

After the Rave:
What to watch out for after your
patient comes off their party high

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Disclosures

- No financial interests
- Very sheltered life until entered medical field

Objectives

- Brief review the basics of toxicology
- Identify the physiological effects of street drugs
- List the serious adverse effects of street drugs
- Describe the medical management of those who have experienced a toxic ingestion

“Poison is in everything and no thing is without poison.”

Paracelsus (16th century German Physician)

http://www.youtube.com/watch?feature=player_embedded&v=cYIN-b8qjmo

Definitions

- Toxicology - study of symptoms, mechanisms, treatments and detection of poisoning (intentional or accidental).
- “Party high” – the physiological and serious adverse effects of intoxicants

Rave

- “Large party or festival featuring performances by disc jockeys playing electronic dance music with the accompaniment of laser light shows, projected images, visual effects and smoke machines” – Wikipedia
- “acid house party,” “wild bohemian parties,” “Woodstock of Generation X,” Burning Man



Toxicology


- Asymptomatic to life threatening
- Dose dependent
- Diagnosis does NOT take precedence over resuscitation and stabilization!
- Very limited human evidence-based trials for therapies
- Seek expert help (i.e. National poison center)

Supportive care

- ABCD's
- "Coma cocktail"
 - glucose, thiamine, naloxone, flumazenil?
- Hemodynamic support
 - IVFs → pressors/ionotropes → transvenous pacemaker, intraaortic balloon pump, ECMO

Decontamination

- Gastric lavage
- Activated charcoal (1 g/kg)
- Cathartics (sorbitol)
- Whole-bowel irrigation
- Enhanced elimination
 - Multi-dose charcoal
 - Forced diuresis
 - Alkalinization
 - Hemodialysis/hemoperfusion



Toxidromes

- Sympathomimetic – “Uppers”
 - Methamphetamine, cocaine, PCP, bath salts

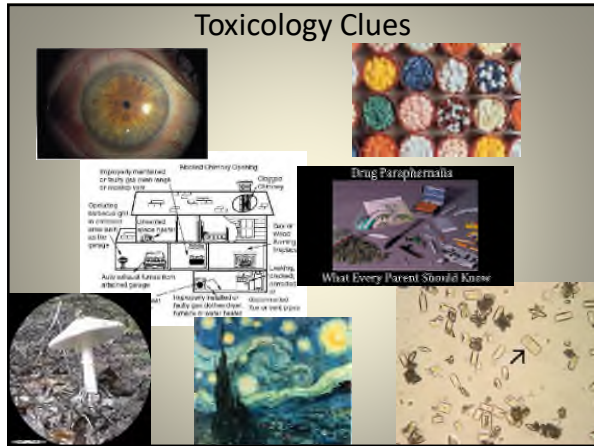
- Sympatholytic (narcotic/sedatives) – “Downers”
 - Narcotics, methadone, benzodiazepines, anti-convulsants

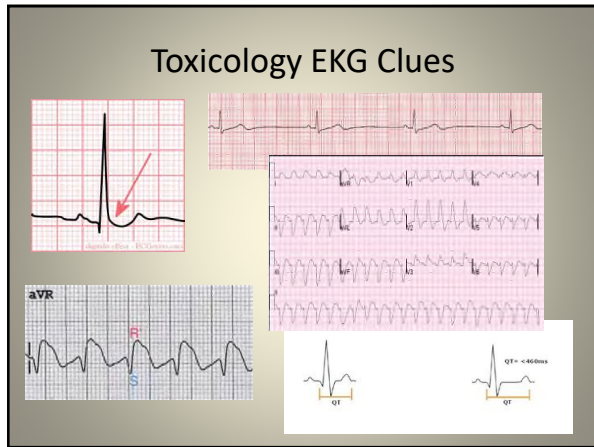
- Withdrawal
 - ETOH, narcotics, sympathetics

