

General approach to toxicology

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Modes of Exposure

■ Ingestion	75 %
■ Dermal	7.9%
■ Inhalation	6.3%
■ Ocular	5.3%
■ Envenomation	3.6%

COMMON POISONINGS

1. Substance abuse - 'recreational'
Alcohol's, narcotics, sedatives, stimulants, hallucinogens
2. Intentional overdose
Suicide / Parasuicide
3. Accidental
Mislabeled containers / paediatric age group
4. Toxic exposures
Gases , sprays, house fires

MANAGEMENT

1. Supportive care
2. Prevention of poison absorption
3. Administration of antidotes
4. Enhancement of elimination
5. Prevention of re-exposure
6. Treat associated conditions/injuries
7. Disposition of the patient

INITIAL PATIENT MANAGEMENT - if unwell

Airway

- Adequacy, protection

Breathing

- Always OXYGEN; intubation/ventilation

Circulation

- Large bore IV's
- Low BP due to decreased vascular tone will respond to IV fluids /inotropes

Emergency Treatment

- A-airway
- B-breathing
- C-circulatio
- For patients with a decreased LOC consider the "Coma Cocktail"
 - Dextrose 50% 50ml
 - Naloxone (Narcan) 2mg (0.03-0.1 mg.kg) /IV
 - Thiamine 100 mg IV/IM/po

EVALUATION 1

- History
- Toxidromes

History

- Unreliable
- What
- When
- How much
- Accidental or self-inflicted
- First time or recurrent
- PMH

EVALUATION 2

- History

- Circumstances of discovery
- Mental illness / suicide attempts
- Reason for overdose
 - Recreational
 - Self harm
 - Depression
- Additional injuries
- Past medical history
- Social history / family history

EVALUATION 3

- prediction of toxicity

1. The substances ingested
 2. The quantities ingested
 3. The time since ingestion
 4. Any treatment to date
 5. Concurrent medical conditions
- 70% of intentional overdoses involve more than 1 substance

EVALUATION 4

- assessment of severity

- Vital signs
- Physical examination
 - Eyes
 - Pupillary size, nystagmus
 - Neurological
 - Focal deficit is rare in overdose patients
 - Skin
 - Odors
- Toxidromes

Some common Toxidromes

Constellation of signs and
symptoms representative of a
toxin

Opiods

(heroin, codeine)

pupils	small, fixed
RR	decreased
BP, HR	slightly decreased
skin	normal
mental status	sedated
bowel sounds	decreased
antidote	naloxone

Sedative Hypnotics (alcohol, benzodiazepines)

pupils	normal
RR	decreased
BP, HR	slightly decreased
skin	normal
mental status	sedated
bowel sounds	normal
antidote	beware of flumazanil

Anticholinergics

(anti-histamines, TCA's, atropine)

pupils	big, fixed
RR	no change
BP, HR	increased HR
skin	dry, hot
mental status	sedated
bowel sounds	decreased
antidote	+/- physostigmine

Cholinergics

(nerve gas, pesticides)

pupils	small, fixed
RR	no change
BP, HR	decreased HR
skin	wet
mental status	agitated
bowel sounds	increased
antidote	atropine, 2-PAM

Sympathomimetics (cocaine, metamphetamine)

pupils	large, reactive
RR	increased
BP, HR	increased
skin	wet
mental status	agitated
bowel sounds	increased
antidote	none

PREVENTION OF POISON ABSORPTION

'Decontamination'

Note - staff may be at risk

DECONTAMINATION 1

- Skin
 - Remove contaminated clothing / wash skin
- Gastrointestinal
 - ✓ Activated charcoal (in 1st hour post ingestion)
 - ✗ Emesis (*'ipeccac'*) – rarely used
 - ✗ Gastric lavage – rarely used
 - ✓ Cathartics / whole bowel irrigation
- Eyes

Decontamination

- Gut Decontamination

Expulsion from GI tract

- Emesis (ipecac)

