



Thug Drugs

Mark Garofoli, PharmD, MBA, BCGP, CPE

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Faculty

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- Experiential Learning Director & Clinical Assistant Professor, WVU School of Pharmacy
- Clinical Pain Management Pharmacist, WVU Medicine Integrative Pain Center
- Coordinator, WV Pain Management Expert Panel (SEMP Guidelines)
- WV PDMP Advisory Panel Member
- CDC Grant Reviewer



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Disclosures

- Advisory Board: DSI

This presentation was not a part of the presenter's official duties at the WVU and does not represent the opinion of WVU



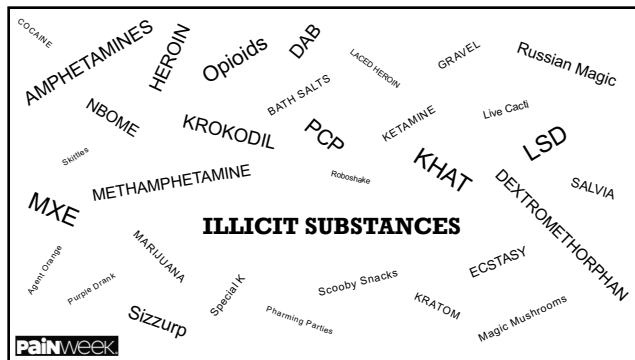
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Learning Objectives

- Recognize commonly abused substances across the globe.
- Classify commonly abused substances based on each substance's mechanism(s) of action.
- Explain how to provide guidance to the lay public on the anticipated effects of commonly abused substances.



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What are *illicit* substances?

1. Schedule 1 Controlled Substances
 - Illegal to make, sell, or use
 - No accepted medical use, dangerous, & potential severe dependence
2. Any Schedule Controlled Substance utilized for unintended people/uses

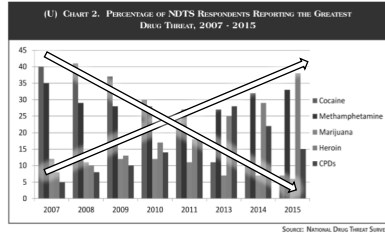
Laws are not uniform among states/countries

- Heroin is LEGAL in the UK, Portugal, Canada, etc.
- Marijuana is "LEGAL" in certain US states, yet Illegal on the Federal Level



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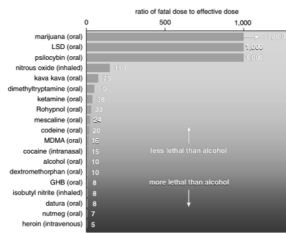
Most Abused Illicit Substances (2015)



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Illicit Therapeutic Index



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The Toxicity of Recreational Drugs. American Scientist. 2006. Volume 94, 206-208.

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Word of Mouth

www.streetrx.com

Shows daily observed prices by location

Did you get a good deal?

Substitution and emergency

Name of drug

Formulation

Price per unit

Price per unit: \$

Submit

Nevada

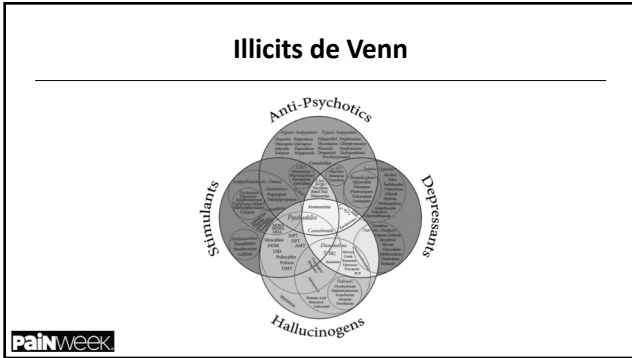
58	oxycodone ER tablet	Not Bad
59	Generic Opave ER, 10mg pill	\$ \$ \$ \$ \$
55	oxycodone, 10mg pill	Reasonable
56	10mg	\$ \$ \$ \$ \$
114	Adderall, 30mg pill	Not Bad
115	30mg	\$ \$ \$ \$ \$
112	Adderall, 30mg pill	Reasonable
113	30mg	\$ \$ \$ \$ \$

Resource for addiction treatment centers by zip code (Links to SAMHSA)

