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Objectives

- Describe the role of GI decontamination
- Recognize common toxidromes
- Recognize substances for which specific antidotes exist
- Initiate ED management of a patient with an overdose
The undifferentiated patient

- A patient is dropped off at the ED door. He is minimally responsive. His friends say they think he took something and drive off...

- Where do we start?
Approach to (possible) Toxicology patient

- Simultaneous treatment & diagnosis
- Immediate action:
  - ABC(D), IV / O2 / monitor
- Thinking:
  - Is this a tox problem?
  - If yes, are there complicating factors?
    - Got drunk and fell down, now with head injury?
  - Resources to get a history?
Approach to (likely) Toxicology patient

- You’ve considered a differential and you think it is a toxicologic issue
- Immediate action:
  - Supportive therapy (airway etc)
  - Decontamination
- Thinking:
  - Toxidrome present?
  - What more information do I need?
- Definitive Management
  - Is there an antidote or specific treatment?
Overdose History

- Time of ingestion
- Talk to witnesses
- Get pill bottles & count!
- Assume common co-ingestants
  - Alcohol
  - Acetaminophen
  - Aspirin

Ondřej Karlík, Wikimedia Commons
Decontamination

- GI exposure
  - Most common route (75% of toxic exposures)
  - Prevent absorption
- Topical exposures
  - Remove clothing
  - Wash skin
- Enhance elimination
  - Whole bowel irrigation
  - Sorbitol
  - Diuresis / ion trapping
  - Hemodialysis
GI Decontamination

***Activated Charcoal***

- Absorbs up to 60% of ingestant
- 1 gm/kg +/- Sorbitol
- Maximal effect if given early (<1 hr)
- Will not bind – metals, electrolytes, acids

Contraindications

- Depressed MS – Intubate to avoid aspiration
- Bowel obstruction / perforation
- Acid/ alkali ingestion
GI Decontamination

- Rare interventions
  - Gastric lavage
    - Early presentation of potentially lethal OD
      - e.g. tricyclics, iron, CCBs, B-blockers
    - High Risk – aspiration / perforation / airway compromise
  - Syrup of Ipecac – Rarely used now
    - Induces vomiting & eliminates less than charcoal
    - Cardiomyopathy risk
  - Whole bowel irrigation
    - Sustained release preparations
    - Body packers
Treatment Goals with Overdose

- ABC’s
- Identify (if possible) substances
- Reduce absorption
- Enhance elimination
- Specific antidotes (if possible)
  - Relatively few but important to know
- Supportive care
Classic Toxidromes

Hint for exam:
Know these
• Narcotic
• Sympathomimetic
• Anticholinergic
• Cholinergic
Narcotics

- Natural & synthetic compounds which mimic endogenous endorphins
- Heroin, Morphine, Dilaudid, Demerol, Vicodin, Methadone, Fentanyl (China White), Oxycontin
- Different pharmacologic parameters
- Common drugs of abuse
- Street drugs – adulterated (mixed OD)
# Narcotics

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Narcotics - Treatment

- Support ABCs
- Narcan 2mg IV q2min until effect
  - Comes in 0.4mg vials!
- Can require massive doses
- IV / IM / SQ / ET routes
- Short acting & may require repeat doses or IV drip
Sympathomimetics

- Fight or flight system
- Drug activate adrenergic nervous system
- Cross-activation of dopaminergic $\rightarrow$ euphoria & hallucinations
## Sympathomimetics

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Common Sympathomimetics

- Cocaine
- Caffeine
- Ephedrine
- MDMA (ecstasy)
- LSD (prominent hallucinations)
- Pseudoephedrine (Sudafed)
Sympathomimetic Treatment

- ABCs
- Supportive care / time
- Cocaine – avoid B-blockers
Anticholinergic Toxidrome

- Antagonism of the cholinergic nervous system (parasympathetic)
- Sympathetic disinhibition & loss of parasympathetic functions
- Common medication side-effect
- Less commonly abused class of drugs
# Anti-cholinergics