Toxidromes

- Cholinergic
 - “**SLUDGE/BBB**” – **S**alivation, **L**acrimation, **U**rination, **D**efecation, **G**I upset, **E**mesis, **B**ronchorrhea, **B**ronchospasm, **B**radycardia
 - Organophosphates, carbamates (i.e. neostigmine and donepezil), nerve agents (sarin)

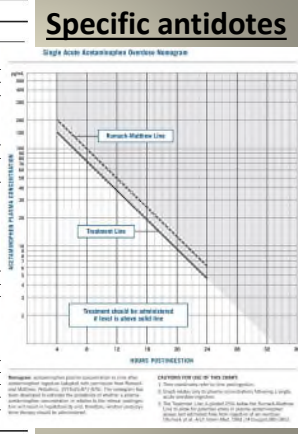
- Anticholinergic
 - Mad as a hatter, red as a beet, dry as a bone, blind as a bat, hot as a hare, full as a flask
 - Antihistamines, TCAs, sleep aids or cold medication, atropine, and plants (jimson weed)





Poison	Antidote
Acetaminophen	N-acetylcysteine (Acetadote®), Mucosyl®)
Anticholinergics	Physostigmine
Anticoagulants	Vitamin K
Calcium channel blockers	Calcium chloride calcium gluconate glucagon insulin/glucose
Carbon Monoxide	Oxygen
Cholinergics	Atropine Pralidoxime (2-PAM)
Cyanide	Cyanide antidote kit (Lilly Kit) Amyl nitrite Sodium nitrite Sodium thiosulfate Hydroxycobalamin (Cyanokit) Sodium thiosulfate alone
Digoxin	Digoxin FAB (Digibind)
Heparin	Protamine
Heavy Metals	Dimecaprol EDTA Penicillamine Succimer (DMSA)
Iron	Desferrioxamine
Isoniazid	Pyridoxine
Methanol	Ethanol
Ethylene glycol	Fomepizole (Antizol)
Opioids	Naloxone

www.ebmedicine.net

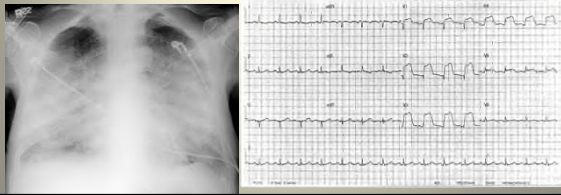




STREET DRUGS – PARTY HIGH

Case # 1

- 25 yo F Sky Hy with no PMx calls 911 c/o severe chest pain with associated SOB
- PE: HR 135 (sinus), BP 189/95, O2 sat 90% RA
– Diaphoretic, dilated pupils, agitated



Case #1 cont.

- Diagnosed with acute STEMI → heparin, ASA, cath lab called, and metoprolol
- HR slows to 105 but BP increased to 220/115 and becomes unresponsive...STAT CT head....



“Uppers”

Cocaine, methamphetamine, MDMA, ephedra, Khat



- Diaphoretic
- Hyperthermic
- Tachycardic
- Mydriasis
- HTN
- Agitated
- Combative

Pathophysiology

- Causes release of dopamine, epinephrine, NE, serotonin, then inhibits re-uptake at synapse
- Physiologic affects:
 - “High” = Dopamine, serotonin and N-channel blockade
 - Increases excitatory tone in brain
 - Alpha receptors increase vascular smooth muscle tone
 - Beta 1 receptors increase HR and myocardial contractility
 - Na-channel blockade delays cardiac conduction

Pharmacology



- Cocaine – “crack,” “speedball”
 - Inhaled (pipe), intranasal, IV, oral, skin popping
 - Onset seconds, peak effect 5-10 min, duration 10-30 min
- Methamphetamine – “crystal meth,” “crank”
 - Inhaled, IV
 - Delusions can persist for >15 hours
- MDMA – “ecstasy,” “love drug,” “XTC,” “Adam”
 - Oral

Adverse effects

- Significant hyperthermia
- Rhabdomyolysis
- HTN emergency
 - MI, ICH, CVA, vascular dissection, pulmonary edema
- Cardiac dysrhythmias
- Choreoathetoid movements “crack dancing,” “tweaking”
- Hyponatremia, SIADH picture (MDMA)
- Burns, nasal perforation, infection (endocarditis, abscess)