- Lavage

Decrease absorption

- Charcoal

- Whole Bowel Irrigation

Gastric Lavage

- Protect Airway
- Large Bore Tube (30-40 F)
- LLD Position
- Lavage Until Clear
- External Massage

Ipecac

Emetine

Alkaloids

Caphaeline



دوز اپیکا:

زیر 6 ماه: ممنوع

شش تا دوازده ماه: 10 سی سی - در صورت عدم استفراغ عدم تکرار

یک تا دوازده سال: 15 سی سی - در صورت عدم استفراغ تکرار یکبار

بالا تر از ده سال: 30 سی سی - در صورت عدم استفراغ تکرار

استفراغ 20 دقیقه بعد اپیکا شروع شده و 30-120 دقیقه ادامه میابد

DECONTAMINATION 2

- activated charcoal

- 1 gram / kg
- Does *not* absorb
 - Lithium
 - Heavy metals - iron
 - Alcohols/Solvents/hydrocarbons
 - Caustics/strong acids
 - Cyanide
 - Pesticides
- Recovers 60% of poison if administered within the first hour



DECONTAMINATION 3

- cathartics

- Reduced gastrointestinal transit time
=> reduced time for drug absorption
- Osmotic agents – sorbitol, mannitol, MgSO_4
- Contraindications
 - ileus / bowel obstruction
 - electrolyte imbalance

WBI

whole bowel irrigation

- May be useful for concretions & sustained-release preparations
- Polyethylene-glycol solution
- Administer at 1000 mls/hour until effluent is clear

WBI

- Fe, Pb, As, Zn
- Sustained release (CCB)
- Packets of illicit drugs
- carbamazepine-Theophylline

Contraindications

ileus or obstruction, gastrointestinal hemorrhage
in patients with inadequate airway protection
uncontrolled vomiting, hemodynamic instability.

ANTIDOTES – some examples

<u>Poison</u>	<u>Antidote</u>
1. Paracetamol	1. N-acetyl cysteine
2. Narcotics	2. Naloxone
3. Oral anticoagulants	3. FFP, Vitamin K
4. Carbon monoxide	4. oxygen
5. Organophosphates	5. Atropine, oximes
6. Betablockers	6. Glucagon, insulin/glucose
7. Ca channel blockers	7. Calcium
8. Iron	8. Desferrioxamine
9. Digoxin	9. Digoxin Fab fragments
10. Methanol, ethylene glycol	10. ethanol, fomepizole
11. Cyanide	11. Vit. B12, E-L kit, Kelocyanor

Flumazenil

- Contraindications
 - +TCA
 - Hx head trauma
 - Hx seizures
 - Chronic BZDP use

ENHANCEMENT OF ELIMINATION

1. Diuresis
2. Multiple-dose activated charcoal
3. Urinary pH manipulation
 - *salicylate*
4. Haemodialysis
 - *small molecules, low protein binding*
 - *e.g. salicylate, Lithium*
5. Charcoal haemoperfusion
 - *theophylline/barbiturates/carbamazepine*

MDAC

- Multiple dose activated charcoal
- Gastric dialysis-pulls drug across the blood/gut membrane due to osmotic gradient of drug
- phenobarbital, carbamazepine, theophylline, dapsone, quinine

Contraindications

- Bowel Perforation
- Bowel Obstruction
- GI Hemorrhage
- Hemodynamic Instability

■ F. Hemodialysis:

- I = Isopropanol,
- S = Salicylates,
- T = Theophylline,
- U = Uremia,
- M = Methanol,
- B = Barbiturates,
- L = Lithium,
- E = Ethylene glycol

The Laboratory Tests

- Labs help confirm the diagnosis
- Labs help to determine the extent of intoxication
- Use history, clinical examination and labs to manage the patient

The “Tox” Screen

- Every poisoned patient should have an EKG, ABG, ASA, and acetaminophen level.
- Can calculate Anion Gap and Osmolar Gap from Electrolytes.
- Further testing should be based on the above results and the patient’s toxidrome.

