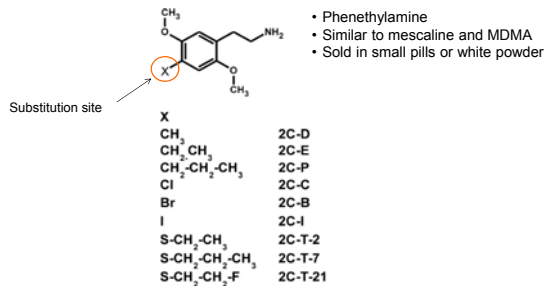
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## “2C” Series (synthetic hallucinogen)



Maurer, Hans. Chemistry, Pharmacology, and Metabolism of Emerging Drugs of Abuse. Ther Drug Monit 2010.

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## 25i-NBOMe



- New emerging “legal high”
- Derivative of hallucinogen 2C-I
- Potent agonist activity at 5HT<sub>2A</sub> receptors
  - Activation of these receptors is what causes the effects of LSD
  - Serotonergic and sympathomimetic toxicity
    - ↑ blood pressure, ↑ heart rate, hallucinations, seizures, rhabdomyolysis
    - Symptoms may be prolonged



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## 25i-NBOMe



"I can see 25i becoming this generation's acid. It's incredibly cheap; This dose cost me literally 6 cents. 25i-NBOMe has all the positives of acid, but unlike acid, it's extremely stable and completely legal as long as its not 'for human consumption.' This is one of the best if not THE BEST drug ever made. It would be almost impossible to improve. I am done searching for the perfect psychedelic; this is the one. Both low and high doses are extremely comfortable and get more rewarding as the dosage is pushed higher. Under its influence at relatively high doses there was no nausea, no anxiousness, and absolutely no fear. There was, instead, a gentle push as the chemical guided me to a mind-state of pure and indescribable bliss. There is no doubt in my mind that this chemical changed me. It's made me happier. It's made me more compassionate. It's made me more enthusiastic about going and doing things. The experience in itself is incredible, but it is the effect it has had on my perception of the world that makes up the majority of its value to me."

<http://www.erowid.org/experiences/exp.php?ID=95009>



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## Piperazines



- Often sold as Ecstasy (effects similar to MDMA)
- Prototype: Benzylpiperazine (**BZP**)
  - ↑ CNS concentrations of dopamine, norepi, serotonin
  - About 1/10 potency of methamphetamine
  - Can be injected or parachuted
  - Used in combination with TFMPP or MDMA
- m-chlorophenylpiperazine (**mCPP**)
- Trifluoromethylphenylpiperazine (**TFMPP**)
  - Limited effect when taken alone; usually taken with BZP



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## PMMA and PMA



- Paramethoxyamphetamine- "Doctor Death"
- Frequently sold as Ecstasy; higher toxicity
  - May cause life-threatening ↑ of BP and temp
    - Delayed onset
  - Tablets may have 3 diamond "Mitsubishi" logo, Superman, happy face or Macintosh Apple
- PMA (paramethoxyamphetamine) is active metabolite of PMMA
- Not detectable in routine lab tests



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## Tryptamines



- Natural hallucinogens
  - Psilocybin and Psilocin (Psilocybe mushrooms)
  - Bufotenin (Bufo alvarius toad species)
- Synthetic hallucinogens
  - DMT (dimethyltryptamine)
    - Inactive orally
  - 5-MeO-DMT (5-methoxydimethyltryptamine)
  - 5-MeO-DIPT (“foxy methoxy”)
  - May be sold as LSD



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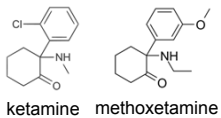
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## Methoxetamine



- Powerful dissociative drug; same family as ketamine and PCP (lasts longer than ketamine)
- Aka rolfcopter, mexxy, Mket, MXE



- No legal restrictions in U.S.
- PO, snorting, IM, IV, rectal
- Effects: euphoria, agitation, ↑ heart rate, ↑ blood pressure, nausea, nystagmus, dissociative state



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## Methylhexaneamine (Geranamine) Dimethylamylamine (DMAA)



- AKA “Pump-It Powder” or “Party Pills”
- “Legal replacement” for banned bath salts
  - Effects are amphetamine-like
  - Long believed to be a natural aphrodisiac
- Found in some sports & dietary supplements
  - Advertised to ↑ energy and physical performance
  - Removed from stores on military bases following 2011 deaths of two U.S. soldiers
- No legal restrictions in U.S.



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## Methylhexanamine “Pump-It Powder”



Sold online ~\$25-30

- Comes in a lip balm-like container
- Marketed as an “enhanced plant vitamin”
- Can be snorted, injected or less commonly smoked
- Said to make users feel as if they had ingested cocaine or meth
- ER reports of ↑ heart rate, seizures, hallucinations, paranoia



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## Phenazepam



- Zannie Air Freshener sold on internet
  - Light blue/green color liquid
  - “Product is intended to be sprayed into mouth like a breath freshener”
  - Onset within 1 hr; may last several days
- Contains phenazepam
  - Powerful, long-acting benzodiazepine
  - Russian epilepsy medication
  - Sold on the street as yellow & white tablets



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## Kratom (*Mitragyna speciosa*)



- Tree indigenous to SE Asia
- Acts as both a stimulant (low doses) and opiate-like at high doses
  - Used for pain and opiate addiction since the 19<sup>th</sup> century
- Fresh leaves are chewed, smoked or brewed into tea (with sweeteners)
- Undetected in routine drug screens
- Legal and unregulated in U.S.



Dried kratom leaf



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## “Cinnamon Challenge”



Popular dare game  
Videos on Internet

- Teens dared to swallow a tbsp of cinnamon without drinking water in under 60 seconds
- Results in the cinnamon coating and drying mouth and throat; makes swallowing difficult
- Causes gagging, coughing, choking, vomiting, throat irritation
- May lead to respiratory distress



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## Messages You Can Deliver



- It is impossible to know what these drugs contain, or who made them, or what you are going to get
- Getting high – no matter how – carries risks of making unsafe or unhealthy decisions
- Just because a drug is legal – or is labeled as legal – does not mean that it is safe
- We don't know the long term effects of synthetic drugs because the drugs are so new
- Prevent, Intervene, Get Treatment, Recover

Source: The Partnership at DrugFree.org



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## Looking Ahead...

- Chemicals change to reflect legislation?
  - Discouraging & reducing consumption most important
- Long term effects?
- Care for the chronic user?
- Refer to drug courts
  - How to monitor?
- Develop better drug screens
  - Worth investing in?
- Prevention



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