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 nothing is without poison.”

Paracelsus (16th century German Physician)

http://www.youtube.com/watch?feature=player_embedded&v=cYN-bhiqmo

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” – Salivation, Laccimation, Urination, Defecation, GI upset, Emesis, Bronchorrhea, Bronchospasm, Bradycardia
  - 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)
Toxicology Clues

Specific antidotes

<table>
<thead>
<tr>
<th>Poison</th>
<th>Antidote</th>
</tr>
</thead>
</table>
| Anesthetic    | Neostigmine, pyridostigmine, edrophonium |}

<table>
<thead>
<tr>
<th>Poison</th>
<th>Antidote</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol</td>
<td>Antabuse</td>
</tr>
<tr>
<td>Anticoagulants</td>
<td>Warfarin reversal agent</td>
</tr>
<tr>
<td>Cannabis</td>
<td>Naloxone, naltrexone</td>
</tr>
<tr>
<td>Carbon Monoxide</td>
<td>Oxygen</td>
</tr>
<tr>
<td>Cholera</td>
<td>Cholerine</td>
</tr>
<tr>
<td>Cyanide</td>
<td>Cyanide antidote (Nalysyn)</td>
</tr>
<tr>
<td>Heavy Metals</td>
<td>Chelating agents</td>
</tr>
<tr>
<td>Heavy Metals</td>
<td>DMPS, DMPS (intravenous)</td>
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</tbody>
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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-lifes (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/NR/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

Pearls:
- Combination drinks – "toxic-jock syndrome"
- Toxic alcohols (methanol, ethylene glycol, propylene glycol, isopropanol)
  - Osmol gap, blindness, renal failure
- Alcohol withdrawal – life threatening

Alcohol intoxication

Pearls:
- Combination drinks – "toxic-jock syndrome"
- Toxic alcohols (methanol, ethylene glycol, propylene glycol, isopropanol)
  - 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 Cannibus

Conclusion

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- Describe the medical management of those who have experienced a toxic ingestion

References

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