

Emergency Medicine & Medical Toxicology Cases

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Case 1

- 19 yo male: found unresponsive by police slumped at the wheel of his parked car
- EMS
 - » Dilated pupils
 - » Vomiting
 - » Respiratory distress
- Intubated at the scene
- Police found empty packages of K2

K2 & Spice



Designer Drug Loophole

- 1986 Federal Analogue Act:
 - To prevent designer drugs
 - Did not prevent possession or manufacture
 - Unless intended for human consumption
- Spice/K2 & bath salts:
 - Herbal Incense
 - Bath salts
 - “Not for human consumption”



Emerging Drugs of Abuse

- Spice/K2 & Bath Salts
- Designer Drug Loophole
- “Not for human consumption”
- Sold via internet, head shops, gas stations, convenience stores
- Very infrequently sold by drug dealers



Emerging Drugs of Abuse

- Spice/K2 & Bath Salts
- Designer Drug Loophole
- Reasons for popularity:
 - » “legal”
 - » Perceived safer
 - » Easier to obtain
 - » Don't have to go to a drug dealer
 - » (-) Tox screen

Spice

- “Dune” book reference
 - Wide-open eye imprint
 - Fictional drug “Melange”
 - Referred to as spice
 - Causes blue sclera



- Different names & brands:

Spice, Aroma, K2, Dream, Herbal Incense, Spice Silver, Spice Gold, Spice Diamond, Banana Cream Nuke, Spice 99, Happy Tiger Incense, Genie, Yucatan Fire, Sence, Smoke, Skunk, Zohai, Mr. Smiley, Zohai, Eclipse, Black Mamba, Cloud 9, Super Nova, Spike Max, California Spice, Blueberry Haze

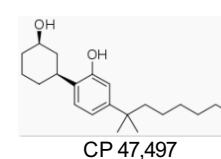
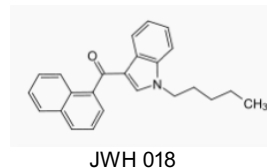
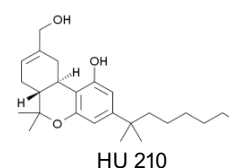
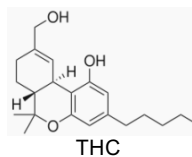
Spice/K2

- Synthetic cannabinoids: many different ones
- Dissolved in a solvent (acetone)
- Sprayed on a plant that can be smoked
- Activity at cannabinoid receptors
- Users: similar to smoking marijuana



Synthetic Cannabinoids

- 1960s: Hebrew University: THC analogs
 - » HU series (HU 210)
- 1970s: Pfizer: cyclohexylphenols
 - » CP series (CP 59,540, CP 47,497)
- 1990s: JW Huffman: aminoalkylindoles
 - » Organic chemist at Clemson University
 - » JWH series (JWH 018, JWH 073)

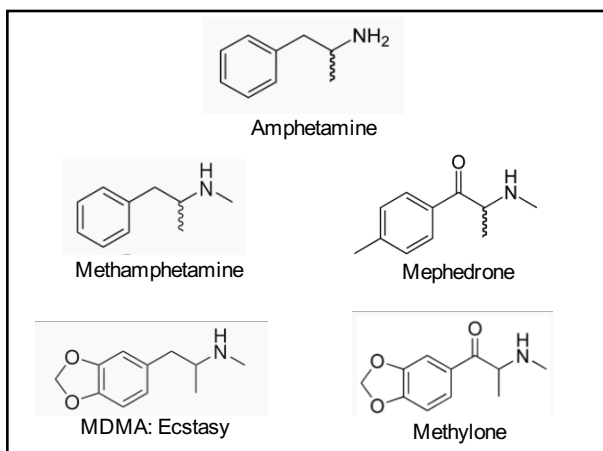


Clinical Presentation:

- Euphoric effects similar to marijuana
- Other symptoms:
 - » Hallucinations (~25%)
 - » Psychotic experience
 - » Anxiety/panic
 - » Agitation
 - » Tachycardia & hypertension
 - » Rare seizures
 - » Rare respiratory distress