Medical Management

- Pharmacological sedation
 - Benzodiazepines, avoid anti-psychotics
- Cooling
 - Aggressive, ice packs, cooling blankets, sedation
- Blood pressure control
 - Avoid isolated beta-blockade!
 - Alpha antagonists: Phentolamine, nitrates
- Dysrhythmias
 - Atrial (SVT, A-fib): sedation
 - Ventricular (wide-complex): sodium bicarbonate, avoid lidocaine!
- Chest pain
 - Traditional ACS meds except beta-blockers
 - Sedation, benzodiazepines

Withdrawal

- “Crash”
 - Sleep, exhaustion
 - Dehydrated, electrolyte abnormalities
 - Depression, suicidality
- Supportive care




Case # 2

- 25 yo M Ynjecht Aweigh unresponsive at a fraternity party. 911 called by friends.
- PE: GCS 5, HR 85, BP 90/40, RR 3, O2 sat 85% RA and gurgling, pinpoint pupils


Case #2 cont.

- Per protocol, given narcan 0.4 mg IV with quick recovery to wakefulness and improved vital signs.
- 30 min later, slips into unconsciousness again and stops breathing, BP/HR fall precipitously



“Downers”

Heroin, ETOH, prescription narcotics, benzodiazepines



- Sedated
- Respiratory depression
- Miosis
- Bradycardia
- Hypotension
- Euphoria
- Nausea/vomiting

Pathophysiology

- Bind to various receptors in body including OP1 (delta), OP2 (kappa), and OP3 (mu)
 - Associated with pain and perception of pain
 - Also located on mast cells and in GI tract
- GABA and NMDA receptor dysregulation
- With chronic use, upregulation of cAMP occurs
 - When antagonist given or exposure discontinued → temporary excess of cAMP with increased sympathetic activity



Pharmacology

- Heroin – “dope,” “speedball,” “black tar”
 - IV, SQ, nasal
 - Peaks within 1-5 min, lipophilic
 - metabolized in liver and renally excreted
- Prescription narcotics – vicodin, morphine, demerol, dilaudid, fentanyl, methadone, etc.
 - Oral, IV, IM, SQ, transdermal, nasal, buccal, inhaled
 - Varied half-lives (0.5 hr → 48hrs)



Adverse effects

- CNS depression
- Respiratory depression → loss of airway reflexes
 - Non-cardiogenic pulmonary edema
- Orthostatic hypotension
- Nausea/vomiting with ileus
- Urinary retention
- Hypoglycemia
- Pruritis
- Seizures

Medical Management

- Airway and ventilatory supportive care
- Antidote:
 - Naloxone (IV, IM, SQ, ETT) 0.4-2 mg, infusion if necessary
 - Duration is 1-2 hours
 - Adverse effects: acute withdrawal, pulmonary edema, HTN, dysrhythmias
 - Has some effects on other intoxicants
 - VPA, clonidine, captopril, ETOH
- Assess for co-ingestants (APAP, ASA)

Withdrawal

- NOT life-threatening
 - Agitated, dehydrated, electrolyte abnormalities, cravings, nausea/vomiting
 - Sympathetic hyperactivity
- Clonidine, buspirone, dexmedetomidine, diphenhydramine
 - Methadone initiation



Case # 3

- Called to local high school for 17 yo M with agitation, yelling, diaphoretic, and hallucinating
- 2 minutes later, school RN calls you into the room next door for another 2 M teenagers with similar symptoms
- A 4th teen staggers into the office very agitated, vomiting, and having non-sensical speech...principal reports that teens are all friends and had been out in the parking lot ditching the last class

Case #3 cont.