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Anti-cholinergics

- Blind as a bat (mydriasis)
- Hot as hare (flushed & warm)
- Mad as a hatter (delirium)
- Dry as a bone (membranes & axillae)

“Can’t see, can’t pee, can’t s—t, can’t spit”
Common Anti-cholinergics

- Atropine
- Antihistamines (Benadryl)
- Phenothiazines (antiemetics)
- Tricyclic antidepressants
- Jimsonweed (Datura)

Aldipower, [Wikimedia Commons](https://commons.wikimedia.org/wiki/User:Aldipower)
Anti-cholinergics Treatment

- ABCs
- Decontamination
- Supportive / time
- Urinary drainage
Cholinergic Toxidrome

- Increased acetylcholine activity
- Nicotinic NS: increased nerve transmission and muscle activation
- Muscarinic NS: liquid management
- Rarely abused
- Occupational exposures - insecticides
Cholinergics – Clinical Picture

- **Nicotinic effects**
  - Tachycardia, muscle fasciculation, weakness (nerve transmissions can’t get through), respiratory depression, paralysis, miosis

- **Muscarinic effects - SLUDGE**
  - Salivation
  - Lacrimation
  - Urination
  - Defecation
  - GI upset
  - Emesis
# Cholinergics

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Common Cholinergics

- Organophosphate insecticides
- Nerve gas (i.e. Sarin, VX)
- Myasthenia gravis meds
- “Green tobacco sickness”
  - Nicotine poisoning during harvest

Parathion (insecticide)

Mr.checker, [Wikimedia Commons](https://commons.wikimedia.org)
Cholinergics - Treatment

- ABCs
- Decontamination
- Atropine 2 mg q 5 minutes until secretions dry (massive doses)
- Pralidoxime (2PAM) if organophosphates
- Supportive care / time
Case 1

- 2 yo M got into older sister’s medication. Mother brings to ED stating he’s had an allergic reaction
- P145  R25  T100.1  Skin flushed but no urticaria or rash. Seems to be picking at the air. Pupils dilated. Dry diaper.
- Nurses requesting Benadryl for his allergic reaction.
- Is this a good idea? What’s going on?
Case 1 (Continued)

- Anticholinergic toxiidrome
- Sister’s medication → Detrol
  - Anticholinergic
- Benadryl also anticholinergic!

- Treatment?
Case 2

- 15 people from a local government building with vomiting and weakness.
- 2 patients with respiratory distress require intubation. Copious oral secretions are noted.

What’s going on?
Case 2 (Continued)

- Cholinergic toxidrome
  - SLUDGE

- Nerve gas / deliberate exposure
  - 1995 – Sarin in Tokyo subway

- Treatment?
Classic Ingestions
Acetaminophen
Acetaminophen

- Common “cry for help”
- Ubiquitous
  - Accidental OD’s – “multi-symptom cold meds”
  - Common co-ingestant
- Initially asymptomatic or mild GI upset
- Quiescent period of a few days after intoxication (LFTs may be elevated)
- Delayed & sometimes fatal liver toxicity
Acetaminophen

- Metabolite toxic to hepatocytes causing hepatic necrosis
- At therapeutic doses, glutathione neutralizes metabolite and prevents toxicity
- At high doses glutathione depleted and toxicity results
Acetaminophen

- Rumack-Matthews Nomogram
- Predicts hepatic toxicity based on level and time of overdose
- Toxic threshold = 140 mcg/ml

www.vh.org/adult/provider/familymedicine/fphandbook/chapter02/figure2-1.html
Specific intoxications: Tylenol

The rule of 140

- Toxic dose is 140 mg/kg
- Toxic level at 4 hours is 140 mcg/ml
- First dose of NAC is 140 mg/kg po (subsequent 17 doses are 70mg/kg)

- If 15 kg child, how many ES Tylenol pills (500 mg each) for toxic level?
Acetaminophen

