Poisons, drugs & rock ‘n’ roll

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Poisons

Fundamentals of poisoning management

Antidote therapy
Poisons and antidotes

A poison is a chemical substance capable of producing adverse effects in a living organism.

Chemicals may be divided into those intended for human use (food, drugs, cosmetics) and those that are not (household products, industrial chemicals, nonfood, nondrug botanicals).

An overdose implies exposure to excessive amounts of the former and any amount of the later.

Antidotes counteract the effects of poisons by neutralizing them or by antagonizing their physiologic effects.
Poisons and antidotes

Worldwide, more than 13 million natural and synthetic chemicals have been identified.

Less than 3000 cause 95% of cases of accidental and deliberate poisoning.

Suspecting and identifying cases of poisoning and accurately assessing a poison's potential toxicity are critical to successful management because treatment is merely supportive unless a specific toxicologic symptom complex is diagnosed.
Diagnosis and poisoning management

- Lack of patient’s history
- Aggressive and hostile relatives
- Lack of reliable data
- Low medical knowledge
Poisoning management

- Basic treatment
- Transport conditions
- Transport preparations
- Hospital treatment
Poisons and antidotes

- Only 30% of all poisoned patients require hospitalization.
- They account for 5-10% ED visits, 3-5% of ICU admissions and up to 30% of psychiatric admission.
- Suicide attempts account for the majority (60-90%) of serious or fatal poisoning in adults.
- Mortality rate 0.05-1%
Poisons and antidotes

Most drug related fatalities are: antidepressants, antipsychotic drugs, benzodiazepines, sedative-hypnotics, stimulants and street drugs, cardiovascular agents and asthma medications.

Chemical agents implicated in fatal poisoning include: inorganic chemicals, ethanol, methanol, ethylene-glycol, cleaning agents and hydrocarbons.
Accidental exposures result from improper use of chemicals or drugs (children), product mislabeling, label misreading, mistaken identification of unlabeled chemicals, uninformed self medication and dosing errors, drug abuse and excessive self-dosing.

Poisoning should be considered in the differential diagnosis of any unexplained symptoms or signs, especially in children younger than 5 years and young adults.
Poisons and antidotes

Poisoning may be an attempt at suicide in depressed persons.

Other high-risk groups include elderly (medication mix-ups), hospitalized patients (drug errors), workers exposed to occupational chemicals, and persons exposed to environmental pollution.
Poisons and antidotes

Although poisoning can mimic other illnesses, the correct diagnosis can usually be established by the history, physical examination, routine and toxicology laboratory evaluation and clinical course.

Important data are:

- the time, route, duration, and circumstances of exposure
- the name and amount of each drug, chemical or ingredient involved
- the time of onset, nature, and severity of symptoms
- the time and type of first aid measures provided, and past medical and psychiatric history
Poison's entrance to the body

Inhalation

Swallowing

Skin

IV, IM, SC, Rectal
Poisoning management

Vital signs: conciseness, BH, BW, BP, PR, RR, temperature

Blood, urine, gastric content

ECG

TBC, arterial blood gases, electrolytes, blood sugar, creatinine, AST, ALT, LDH, PV, bilirubin, urine
Poisons and antidotes

The clinical picture of poisoning can usually be characterized by either physiologic stimulation or depression.

Patient should also be examined for evidence of trauma and underlying illness.

Response to antidotes may also be used for diagnostic purposes.

Resolution of altered mental status and abnormal vital signs within minutes of intravenous dextrose, naloxone or flumazenil administration is virtually diagnostic of hypoglycemia, narcotic overdose and benzodiazepine intoxication respectively.
Toxicology analyses

100 ml of urine

50 ml of gastric content

15 ml of blood
Power of knowledge

Poison control centre
Jordanovac 104, Zagreb

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Poisons and antidotes

The absence of signs and symptoms soon after an overdose does not rule out a poisoning.

