Household Poisoning

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Objectives:

At the end of this lecture the student will be able to:

1. Define poisoning.
2. Describe the features and general management of poisoned children.
3. Identify some specific Toxidromes:
   - Paracetamol/ Acetaminophen.
   - Iron.
   - Salicylates.
   - Kerosene.
   - Carbon monoxide.
4. Outline the management of the specific toxidromes.
Poisoning:

• **Definition:**
  Exposure to a chemical or other agent that adversely affects the function of an organ.

• **Exposure can be:**
  - intentional,
  - accidental,
  - environmental,
  - medicinal
  - or recreational.

• **Routes of exposure can be** ingestion, injection, inhalation or cutaneous.
ETIOLOGY AND EPIDEMIOLOGY

• The common agents ingested by young children: Cosmetics, analgesics and cleaning solutions.

• Fatal poisonings:
  Analgesics, sedative/hypnotics and fumes/gases.

• Male predominance in children under 13.

• Female predominance in adolescence.
CLINICAL MANIFESTATIONS

• Any unexplained symptoms e.g. altered mental status, seizure, cardiovascular compromise, consider poisoning.

• Certain complexes of symptoms and signs are relatively specific (toxicidrome)
COMPLICATIONS

A six basic clinical patterns:

1. Coma.

2. Direct toxicity.

3. Metabolic acidosis with high anion gap (ABG).

4. Dysrhythmias (ECG).

5. GIT symptoms: emesis, cramps, diarrhea, ...

LABORATORY AND IMAGING STUDIES

- Glucose.
- Electrolytes.
- Measurement of arterial blood gases (ABG).
- Calculation of the anion and osmolar gap.
- ECG.
- Urine screening for drug abuse.
- Quantitative toxicology assays, also to guide therapy, anticipating complication.
TREATMENT

Supportive Care:
- The mainstay of treatment (ABCDEFG).
- In coma: I.V glucose, 100% oxygen and naloxone.

Gastrointestinal Decontamination:
- Activated Charcoal,
- A cathartic (magnesium citrate),
- Lavage, whole-bowel irrigation,
- Syrup of ipecac

Enhanced Elimination:
- Multiple-dose activated charcoal.
- Alkalization of urine e.g. salicylate ingestion.
- Dialysis for salicylates, theophylline and lithium.
Specific Antidotes:

- Acetaminophen  
  *N-Acetylcysteine*

- Carbon monoxide  
  Oxygen

- Iron  
  Desferrioxamine

- Opiates  
  Naloxone

- Organophosphates  
  Atropine
PREVENTION

• Educate parents regarding safe storage of drugs.
• The poison control center should be called immediately.
• Passive interventions e.g.
  - Child-resistant containers for drugs and other dangerous household products.
Fig. 5. Keep poisonous chemicals out of reach of children.
Fig. 8. Make sure that caps and tops are kept on bottles.
Specific toxidromes

1. **Acetaminophen:**

   The single acute toxic dose of acetaminophen: >200 mg/kg in children.
Acetaminophen

- **Stage I: (0-24 hrs)**
  - Mild
  - Serum acetaminophen level **4 hrs post ingestion**
    - Plot on specific NOMOGRAM.
    - If > 900 µmol/L ---> POSSIBLE RISK.
  - Nausea, vomiting, malaise and diaphoresis.
  - **Normal** bilirubin, liver transaminases and PT.
Note: Nomogram may not be applicable in overdoses of sustained release preparations because of the potential for prolonged absorption.

Acetaminophen Nomogram

*adapted from Medical Toxicology, Ellenbom and Barceloux, 1988.
Acetaminophen poisoning

• Stage II: (24-48 hrs) after ingestion.
  • Better, less symptoms.
  • But ..... 
    - Elevated bilirubin, transaminases and PT
Acetaminophen poisoning

- **Stage III:** 48-96 hrs (2-4 days) after ingestion:
  - Hepatic dysfunction (Rarely hepatic failure).
  - **Peak elevations** in:
    - Bilirubin
    - Transaminases may reach > 1000 IU/L
    - Prolonged PT
Acetaminophen poisoning

• **Stage VI:** 168-192 hrs (7-8 days)
  - **Clinical** improvement
  - LFTs returning to normal.
Treatment

• Probable toxicity should be treated (antidote):
  - N-acetylcysteine bolus 140 mg/kg
  - then 70 mg/kg Q 4 hrs for up to 17 doses.