Home About Blog External Resources Disclaimer Contact

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Illicit Substances Overview

<u>Hallucinogens</u>	<u>Stimulants</u>	<u>Opioid-Related Products</u>
<ul style="list-style-type: none"> • NBOME • LSD • Ketamine • MXE • PCP • Psychedelic Mushrooms • Peyote Cacti • Ecstasy 	<ul style="list-style-type: none"> • Cocaine • Methamphetamine • Khat • Bath Salts & Gravel 	<ul style="list-style-type: none"> • Heroin • Laced Heroin • Krokodil • Kratom • Salvia • Dextromethorphan • Loperamide
	<u>Cannabis Products</u>	
	<ul style="list-style-type: none"> • Marijuana Plant • Synthetic Marijuana • Marijuana Extracts 	

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Increased Neurotransmitter Effects

	<u>Serotonin (5HT)</u>	<u>Dopamine (DA)</u>	<u>Norepinephrine (NE)</u>	<u>Opioid</u>
Effects	Hostility/agitation Muscle Rigidity Shivering Goose Bumps Dilated Pupils Fever/Sweating Diarrhea Seizures Bradycardia Tachycardia	"Reward & Pleasure" Schizophrenia Muscle Twitching Amnesia Insomnia Tachycardia	"Fight or Flight" Dilated Pupils Tachycardia Dry Mouth Urinary Retention	Constricted Pupils Constipation Nausea/Vomiting Constipation Dry Mouth Urinary Retention Respiratory Depression
Structures	<chem>NC(=O)c1ccc(O)c1</chem>	<chem>NC(=O)c1ccc(O)c1</chem>	<chem>NC(=O)c1ccc(O)c1</chem>	<chem>CN1CC[C@]23[C@@H]4OC5=C(C2)C=CC(=C5N1)C3</chem> Morphine (Pentamorphine)

A Venn diagram with three overlapping circles representing Serotonin, Dopamine, and Norepinephrine. The central area where all three overlap is labeled 'Increased Neurotransmitter Effects'.





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HALLUCINOGENS

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



Hallucinogens

NBOMe	1 st 5-HT _{2A} Receptor Agonist	
LSD	Affects D/5HT/NE Receptors	
Ketamine	NMDA Antagonist, <u>D</u> / <u>mu</u> / <u>k</u> agonist, <u>S</u> / <u>N</u> / <u>D</u> -RI, <u>Na</u> / <u>Ca</u> Channel Blockers, <u>NO</u> Synthase Inhibitor	
MXE	NMDA Antagonist & SSRI (5HT)	

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Hallucinogens

PCP	NMDA Antagonist, Anti-Cholinergic, & Dopamine	
Psychedelic Mushrooms	5-HT _{1A} and 5-HT _{2A} and 5-HT _{2C} Agonist	
Peyote Cacti	5HT-2A Receptors & Dopamine	
Ecstasy (MDMA)	5HT/DA/NE	

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STIMULANTS

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Cocaine

Nicknames	Coke, Speed, Snow, Blow, or Cocoa Puffs	
Mechanism	5HT/NE/D & Na-Channel Blocker	
Market	Snorted Powder "Lines" include: "Bumps" (35mg) or "Balls" (100mg) Cocaine HCL + Baking Soda -> Crack Dime Bags: \$10 for 1/10th Gram (Smoked)	

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Stimulants

Methamphetamine	NE & Dopamine	
Khat	NE & Dopamine	
Bath Salts & Gravel	Synthetic Cathinones NE & Dopamine	

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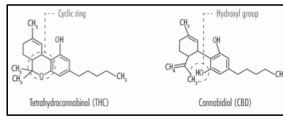
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Marijuana

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Let's Dive into the WEEDs...



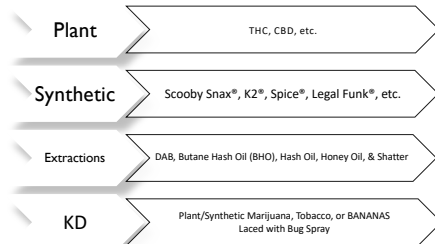
THC	CBD
<ul style="list-style-type: none"> Pain Nausea Vomiting Appetite Glaucoma Insomnia Anxiety Muscle Spasticity (Stiffness) 	<ul style="list-style-type: none"> Pain Inflammation Seizures Psychosis Depression IBS

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www.marijuana.com/industry/medical-marijuana/2014/09/24/2014-09-24-01

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Marijuana



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Cannabinoids

Adverse Effects & Interactions

Adverse Effect	~Odds Ratio
Disorientation	5
Dizziness	5
Dry Mouth	4
Euphoria	4
Drowsiness	4
Confusion	4
Balance Issues	3
Hallucinations, Nausea, Vomiting, Diarrhea, & Fatigue	2

