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Toxicologic Emergencies

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Objectives

- Develop an appropriate approach to a toxicologic emergency
- Recognize common toxidromes
- Review treatment of common toxicologic emergencies

Priorities

- YOUR SAFETY- are first responders sx?
- Airway
  - Intubate if no gag reflex
- ABG/pH
- IV access
  - CBC, CMP
- Coma cocktail
  - Thiamine 100mg IM/IV
  - D50
  - Narcan 1-2 mg up to 10-20mg

Priorities

- Circulation
  - 20ml/kg bolus of crystalloid
  - 5-15 mcg/min dopamine
  - If not normotensive, central monitoring
- Treat seizures
  - Diazepam 0.1-0.2mg/kg
  - Lorazepam 0.05mg/kg
  - Phenobarbital 20mg/kg
  - Phenytoin doesn't usually work

Priorities

- 12 Lead EKG, monitor
  - Note intervals
- Gastric decompression
  - NG or OG for activated charcoal 1g/kg if ingestion within one hour
- What else emergently
  - Head trauma?
  - Other traumatic cause for shock?
  - Metabolic disorders (hypo Na, Glu)
  - Temp high or low?

Toxidromes

- After Vital signs look at the patient
- EYE
  - Pupils big or small?
- SKIN
  - Moist, dry, red, hot?
- NEURO
  - ALOC, happy, mad, sleepy, hyper?

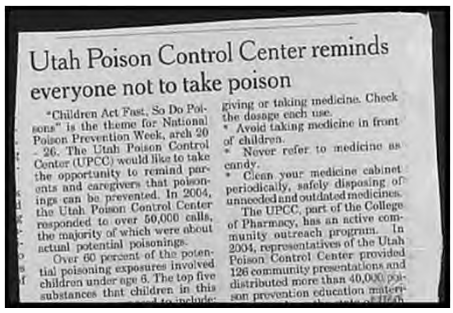
TYPE	EXAMPLES	PHYSICAL EXAM	OTHER S/SX	TREATMENT
Opioid	Heroin, Morphine	Miosis, resp and CNS depression	Hypothermia, bradycardia, Pulm edema	Naloxone, ventilate
Sympathomimetic	Cocaine Amphetamines	Agitation, mydriasis, HTN, tachycardia, fever	Sz, Rhabdo, ACS	Cooling, sedation (benzos) hydration
Cholinergic	Organophosphate Carbamate Insecticides	SLUDGE, bronchorrhea, fasciculations	Bradycardia, sz, paralysis, resp. failure	Airway/vent Atropine Pralidoxime
Anticholinergic	Scopolamine Atropine, plants	AMS, mydriasis, dry red skin & mouth	Urinary retention, Sz, dysrhythmias, hyperthermia	Physostigmine, Benzos, cooling
Salicylates	ASA, wintergreen oil	AMS, tinnitus, hyperpnea, tachycardia, diaphoresis, NV	Low grade fever, ketonuria, metabolic acidosis/resp alk	MDAC, alkalinze urine, dialysis, hydration
Hypoglycemia	Sulfonylureas Insulin	AMS, diaphoresis, tachycardia, HTN	Slurred speech, bizarre behavior, Sz, paralysis	D50, oral feeding if able
Serotonin syndrome	SSRI, MAOI, TCA, amphetamine	AMS, increased muscle tone, hyperreflexia	Hyperthermia, "wet dog shakes" (intermittent rigor)	Cooling, benzos, cyproheptadine?

Anticholinergic Toxidrome

Call someone who knows…

- 1-800-222-1222 National Poison Control
- Look on the phone
- Substance ingested or inhaled
- Time since ingestion, others affected?
- Vitals, weight
- Physical exam clues
  - Vitals, eyes, odors, skin, tone/neuro

Poison Control Center



Utah Poison Control Center reminds everyone not to take poison

"Children Act Fast, So Do Poisons" is the theme for National Poison Prevention Week, arch 20 - 26. The Utah Poison Control Center (UPCC) would like to take the opportunity to remind parents and caregivers that poisonings can be prevented. In 2004, the Utah Poison Control Center responded to over 50,000 calls, the majority of which were about actual potential poisonings.

Over 60 percent of the potential poisoning exposures involved children under age 6. The top five substances that children in this

giving or taking medicine. Check the dosage each use.
* Avoid taking medicine in front of children.
* Never refer to medicine as candy.
* Clean your medicine cabinet periodically, safely disposing of unneeded and outdated medicines.