Bath Salts

- Real bath salts: mineral additives added to bath water to mimic mineral baths or hot springs
- Vehicle to market
- Amphetamine derivatives:
 - » Cathinone: alkaloid derived from Khat plant
 - » β -ketone derivatives of amphetamines
 - » AKA BK-amphetamines



Bath Salts Marketing

- Also marketed as plant food
- No instructions how to use for drug abuse
- Typically \$25-\$30 for ½ gm package
- Typical dose: 5-20 mg snorted
 - Can be injected or ingested
- Bliss, Purple Wave, Vanilla Sky, Ivory Wave, Pure Ivory, Zoom 2, Aura, White Rush, Cloud 9, Blue Silk, Bliss, 8Ballz, Legal Cocaine

Clinical Presentation:

- Euphoric effects similar to cocaine
 - » Quality of high > cocaine: 55%
 - » Rapid absorption
 - » Peak at 1.5 hrs; lasting 3-4 hrs
- Symptoms:
 - » Sympathomimetic
 - » Hallucinations/Psychotic symptoms
 - » Severe agitation/Violence

Case 2

- 25 yo male smoking gravel with friends
- Over the next several hours:
 - » Hallucinations
 - » Sudden violent behaviors
- 911 called
- Arrives in ED: Agitated & Violent

Agitated & Violent Patients

- Physical restraint initially
 - » JCAHO area of concern
- Pharmacologic restraint
 - » Sedatives
 - » Antipsychotics
- Bath salts
 - » May require massive doses

Ketamine For Severe Agitation

- Limited number of studies: Describing usefulness of ketamine (no RCTs)
- Most prehospital
- Rapid onset (IV: 1-2 min; IM: 3 min)
- Dose: 4-6 mg/kg (40-400 mg doses); median dose: 200 mg IV/IM
- Agitation more rapidly controlled
- May increase intubation rate

Bath Salts: Dangerous Behavior

- Firing guns at non-existent people
- Jumping out of a balcony to escape from no apparent threat
- Fighting requiring multiple people to subdue
- Lying down in the middle of a highway

Designer Drug Loophole

- 2010: A number of states enacted laws banning usage
- DEA 3/1/11: JWH-018, JWH-073, JWH-200, CP-47,497, and cannabicyclohexanol
- DEA 10/21/11: Mephedrone, MDPV and Methylone
- DEA 4/12/13: methylone permanent ban & 3 synthetic cannabinoids (UR-144, XLR11, and AKB48)

Case 1 cont' d

- ED arrival:
 - » 37.2, BP 135/74, HR 96, RR 16, POx 100%
 - » Intubated, not following commands
 - » Withdraws to pain
- IVF & antibiotics administered
- Labs
 - » ABG: 7.39/41/566 on 100% FIO2
 - » WBC: 24.9; HGB: 13.0; Plt: 209
 - » Lytes; LFTs: unremarkable
 - » (-) Etoh; (-) ASA; (-) APAP
 - » Tox screen: (-), (-) THC
 - » EKG: unremarkable

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Case 1 cont' d

- CXR: (-)
- CT Head: (-)
- Spinal tap: unremarkable
- Admitted to ICU
- Hospital day #2: patient extubated

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Case 1 cont' d

- Awake, alert & normal CNS exam
- Chronic marijuana user
- A friend gave him K2 purchased at a convenience store: "Herbal Incense"
 - Smoked K2 out of a pipe: his 1st usage
 - In parked car
- Remembers smoking and then the hospital
- Denied other drug or pill usage
- 3 months later: full recovery

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Summary: Emerging Drugs

- Spice/K2: synthetic cannabinoids
- Bath Salts: BK-amphetamines
- Designer Drug Loophole
 - Multiple compounds
- Clinically:
 - Hallucinations & psychotic symptoms
 - Bath salts: more dangerous
 - Sympathomimetic: cocaine-like
 - Agitation & violence

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Case 1

- 46 yo M brought in by a friend and dropped off at ED front door
- “He OD’ d on heroin”
- VS: 98.0; 100/50; 80; 10; 97%
- PE:
 - Moves to painful stimulation
 - Pupils 6mm bilaterally
 - Otherwise unremarkable

