



# POISONING AND DRUG OVERDOSAGE

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# General Info

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- All chemicals have potential to be poisons if given a large enough dose
- Poisoning occurs when exposure to a substance adversely affects function of any organ system
- 3 factors  
toxicants ; dose-related ; hazards to the body



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## Definition:

Development of dose-related adverse effects following exposure to chemicals, drugs, or other xenobiotics.



# classification

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- Chemicals from: industrial、 medicine、  
pesticide、 plants、 animals
- Organ or tissue involved: cardiovascular、  
respiratory, nerve, liver, kidney, blood
- Causation: occupational, daily life
- Onset: acute, subacute, chronic



## Epidemiology

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- More than 5 million toxic exposures reported in 2006 US each year
  - Over half were children < 6 yo
- Poisoning third leading cause of death from 1985-1995
- Most are acute and accidental
- 5% require hospitalization
- Incidence of toxin related deaths increase 300%, Mortality 0.4%



# Resuscitation

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- First priorities are ABC's(air,breath,circulation)
- Vital sign including pulse oximetry and hypoglycemia must be corrected
- Only in very rare incidences does administration of antidote precede stabilizing ABC's and vital signs
- pulse oximetry(blood gas analysis)



# Resuscitation

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- Unresponsive pt's treated empirically with coma cocktail
  - Oxygen, naloxone, D50W, and 100mg thiamine
  - 50 ml of D50W for adults and 1g/kg glucose for children (4ml/kg D25W or 10ml/kg of D10W)
  - Thiamine not usually given to children
- Glucose and thiamine should be given in timely manner however thiamine does not have to precede glucose to prevent Wernicke's (D50W=50% dextrose)



# History

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- Need to obtain as much info as possible about exposure
  - Number of exposed persons, type of exposure, amount or dose, route
- Pt's intent must be determined
- Info from pt's primary care physician, witness or EMT(mergency medical technican) helpful
  - Check for empty bottles or containers, smells or unusual containers, or suicide not





# Physical Exam

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- Undress pt completely for thorough exam
- Check clothing for objects or substances
- Assess general appearance of pt
  - Agitation, confusion, or obtundation
- Exam skin for bruising, cyanosis, flushing
- Exam eyes for pupils size, nystagmus, reactivity, dysconjugate gaze, increased lacramation



# Physical Exam

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- Oropharynx for increase salivation or excessive dryness
- Cardiovascular: rhythm, rate, regularity
- Lungs: bronchorrhea or wheezing
- Abd: bowel sounds, tenderness or rigidity
- Exterior: fasciculations, tremor
- Neuro: CN, reflexes, muscle tone coordination, cognition, ability to ambulate



# Toxidromes

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- Physiologically based abnormalities that are known to occur with specific classes of substances and typically are helpful in diagnosis



# Toxicological Screen

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- In the acute care setting tox screen is very limited and does not contribute significantly
- Tox screens may play a role in evaluation of children



# Gross Decontamination

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- undressing patients and washing them thoroughly with copious amounts of water
- Should occur outside of ED(emergency department)
- All towels and clothing should be put into hazardous waste bags
- Pt should initially be in isolated area



# Eyes

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- Ocular exposure's should be treated immediately by copious irrigation
  - Usually 2 L NS(normal saline)
  - Use of tetracaine may be needed
- Alkalies require specific considerations
  - Lengthy continuous irrigation until pH < 8.0
  - Need ophthalmologic consult



# GI Decontamination

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- Three general methods involve removing toxin from stomach via the mouth, binding it inside gut lumen, or mechanically flushing it through GI tract
- Each method has benefits and risks



# Gastric Emptying

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- Emesis: achieved by using syrup of ipecac (吐根碱)
  - Dosing: 15 ml for 1-12 yo and 30 ml for adults; may repeat once if no emesis in 12 hr
- 90% vomit within 20 minutes of first dose and 97% vomit with second dose
- Usually 3-5 episodes of emesis and resolve in two hours; if protracted emesis occurs consider toxin as etiology





# Ipecac con't

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- Contraindications: ingestions with potential for change in mental status, active or prior vomiting, caustic ingestion, toxin with more pulmonary than GI toxicity (hydrocarbons), ingestion of toxins with potential for seizures
- Complications: aspiration, intractable vomiting
- Use of Ipecac very limited
- Copper sulfate



# Gastric Emptying

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- Orogastric lavage: 36-40 French tube used in adults and 22-24 French tube in children.
  - Measure from chin to xiphoid and confirm with air insufflation (use hypodermic syringe)
- Lavage with room temperature water until it runs clear (>2L)
- Charcoal should be used before withdrawal of tube



# Orogastic lavage con't

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- Contraindications: large pills, nontoxic ingestion, non-life threatening, caustic ingestion, airway integrity not secured, more toxic to lung than GI
- Complications: insertion into trachea, aspiration, esophageal or gastric perforation, decreased O<sub>2</sub>, inability to withdrawal tube
- Drug removal range from 35-56%
- Indicated if w/in 1 hr of ingestion, **6hrs**