The UPCC, part of the College of Pharmacy, has an active community outreach program. In 2004, representatives of the Utah Poison Control Center provided 126 community presentations and distributed more than 40,000 poi-

son prevention education materi-

Decontamination

- Inhalation
  - Fresh air, consider cool mist neb
  - Be ready for airway problems, pulm edema
- Eyes
  - Flush with normal saline 500-1000 ml
- Skin
  - Remove and keep clothing in sealed marked container
  - Remove particulates prior to irrigation
  - Hydrofluoric acid particularly nasty- calcium tx

Decontamination

- Ingestion
  - Ipecac is useless- not recommended
  - Gastric suction/lavage almost useless
  - Charcoal is preferred
    - Caution with aspiration
    - DOESN'T work on
      - Caustics
      - Hydrocarbons
      - Alcohols
      - Fe, Li, Pb, or K
  - Whole bowel irrigation- GoLYTELY 1-2L/hr until rectal effluent clear

Physical Exam/Lab/X-ray

- LOOK FOR Toxidromes
  - Gives you a clue as to the class of drugs you may be dealing with
- CBC, CMP, ABG, UA, Drug screen
  - MUDPILES for gap acidosis
- CXR
- Abd XR for CHIPS (radio-opaque drugs)
  - Useful if recent ingestion, otherwise not helpful

Mnemonics

- **M**ethanol
- **U**remia
- **D**KA
- **P**olypropylene glycol
- **I**soniazid
- **L**actic acidosis
- **E**thylene glycol
- **S**alicylates

- **C**hloral hydrate
- **H**eavy metals
- **I**odide
- **P**sychotropics
  - Phenothiazines
  - TCA
- **S**odium
- Also most enteric coated tablets

Enhancing Elimination

- Based on understanding pharmacodynamics of drug involved
  - Should be directed by poison control
- Diuresis and pH manipulations
- Hemodialysis
- Hemoperfusion
- Repeated doses of charcoal
- Lipid emulsion

Antidotes

- Acetaminophen – acetylcysteine
- Anticholinergics – physostigmine
- Anticholinesterases – atropine, pralidoxime
- Benzodiazepines – flumazenil
- Beta blockers – glucagon
- Calcium channel blockers – calcium
- Opiates - naloxone
- CO – O2
- Cyanide – sodium nitrite, sodium thiosulfate, B12
- Digoxin – digibind (Ab)
- Heavy metals – chelation
- Isoniazid – Pyridoxine (B6)
- Methanol/Ethylene glycol – ethanol, folate, 4 methyl pyrazole
- TCA – HCO3

Charcoal

- Obtunded
  - Intubate prior to charcoal, give via NG/OG tube
  - Helps prevent aspiration
- Awake/Alert
  - Drink it!
- Lethargic
  - Best to just secure the airway

Seizures

- Sz caused by poisons are not focal and do not have asymmetric neurologic findings
- Consider meningitis and LP
- Consider ICH, hyponatremia, hypoglycemia
- Tx generally same as other causes
  - Airway, anti-convulsants, correct acidosis, hypoxemia, electrolyte abnormalities, and hyperthermia

Seizures

- IF SZ are refractory
  - Consider HD or hemoperfusion for theophylline, Li, or salicylate OD
  - Pyridoxine 1g per gram of INH ingested IV
  - Atropine and pralidoxime if suspected organophosphate/cholinergic toxidrome
  - Physostigmine if anticholinergic toxidrome

Hypotension

- Common problem
  - Beware occult trauma/sepsis
- Try a 1L bolus NS if no pulmonary edema
- If not responding to fluids and temperature correction, consider pressors
- Central pressure monitoring needed if refractory

Hyperthermia

- Salicylates
  - Uncouples oxidative phosphorylation, resulting in inefficient (heat generating) production of ATP
- Phenothiazines
  - Inhibit the autoregulatory ability of the CNS, leading to environmentally induced hypo/hyperthemia
- Sz/Hyperactivity
  - Hyperthermia is common after Sz or extreme hyperactivity (especially if patient is forcibly restrained) following PCP, cocaine, or amphetamines.
- Anticholinergics
  - Inhibit sweating
- TREATMENT
  - Active cooling, benzodiazepines, or RSI with neuromuscular paralysis

Delayed Severe Toxicity

- Acetominophen and delayed release drugs among others
- Observe for longer
  - Minimum 4-6 hours
  - Usually warrant admission

Delayed Severe Toxicity

Poison	Delayed effect
Acetominophen	Hepatic necrosis
Amanita mushrooms	Hepatic necrosis
Carbon tetrachloride	Hepatic and renal damage
Methanol	Blindness
Paraquat	Pulmonary fibrosis
Super-warfarins	Bleeding
Thallium	Peripheral neuropathy, hair loss
Ethylene glycol	Renal failure

Acetaminophen

- Toxic dose
  - 150mg/kg in kids
  - 7g in adults
- Initially Asx, maybe nausea, RUQ pain
- 4 hr level, plot on nomogram. Get another level at 6 hrs
  - Most say give NAC if any rise
- Get salicylate levels

Amphetamines

- Sympathomimetics/CNS stimulants
- Supportive treatment, no antidote
- Control Sz, temp, BP and arrthymias
- Benzo, propranolol, consider cardiac w/u
- Cooling

Anticholinergics

- Blind as a bat
- Hot as hades
- Red as a beet
- Dry as a bone
- Mad as a hatter
- Supportive treatment, physostigmine for major problems