Cannabinoid	CYP-2C9	CYP-2C19	CYP-3A4
Δ9-THC	X		X
Δ8-THC	X		X
CBD		X	X
CBN	X		X

Colorado Department of Public Health and Environment. Monitoring Health Concerns Related to Edibles in Colorado. 2016. <http://dph.colorado.gov/sites/default/files/2016/05/2016-05-19-Edibles-Health-Concerns-Report.pdf>
Winters, K. et al. Adverse Health Effects of Marijuana Use. MMWR. 2016; 65(2): 239-243.

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“Medical” Marijuana States Timeline

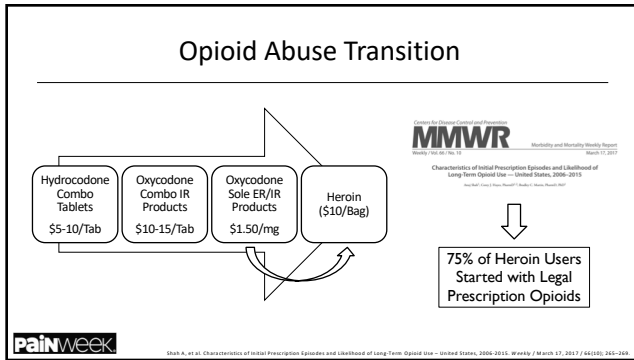
California	1996
Alaska	1998
Oregon	1998
Washington	1998
Maine	1999
Colorado	2000
Hawaii	2000
Nevada	2000
Montana	2004
Vermont	2004
Rhode Island	2006
New Mexico	2007
Michigan	2008
Arizona	2010
New Jersey	2010
Washington, DC	2010
Delaware	2011
Connecticut	2012
Massachusetts	2012
Illinois	2013
New Hampshire	2013
Maryland	2014
Minnesota	2014
New York	2014
Arkansas	2016
Florida	2016
North Dakota	2016
Ohio	2016
Pennsylvania	2016
West Virginia	2017
Oklahoma	2018

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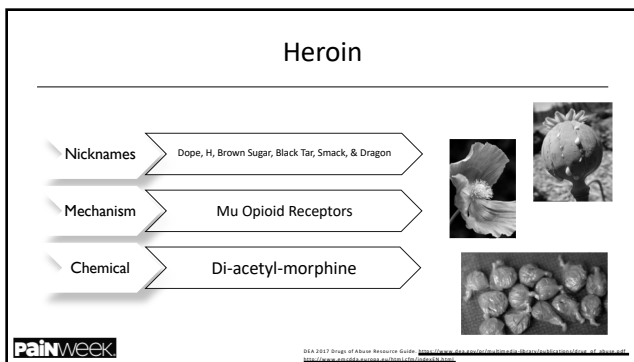
Opiates/Opioids

http://ohiovalleyresource.org/2016/07/15/medical-marijuana-law47_jan+1210143126-2020308723-146893668

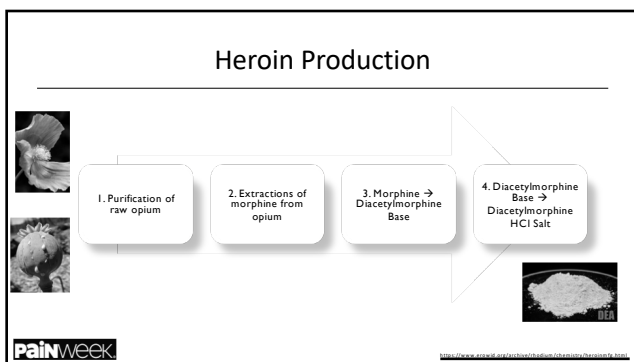
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
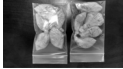
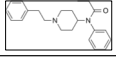

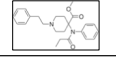



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Laced Heroin

Heroin	Fentanyl	Carfentanil	Remifentanyl Sufentanil Alfentanil
<ul style="list-style-type: none"> MME: 3  	<ul style="list-style-type: none"> MME: 100 Theraflu, Bud Ice, or Income Tax  	<ul style="list-style-type: none"> MME: 10,000 Wildnil Elephant tranquilizer  	

PainWeek © 2017 Society of Abuse Research Guide <http://www.sar.org/2017/08/01/10-heroin-laced-with-fentanyl/>

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Krokodil

Nicknames	Russian Magic or Poor Man's Heroin	
Mechanism	Mu Opioid Receptors	
MME Factor	Ten (10)	
Chemical	Desomorphine (di-hydro-des-oxymorphine) Patented in 1934 as Permond in Switzerland	

PainWeek Allen SA, et al. The Heroin Chemistry Behind Krokodil (Desomorphine) Synthesis and Mechanisms of Toxicity. Forensic Science International 268 (2015) 207–223.