The ABG

- A normal pH and anion gap rules out many ingestions
 - e.g. ASA, cyanide, toxic alcohol
- If a patient ingested ETOH and a toxic alcohol, he may not become acidotic until his ETOH is cleared.
 - Consider serial ABG's or toxic alcohol levels

Anion Gap

- $AG = (\text{sodium}) - (\text{bicarbonate} + \text{chloride}) = 12 - 16$

- High Anion Gap Metabolic Acidosis

Methanol

Uremia

Diabetic Ketoacidosis

Paraldehyde

INH, iron

Lactate

Ethylene glycol

Salicylates

Cyanide

Alcoholic Ketoacidosis

Toluene

Consider specific tests

- CXR for pulmonary aspiration / oedema
- LFT's / coagulation for liver damage
- Creatinine kinase for rhabdomyolysis
- Cervical spine XR / CT head for injury
- AXR for radio-opaque substances

- b. KUB - for radioopaque agents

- C = chloral hydrate,

- H = heavy metals,

- I - iron,

- P = phenothiazines,

- E = enteric coated ASA,

- S = sustained release products

- آرسنیک-استازولامید-باریم-بسته های مواد مخدر-بیسموت
تیامین-حلال ها(تتراکریل کربن-کلروفرم)-سرب-فسفر-
کربنات کلسیم-کلریل پتاسیم-کریل سدیم-ید-ویتامین ها

Vital sign clues to possible ingestions

- 1. Bradycardia:
- P = propranolol (b- blockers),
- A = Anticholinesterase drugs,
- C = calcium channel blocker, clonidine,
- E = ethanol, alcohols,
- D = digitalis, Darvon (opiates)

■ 2. Tachycardia:

- F = free base cocaine,
- A = anticholinergics, antihistamines,
amphetamines,
- S = sympathomimetics,
- T = theophylline

■ 3. Hypothermia:

- C = carbon monoxide
- O = opiates
- O = Oral hypoglycemics,
- L = liquor
- S = sedative hypnotics

■ 4. Hyperthermia:

- N = neuroleptic malignant syndrome, nicotine
- A = Antihistamines
- S = salicylates, sympathomimetics
- A = anticholinergics, antidepressants

■ 5. Hypotension:

- C = clonidine
- R = Reserpine
- A = antidepressants, antihypertensives
- S = sedatives
- H = heroin (opiates)

■ 6. Hypertension:

- C = cocaine
- T = theophylline
- S = sympathomimetics
- C = caffeine
- A = anticholinergics, amphetamines
- N = nicotine

- 10.Diaphoresis:
 - S = sympathomimetics
 - O = organophosphates
 - A = aspirin

- 11. Breath odors:
- Bitter almonds = cyanide
- Fruity = Dka, Isopropanol
- Rotten eggs = sulfur dioxide, hydrogen sulfide
- Pears = chloral hydrate
- Garlic = organophosphates, arsenic,
- Mothballs = camphor

■ 7. Miosis:

- C = cholinergics, clonidine
- O = opiates, organophosphates
- P = phenothiazines, pilocarpine, pontine bleed
- S = sedative hypnotics

■ 8. Mydriasis:

- A = antihistamine, antidepressants, anticholinergics, atropine
- S = sympathomimetics (cocaine, amphetamines)

■ 9. Seizures:

- O = organophosphates
- T = tricyclic antidepressants
- I = insulin, isoniazid
- S = sympathomimetics
- C = camphor, cocaine
- A = amphetamines
- M = methyl-xanthines
- P = pcp
- B = beta-blockers
- E = ethanol (withdrawal)
- L = lithium
- L = lead

POISONS INFORMATION

- Text books

 - Medical Toxicology

 - 5-minut Toxicology consult

 - Haddad Toxicology

 - Ellenhorn Toxicology

 - Goldfrank Toxicology

- On-line resources

 - Substance database (National Poisons Centre)

 - Poisindex

 - Toxindex