Case 1 Cont’ d

- Naloxone given
- The pt immediately becomes wildly agitated, hypertensive, tachycardic
- Skin is warm, dry and flushed
- Anticholinergic toxidrome
- Rx: physostigmine
- Later: Samples found to have heroin and scopolamine (polo outbreak)

Case 2:

- 25 year old male heroin abuser
- “Felt funny after snorting heroin”
- Thought he got “bad heroin”
- Heroin use: 2-3 x per week
- No other PMH
- PE:
 - BP 85/38; Pulse 140/min; RR 25; afebrile
 - Pupils slightly dilated

Case 2 cont’ d

- Labs:
 - Na 143, **K 2.2** mEq/L, Cl 105, **Bicarb 19** mEq/L, BUN 13, Cr 1.8, **Glu 228** mg/dL
 - Ischemic changes on ECG
 - Poor urine output
- ED course
 - Given 5 L of fluids, began to void
 - Utox: (+) opiates, (+) THC
 - Agitated and tachycardic: treated with diltiazem and halperidol

Case 2 cont’ d

- BP dropped to 60/13
- Ph 7.27; PCO₂ 29.5; PO₂ 127
- Pupils: 7-8 mm
- Lactic acid: 10.6
- Mixed venous oxygen (PvO₂): 72 mm Hg

Disruptors of Cellular Metabolism

- Cyanide
- Phosphines
- Monofluoroacetate
- Azides
- Rotenone

Cyanide

- CN binds to cytochrome oxidase:
 - Disrupts cellular energy production
 - Cellular hypoxia & lactic acidosis
- Hydroxocobalamin or CN antidote kit:
 - Amyl nitrate pearls (inhaled)
 - Sodium nitrite IV
 - Sodium thiosulfate IV
- CN + Met-Hb \rightleftharpoons cyano-Met-Hb

Case 2 cont' d

- Na thiosulfate administered
- Physician at bedside: patient feeling better
BP 112/61; Pulse 128
- Later: RR >30; very anxious; HR ~ 130,
patient asking for valium
- Repeat PvO₂: > 100 mm Hg
- Na Nitrite (300 mg) administered
- Patient appears to breathe easier

Case 2 cont' d

- Post Na nitrite:
 - PvO₂: 75 mm Hg
 - Methemoglobin: 6.6%
- PvO₂ (6 hrs later): 181 mm Hg
- 2 additional patients present to the same
hospital ED with similar complaints and
laboratory findings



Case 2 cont' d

- A case definition established:
- Heroin user with
 - Acidosis
 - Hypotension
 - Hypokalemia
 - Hyperglycemia
 - Elevated PvO₂



Case 2 cont' d

- Initial 3 patients: (-) cyanide
- Initial tests reveal: (-) heroin
- NJ State Police Lab: (+) clenbuterol
(GC/MS)
 - FBI: (+) Clenbuterol, (+) quinine, (+) mannitol
 - NYC cases: (+) clenbuterol



Clenbuterol

- A potent beta-agonist
- Athletes in training: popular - but banned
- Anti-catabolic on muscles: decreases
reduction of protein (bigger muscles)



Clenbuterol

- Liver toxicity
- Cheating with clenbuterol seen at 4H shows (beefing up cattle)
- Veal liver clenbuterol ingestion: Spanish outbreak of >100 patients poisoned:
 - Nervousness, tachycardia, muscle shaking, muscle pain and headache
 - (+) serum & urine clenbuterol

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2006

- Marked increase in drug related 911 calls
- Opioid toxidrome
- Increased number of fatalities
- Fentanyl related

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Carfentanil:

- 4-carbomethoxyfentanyl, Wildnil®
- Most potent opioid (10,000 x morphine)
- Dose: 0.005-0.02 mg/kg IM for animals
 - » Human lethal dose: 200 mcg??
- Onset: Rapid
- Half life: 7 hrs in animals??
- Naloxone dose: large & multiple
- EMS risk: powder absorbed through skin & can be aerosolized

Heroin: What's In The Mix?

- Cyanide
- Strychnine
- Fentanyl
 - Fentanyl analogs
 - China White
- Scopolomine
 - Polo
- Clenbuterol
- Cheese
 - Tylenol PM (APAP and diphenhydramine)

Muller et al Ann EM 2007