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Kratom

Nicknames	Thang, Thom, & Swim	
Mechanism	Potent K-Opioid D2 Agonist COX-2 Anti-inflammatory	
Drug Interactions	CYP450 3A4, 2D6, & 1A2 Inhibitor	
Chemical	Mitragyna Speciosa Tropical plant in coffee family Native to Southeast Asia	

PainWeek © 2017 Society of Abuse Research Guide <http://www.sar.org/2017/08/01/10-heroin-laced-with-fentanyl/>

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Salvia

Nicknames Salvia Divinorum, La Maria, Magic Mint, or Diviner's Sage

Mechanism Potent K-Opioid D2 Agonist Endocannabinoid Modulator

Drug Interactions CYP450 1A1, 2C18, 2D6, & 2E1

Chemical Sage plant (Mint Family) Native to Mexico

PainWeek © 2017 Drug of Abuse Research Guide: <http://www.drugofabuse.com/2017/10/29/salvia-divinorum/>
<http://www.drugofabuse.com/2017/10/29/salvia-divinorum/>
<http://www.drugofabuse.com/2017/10/29/salvia-divinorum/>

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Dextromethorphan (DXM)

Nicknames Sizzurp, Purple Drink, Purple Tonic, Robitussin DM+ → Roboshake, Delusim → Agency Orange, Coricidin HBP → Skittles

Mechanism Non-Selective Serotonin Reuptake Inhibitor, NMDA Antagonist, Opioid Sigma Agonist, & Anesthetic

Chemical D-enantiomer of levomethorphan (methyl-levorphanol)

One in 10 American teenagers has abused products with DXM

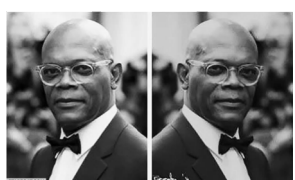


Dose (mg)	Effects
100-200	Mild Stimulation
201-400	Euphoria & Hallucinations
401-600	Distorted Vision & Coordination
601-1500	Dissociative Sedation

PainWeek © 2017 Drug of Abuse Research Guide: <http://www.drugofabuse.com/2017/10/29/dextromethorphan-dxm/>
<http://www.drugofabuse.com/2017/10/29/dextromethorphan-dxm/>
<http://www.drugofabuse.com/2017/10/29/dextromethorphan-dxm/>

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Chirality



Samuel-L-Jackson

Samuel-D-Jackson

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Opioid "Cousins"

Dextromethorphan (DXM)

CN1CC[C@H]2C=C[C@@H]1C2

⇨

CYP-2D6
O-demethylation

Dextrorphan (DXO)
 "D(+)-enantiomer" of racemorphan

CN1CC[C@H]2C=C[C@@H]1C2

↕

Levorphanol
 "L(-)-enantiomer" of racemorphan

CN1CC[C@@H]2C=C[C@@H]1C2

PainWeek Clinical Pharmacology Online Database 2011

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loperamide

Nicknames → Poor Man's Methadone & Imodium®

Mechanism → Peripheral Mu-Opioid Agonist

Info → 1988 Moved from C-V to OTC

Eggleston W et al. Loperamide abuse associated with cardiac dysrhythmia and death. Ann Emergency Medicine. 2016; 1-4.
 Dierksen J et al. Poor man's methadone: a case report of loperamide toxicity. Am J Forensic Med Pathology. 2015;36:268-270.