Antidepressants

- TCA, SSRI, MAOI
- Anticholinergic symptoms
- Cardiovascular sx are frequently life threatening
  - QRS widening
  - Profound hypotension
  - AV blocks
  - Ventricular arrhythmias

Beta Blockers

- Hypotension, bradycardia, bronchoconstriction
- Fluids, glucagon
- Pacing may be required

Calcium Channel Blockers

- Hypotension, bradycardia, CNS depression
- Supportive treatment
- Calcium, glucagon

Carbon Monoxide

- Binds with great affinity to Hgb
- Severe tissue hypoxia results
- Carboxyhemoglobin levels correlate with severity of symptoms and should guide treatment
- 100% O2 high flow via NRB mask
- Hyperbaric oxygen in severe cases

Cardiac glycosides

- Rhythm and conduction disruption
- Hyperkalemia, maybe yellow vision
- Dig level, K level indicate severity acutely
  - Cardiac sx may be delayed
  - Admit them all
- Consider antibodies to Digoxin (DigiBind)

Caustics

- Acids coagulate tissue
- Alkalines cause liquifacton
- Dilute with water, milk, or NS
- Supportive tx
- Need endoscopy

Cocaine/Local anesthetics

- Local anesthetics
  - Initial CNS excitement and SZ, then CNS depression
- Cocaine
  - Sympathetic hyperactivity with severe hypertension, hyperthermia, ACS, and aortic dissection
- Supportive treatment aimed at symptoms.

Cyanide

- Cellular asphyxiant
- Frequently immediately fatal
- Hypotension
- Mild: O2
- Severe
  - Sodium nitrite, amyl nitrite, sodium thiosulfate
- Don't bother with a cyanide level

Methemaglobinemia

- Occurs when iron changes from ferrous to ferric form in hemoglobin
- Can't bind oxygen or CO2
- Tissue hypoxia
- Sx correlate with severity
  - Cyanosis, dyspnea, CNS depression
- Methylene blue is treatment

Ethanol

- Ethanol, methanol, ethylene glycol, isopropanol are all CNS depressants
- Levels of all should be obtained, but poorly correlate to sx
- ETOH- glucose, thiamine
- Methanol/Ethylene glycol- ethanol drip or fomepizole
- Isopropanol – supportive, maybe HD

Hydrocarbons

- Choking or gagging following ingestion
- Hypoxia
- Delayed (4-6 hrs) physical findings
- Chemical pneumonitis (infiltrates) seen on CXR

Inhalants

- Hypoxia
- Irritation of upper airway and conjunctiva
  - Be ready to intubate
- Chemical pneumonitis and pulmonary edema

Iron

- Widely varied symptoms
- Levels should be obtained and guide treatment
- Chelation therapy

Isoniazid

- Sz, metabolic acidosis, coma
- Sz may be refractory to benzos
  - Try B6 gram for gram
- Toxic dose 80-100mg/kg

Lithium

- Apathy, lethargy, tremor, slurred speech, ataxia
- If severe, choreoathetosis, sz, and coma
- Toxicity usually accidental due to interaction with diuretic therapy and dehydration
- Li levels >2mEq/L usually toxic

Opiates

- Sedation, hypotension, bradycardia, hypothermia and respiratory depression
- Response to naloxone confirms
- Watch due to ½ life differences

Cholinesterase inhibitors

- Salivation/Sz
- Lacrimation, Miosis
- Urination
- Diarrhea/Dyspnea (Bronchorrhea)
- GI pain/emesis
- Excitation of muscles/fasciculation
- Death from respiratory depression
- Atropine, pralidoxime

Phencyclidine

- Vertical, horizontal, and sometimes rotary nystagmus
- Zombies
- Hyperthermia, rhabdomyolysis

Phenothiazines

- Extrapyramidal side effects
  - Dystonia, orofacial spasm
- Sedation, miosis, hypotension common
- Coma, sz, ventricular arrhythmias may occur in large ingestions
- Cogentin, cardiac monitor

Poisonous Mushrooms

- Delayed onset of symptoms
- GI upset at 6-12 hours suggests toxic ingestion of mushrooms

Poisonous Plants

- There's a bunch of them.
- Essential to identify plant
  - Photos very helpful
- Sx depend on plant ingested

Salicylates

- NV and hyperventilation
- Respiratory alkalosis followed by a anion gap metabolic acidosis creating mixed picture
- Tinnitus
- Hypoglycemia prominent in children

Sedative hypnotics

- Nystagmus, atonia, lethargy, somnolence, respiratory depression, hypotension, hypothermia
- GHB one example
- May have aggressive behavior

Theophylline

- Mild
  - NV, tremor, anxiety, abd cramping
- Severe
  - Arrthymia, sz
- 10mg/kg toxic dose

Warfarin

- Single overdose usually tolerated well
- Eccymosis, hematuria, melena, epistaxis, gingival bleeding, hematomas, hematemesis
- Life threatening cardiac tamponade and ICH may occur.

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