- Taken to ED and all started on ativan gtts with airway boxes remaining close by pending ICU admission

Hallucinogens

LSD, PCP, mushrooms, peyote, THC, ketamine, dextromethorphan, Jimson weed



- Dissociation, confusion
- Panic reaction or paranoia
- Diaphoretic
- HTN, tachycardia
- Mydriasis

Pathophysiology

- Serotonergic – LSD, tryptamines (psilocybin mushroom), “foxy”
– Synthetic serotonin → increased cortex and limbic function
- Entactogens – MDMA (ecstasy), PMA (“serenity”), peyote (mescaline), nutmeg
– Alterations of 5-HT neurotransmission and dopamine-agonist
- Dissociative – ketamine, phencyclidine (PCP), dextromethorphan
– NMDA receptor antagonist, sigma receptor, cholinergic, dopamine/NE/serotonin
- Miscellaneous – marijuana, salvia (plant – chew/smoke), absinthe (wormwood), amanita mushrooms
– GABA effects

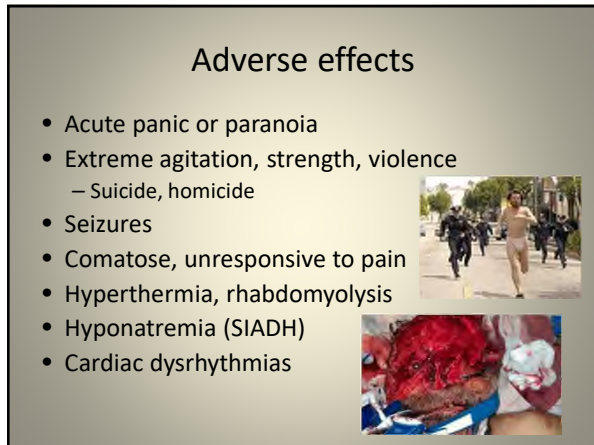
Pharmacology

- Inhaled, oral, injected, baked, intranasal



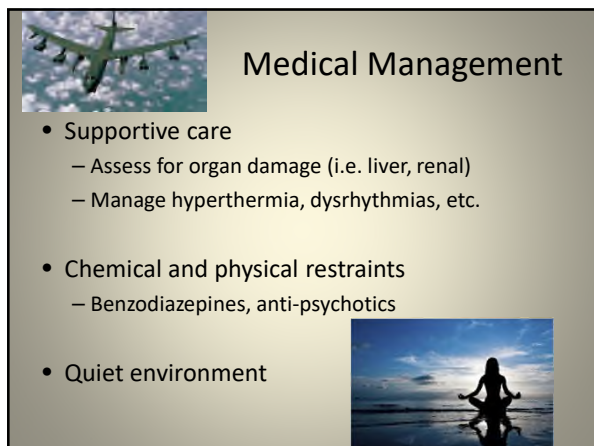
Adverse effects

- Acute panic or paranoia
- Extreme agitation, strength, violence
 - Suicide, homicide
- Seizures
- Comatose, unresponsive to pain
- Hyperthermia, rhabdomyolysis
- Hyponatremia (SIADH)
- Cardiac dysrhythmias



Medical Management

- Supportive care
 - Assess for organ damage (i.e. liver, renal)
 - Manage hyperthermia, dysrhythmias, etc.
- Chemical and physical restraints
 - Benzodiazepines, anti-psychotics
- Quiet environment



Withdrawal

- Minimal
- Depression, guilt, drug counseling

Newest crazes



Alcohol intoxication

- Pearls:
 - Combination drinks – “toxic-jock syndrome”
 - Toxic alcohols (methanol, ethylene glycol, propylene glycol, isopropyl)
 - Osmol gap, blindness, renal failure
 - Alcohol withdrawal – life threatening
 - Benzodiazepine
 - Dexmedetomidine, clonidine, VPA, gabapentin



Recreational marijuana

- May seem harmless, however...
 - Increase in MVA
 - Increase in bronchitis
 - Worsening in cognitive domain of learning, memory, attention
 - Increase risk of development of schizophrenia or other psychosis
 - Increases risk of substance abuse/dependence including ETOH, tobacco, and illicit drugs
 - Cyclical vomiting syndrome



National Academy of Science update Nov 2016 on Cannabis

Conclusion

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- Identify the physiological effects of street drugs
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