• Assess hepatic function:
  - On presentation.
  - Daily.

• Continue other support.
2. **Iron:**

- Toxic dose occurs at **>20mg/Kg** of elemental iron.
- **Iron preparations** (salts) contain different amounts of elemental iron:
  - Fumarate - 33%
  - Sulfate - 20%
  - Gluconate - 12%
Iron Poisoning

• Four Stages but variable:
  – Stage 1: 30min – 6 hrs of ingestion:
    • Gastro-intestinal stage:
      – Vomiting, diarrhea, hematochezia and abd. pain.
      – Severe: fluid loss, bleeding, shock, acidosis, ..
      – Fever
      – Lethargy
      – Coma
Iron Poisoning

• Stage 2 : 6-24 hrs
  – Quiescent (latent) stage:
    • Clinical improvement.
  • But ..... 
    ** Subtle hemodynamic changes e.g.
    – Tachycardia.
    – Decreased urine output.
Iron Poisoning

• **Stage 3: 12-24 hrs**
  
  – *Circulatory collapse (Shock stage):*
    
    • Metabolic acidosis, hypotension, low cardiac output.
    
    • Coagulopathy, lethargy and seizures.
    
    • Multi-organ system failure.
Iron Poisoning

- **Stage 3:** 12-24 hrs
  - **Hepatic failure:** ongoing oxidative damage by the iron.
    - Hepatic necrosis.
    - Increased mortality.
    - Rarely fulminant hepatic failure.
  - Liver transplant can be life saving.
Iron Poisoning

• **Stage 4**: 4-6 wks
  - Bowel obstruction due to scarring.
    - Gastric outlet obstruction.
    - Small intestinal obstruction.
  - *May not pass through stage 4 = die before*
Management

1. Gastric decontamination:
   - Forced emesis.
   - **Gastric** lavage + desferrioxamine to lavage fluid.
   - Iron in **intestine**: bowel stimulant.
   - **No activated char coal**
2. Secure good IV line.
3. Do the **4hrs** iron level.
4. Chelate with parenteral desferrioxamine (**antidote**)  
   *If levels > 500mg/dL or if symptomatic.*
   *Or if ingested > 60mg/kg.*
Specific toxiromes

3. SALICYLATES:

The acute toxic dose of salicylates: $>150 \text{ mg/kg}$
SALICYLATES

• Oral ingestion is the commonest.
• Transdermal (topical) is less common.
• Peak levels at 12 hrs
  – Early: hyperpnoea ➔ respiratory alkalosis.
  – Then metabolic acidosis.
  – Severe cases: Cerebral edema and increased ICP.
MANAGEMENT

– General.
– Gastric decontamination with activated charcoal.
– Treat electrolyte imbalance.
– IV hydration.
– Forced alkaline diuresis.
– Hemodialysis.
Specific toxidromes

4. Hydrocarbons:

Kerosene ingestion:

- Risk of aspiration.
- GIT and Respiratory effects.
- Burning sensation, nausea and diarrhea.
- Cough, choking, gagging and grunting.

**CXR 2-8 hrs later:**

- Pulmonary infiltrates or perihilar densities.

**Possible complications:**

- Pneumatoceles, pleural effusion or pneumothorax and bacterial superinfection.
- Resolution 2-7 days.
MANAGEMENT

– Do not induce vomiting.
– Do not attempt gastric lavage.
– Risk of aspiration outweighs any benefit from removal of substance.
– CXR around 2-4 hrs  “not before 2hrs”
– Observe in ER for 6-8 hrs if no symptoms ➔ discharge.
– General measures.
Specific toxidromes

5. Carbon monoxide:

• CO is a colorless, odorless gas produced by incomplete combustion of carbonaceous material.

• It binds hemoglobin 230-270 times more than oxygen.

C/F: Headache, dizziness, coma, other systems affected

Antidote: Oxygen 100%; hyperbaric O₂

(Half-life of carboxyhemoglobin is 5 hr in room air but 1½ hr in 100% O₂ and 20-30min in hyperbaric oxygen).
Signs of carbon monoxide poisoning

- Headaches
- Nausea
- Dizziness
- Breathlessness
- Collapse
- Loss of consciousness

Carbon Monoxide (CO) Poisoning

Can't be seen, can't be smelled, can't be heard, can be stopped