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Illicit Substances Overview

<p>Hallucinogens</p> <ul style="list-style-type: none"> • NBOME • LSD • Ketamine • MXE • PCP • Psychedelic Mushrooms • Peyote Cacti • Ecstasy 	<p>Stimulants</p> <ul style="list-style-type: none"> • Cocaine • Meth(amphetamine) • KHAT • Bath Salts & Gravel <p>Cannabis Products</p> <ul style="list-style-type: none"> • Marijuana Plant • Synthetic Marijuana • Marijuana Extracts 	<p>Opioid-Related Products</p> <ul style="list-style-type: none"> • Heroin • Laced Heroin • Krokodil • Kratom • Salvia • Dextromethorphan • Loperamide
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Increased Neurotransmitter Effects

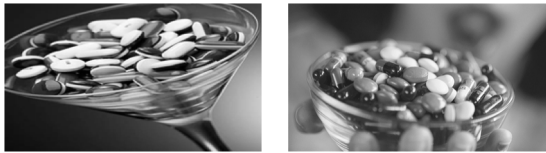
	Serotonin (5HT)	Dopamine (DA)	Norepinephrine (NE)	Opioid
Effects	Hostility/Agitation Muscle Rigidity Shivering Goose Bumps Dilated Pupils Fever/Sweating Diarrhea Seizures Restlessness Tachycardia	"Reward & Pleasure" Schizophrenia Muscle Twitching Amnesia Insomnia Tachycardia	"Fight or Flight" Dilated Pupils Tachycardia Dry Mouth Urinary Retention	Constricted Pupils Confusion Nausea/Vomiting Constipation Dry Mouth Urinary Retention Respiratory Depression
Substances	Peyote Cacti Cocaine DXM Ecstasy Kratom LSD Psychedelic Mushrooms MXE NBOME PMA	Gravel Peyote Cacti Cocaine Ecstasy Ketamine Khat LSD Bath Salts PCP Salvia	Gravel Cocaine Ecstasy Khat LSD Bath Salts	DXM Heroin Ketamine Kratom Oxycodone Salvia U-47700 W-18

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DiPiro, J. et al. Pharmacotherapy: A Pathophysiologic Approach, 10th Edition, McGraw-Hill Education, 2017.
 DEA 2017 Drugs of Abuse Resource Guide: <https://www.dea.gov/sites/default/files/2017-08/2017-2018%20DOA%20Resource%20Guide.pdf>

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Pharming & Punchbowl Parties



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DEA 2017 Drugs of Abuse Resource Guide: <https://www.dea.gov/sites/default/files/2017-08/2017-2018%20DOA%20Resource%20Guide.pdf>

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Resources Concentrating on Illicit Substances

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Support Groups

Alcoholics Anonymous (AA)

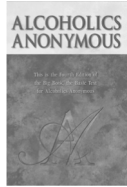
- ❖ <http://www.aa.org/>
- ❖ 212-870-3400

Narcotics Anonymous (NA)

- ❖ <http://www.na.org/>
- ❖ 1-818-773-9999

Nar Anon (Family & Friends)

- ❖ www.nar-anon.org
- ❖ 1-800-477-6291

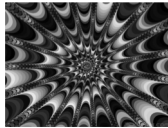


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Audience Question #1

Which of the following illicit substances is a hallucinogen?

- a) Bath Salts
- b) Khat
- c) Ketamine
- d) Carfentanyl



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Audience Question #1 (ANSWER)

Which of the following illicit substances is a hallucinogen?

- a) Bath Salts
- b) Khat
- c) KETAMINE
- d) Carfentanyl



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Audience Question #2

While stopped at a cross-walk on Jefferson St. in downtown Phoenix outside the Gypsy Bar at 2am, you notice a college student next to you leaning against a stop light post, shaking, with a red-toned skin color, grinding her teeth, and profusely sweating. If the student was to have ingested an illicit substance, which of the following would be the most likely of the listed substances.

- a) Kratom
- b) Scooby Snax
- c) Heroin
- d) Ecstasy



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Audience Question #2 (ANSWER)

While stopped at a cross-walk on Jefferson St. in downtown Phoenix outside the Gypsy Bar at 2am, you notice a college student next to you leaning against a stop light post, shaking, with a red-toned skin color, grinding her teeth, and profusely sweating. If the student was to have ingested an illicit substance, which of the following would be the most likely of the listed substances.

- a) Kratom
- b) Scooby Snax
- c) Heroin
- d) ECSTASY



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Audience Question #3

Which of the following are effects of various doses of dextromethorphan (i.e. DXM)?

- a) Cough Suppression
- b) Pain Suppression
- c) Hallucinations
- d) Euphoria
- e) All of the Above



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Audience Question #3 (ANSWER)

Which of the following are effects of various doses of dextromethorphan (i.e. DXM)?

- a) Cough Suppression
- b) Pain Suppression
- c) Hallucinations
- d) Euphoria
- e) ALL OF THE ABOVE



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Discussion



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LinkedIn: Mark Garofoli



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