# Toxin Adsorption in Gut

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- Activated Charcoal
- Multiple-Dose Activated Charcoal
- Cathartics
- Whole-Bowel Irrigation



# Activated Charcoal

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- Most appropriate agent to decontaminate GI tract
- Adsorbs toxin in gut lumen
- Benefits include capability to decontaminate w/out requiring invasive procedures
- Safety proven in adults and children
- Dose 1g/kg



# Activated Charcoal

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- Should not be given if esophageal or gastric perforation suspected or emergent endoscopy possibly needed
- Complications rare; aspiration or impaction possible
- Indications: any drug known to absorb it or after unknown ingestions by pt's with protected airways



# Multi-Dose Charcoal

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- One dose usually sufficient
- Indications for multi-dose activated charcoal:  
ingestion of large doses, substances that form bezoars, slow release toxins, toxins that slow gut function, toxins with enterohepatic or enteroenteric circulation
- Repeat dose is 0.25-0.5 g/kg
- **Smecta (dioctahedral smectite)** paraquat 百草枯



# Cathartics

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- Osmotic cathartic usually given with activated charcoal
- 70% sorbitol (1 g/kg) or 10% mag citrate
- Sodium sulfate
- Shown to decrease transit time of activated charcoal
- No definitive clinical human data suggest that a cathartic limits toxins bioavailability or changes pt's outcome





# Whole-Bowel Irrigation

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- Common indications:
  - Heavy metals
  - Body packers
  - Iron
  - Lithium
  - Sustained or delayed release formulations
  - Potential for bezoar formation
- Dose 2L/h of GoLytely, children is 50-250 ml/kg



# Bowel Irrigation

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- End point is clear rectal effluent
- Contraindications: preceding diarrhea, expectant diarrhea, absent bowel sounds or obstruction
- Complications: bloating, cramping, rectal irritation
- Antiemetic frequently required
  - Avoid phenergan (slows gut motility)
- Endoscopic/surgical :rare



# Enhanced Elimination

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- Alkalinization
- Acidification of urine
- Forced diuresis
- Hemodialysis/Hemoperfusion



# Alkalinization

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- Beneficial in certain ingestions: 2-4-D (herbicide), phenobarbital, chlorpropamide, salicylates, methanol
- Alkalinization achieved by IV dose of bicarb at 1-2 mEq/kg, followed by intermittent boluses or continuous bicarb drip for urine pH 7.5-8.0
- Profound hypokalemia may result, must aggressively replace



# Acidification of Urine

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- Can somewhat enhance elimination of amphetamines, phencyclidine, and some other drugs.
- Risks of rhabdo far out weigh benefits



# Forced Diuresis

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- Never been shown effective for any ingestion
- Technique should not be used
  
- In China used **widly**



# Hemodialysis/Hemoperfusion

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- Dialysis reserved for specific toxins: salicylates, methanol, ethylene glycol, lithium, theophylline, amanita (mushrooms)
- Benefits: removal of toxins already absorbed by gut, ability to remove parent compound and active metabolite, adjust blood PH and fluid/electrolyte imbalance



# Dialysis con't

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- Less effective when toxin has large volume of distribution ( $>1$  L/kg), has large molecular weight, or highly protein bound
- Dialysis rarely contraindicated
- No dialysis for small children, exchange transfusion should be considered





# Hemoperfusion

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- Used for decontamination of pt's systemic circulation
- Involves placing a filter filled with activated charcoal /resin into dialysis circuit
- Alleviates constraints of protein binding and molecular size
- Toxins must be well absorbed by charcoal /resin and have small volume of distribution



# Other

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- Peritoneal dialysis
- less effective but in rural areas we still used
  
- Most effective method:
- HD + HP =HDP



# Side effective of dialysis

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- hemolysis
- hypocalcemia
- Thrombocytopenia



# Remedical measure

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- increase antidotes/other medicine dosage
- blood transfusion



# Other techniques

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- Chelation---heavy metals(lead,mercury)
- DMPS(Sodium Dimercaptosulphonate )
- EDTA(Ethylene Diamine Tetraacetic Acid )
  
- hyperbaric oxygenation---CO



# Administration of antidotes

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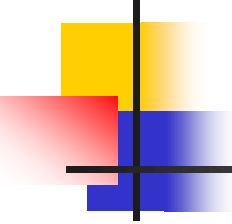
- neutralize---Ab/Ag reactions, chelation, chemical binding
- antagonize---anti physiologic effects
- reduce morbidity/mortality
- potentially toxic



# prevention of reexposure

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- regarding safe use of medications/chemicals
- assistance with
- educational efforts
- avoid hazard circumstance
- Limit children/patient access to poisons



# Specific toxic syndromes and poisonings

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- **See Table 9.1.4**
  
- **Local region**
- **Type of poisoning**