- Treatment: N-acetylcysteine
- Replenishes glutathione in the liver
- Tastes AWFUL
  - May require NGT administration
  - Newer IV form (Acetadote – 2004)
Salicylates
Salicylates

- ASA, Peptobismol,
- Oil of wintergreen
  - 1 tsp = 7gm salicylate (peds lethal dose)
- Symptoms onset within 1 hour
- Enteric-coated delays absorption
- Gastric bezoars also delay absorption
- Renal clearance
Salicylates

- Symptoms
  - Vomiting, tinnitus, hyperpnea, fever (mild)
  - Acidosis, AMS, seizures and shock (severe)
  - **Metabolic acidosis w/ respiratory alkalosis**
- Toxicity begins at 50mg/kg (acute)
Specific Intoxications: Salicylates

- General guidelines for severity
  - Mild <300 mg /kg ingested
  - Moderate 300-500 mg/kg
  - Severe / potentially lethal > 500 mg/kg

- Serum level > 30 mg/dl at 6 hrs - toxic

- Done nomogram
  - Historical interest only
  - Serum level not predictive of degree of toxicity
Salicylates - Treatment

- Increased elimination in urine
  - Urine alkalinization
    - 3 amps of bicarb in 1 L of D5W
- Hemodialysis indicated if
  - Coma, seizure
  - Renal, hepatic, or pulmonary failure
  - Pulmonary edema
  - Severe acid-base imbalance
  - Deterioration in condition
Tricyclic Antidepressants
Tricyclic Antidepressants

- Depression, sleep, & pain disorders
- Less common due to SSRI prevalence
- High toxicity in overdose
Tricyclic Antidepressants

- Anticholinergic toxiidrome plus
- Cardiac Dysrhythmias
  - Quinidine-like (la) effects on Na channels
  - Sinus tach, Vfib, Vtach
- Seizures
Tricyclic Antidepressants

Screening EKG

- Widened QRS
  - > 100ms – sz & dysrhythmia risk
- R wave in aVR and S waves in I, aVL
- Prolonged QTc
TCA Overdose

- EKG ---- CLASSIC
  - Sinus Tachycardia
  - PR, QRS, QT Prolongation
  - Classic Findings - QRS Prolongation, Rightward Axis, “Brugada pattern” in AVR (Terminal R Wave)

**EKG and Arrhythmia**
- QRS < 100 ms -
  - unlikely to develop seizure or arrhythmia
- > 100 ms -
  - 34% chance of developing seizure,
  - 14% chance of life-threatening arrhythmia
- > 160 ms
  - 50% chance of life-threatening arrhythmia
Tricyclic Antidepressants - Treatment

- ABCs
- Bicarbonate drip
  - Reduces cardiac effects
- Control seizures
  - Benzodiazepines
  - Phenobarbital
  - Avoid phenytoin – risk of dysrhythmias
Case 3:

- 27 yo F brought in by family. Confused and vomiting. “She took some Tylenol this morning” (about 4 hours ago)
- P125 BP135/65 T99.4 Warm, dry skin. Oriented x 2. Sometimes nonsensical answers. +gag reflex. Dilated pupils.
- What do you need to know?
- Does this fit with a Tylenol OD?
Case 3

Ragesoss, [Wikimedia Commons](https://commons.wikimedia.org/wiki/File:Tylenol.png)
Case 3

What are your initial orders?

- Hint: ABC, IV, O2, monitor
- What labs / tests do you want?
- Medications?
Case 3

- Acetaminophen level – 375 mg/dl
- What next?
Case 4

- 32 yo M brought in because of violent behavior
- Agitated and combative
- P125  BP 160/95  T99.4
- Warm & sweaty. Dilated pupils. Exam otherwise non-focal
- Differential?
Case 4

- UDS – cocaine positive
- Treatment?
Slides & content for this lecture developed by Stacey Noel, MD
With revisions by Colin Greineder, MD & Laura Hopson, MD
Questions?