Common poisons whose effects are delayed in onset include acetaminophen, colchicines, digoxin, ethylene glycol, methanol, heavy metals, mushrooms, salicylate, rotendicides, and slow or sustained release medications.
Horses or zebras

When you hear hoofbeats behind you, don't expect to see a zebra.

It was coined in the late 1940s by Dr. Theodore Woodward, a former professor at the University of Maryland School of Medicine in Baltimore.

By 1960, the aphorism was widely known in medical circles.

If you hear hoofbeats, think horses—not zebras.
<table>
<thead>
<tr>
<th>Toxindrome</th>
<th>Mental status</th>
<th>Pupils</th>
<th>Vital signs</th>
<th>Other</th>
<th>Usual toxins</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sympathomimetic</strong></td>
<td>Hyperalertness, agitation, hallucinations, paranoia</td>
<td><strong>Mydriasis</strong></td>
<td>Hyperthermia, tachycardia, hypertension, tachypnea</td>
<td>Diaphoresis, tremor, hyperreflexia, seizures</td>
<td>Amphetamines, cocaine, ephedrine, theophylline</td>
</tr>
<tr>
<td><strong>Hallucinogenic</strong></td>
<td>Hallucinations, perceptual distortions, depersonalization, synesthesia, agitation</td>
<td><strong>Mydriasis</strong></td>
<td>Hyperthermia, tachycardia, hypertension, tachypnea</td>
<td>Nystagmus</td>
<td>LSD, mescaline, psilocybin, amphetamines</td>
</tr>
<tr>
<td><strong>Anticholinergic</strong></td>
<td>Hypervigilance, agitation, hallucinations, delirium with mumbling speech, coma</td>
<td><strong>Mydriasis</strong></td>
<td>Hyperthermia, tachycardia, hypertension, tachypnea</td>
<td>Dry flushed skin and mucous membranes, decreased bowel sounds, urinary retention, myoclonus, choreoathetosis, picking behavior</td>
<td>Antihistamines, tricyclic antidepressants, antiparkinson agents, antispasmodics, phenothiazines, atropine, scopolamine, belladonna alkaloids</td>
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<tr>
<td><strong>Opioid</strong></td>
<td>CNS depression, coma</td>
<td></td>
<td>Hypothermia, bradycardia, hypotension, hypopnea, bradypnea</td>
<td>Hyporeflexia, pulmonary edema, needle marks</td>
<td>Heroin, morphine, methadone, diphenoxylate</td>
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<tr>
<td><strong>Sedative-hypnotic</strong></td>
<td>CNS depression, confusion, stupor, coma</td>
<td><strong>Miosis</strong></td>
<td>Hypothermia, bradycardia, hypotension, hypopnea, bradypnea</td>
<td>Hyporeflexia</td>
<td>Benzodiazepines, barbiturates, meprobamate, alcohols</td>
</tr>
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LSD – Lysergic acid diethylamide; MAOI – Monoamine oxidase inhibitors; SSRI – Selective serotonin reuptake inhibitors; TCA – Tricyclic antidepressants.
### Table 14.1. Toxindromes

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<td><strong>Sedative-hypnotic</strong></td>
<td>CNS depression, confusion, stupor, coma</td>
<td></td>
<td>Bradycardia, hypertension or hypotension, tachypnea or bradypnea</td>
<td>Salivation, urinary and fecal incontinence, diarrhea, emesis, diaphoresis, lacrimation, GI cramps, bronchoconstriction, muscle fasciculations and weakness, seizures</td>
<td>Benzodiazepines, barbiturates, meprobamate, alcohols</td>
</tr>
<tr>
<td><strong>Cholinergic</strong></td>
<td>Confusion, coma</td>
<td>Miosis</td>
<td>Hyperthermia, tachycardia, hypertensio, tachypnea</td>
<td>Tremor, myoclonus, hyperreflexia, clonus, diaphoresis, flushing, trismus, rigidity, diarrhea</td>
<td>Organophosphates and carbamates, nerve agents, nicotine, pilocarpine, physostigmine, edrophonium, bethanechol, urecholine</td>
</tr>
<tr>
<td><strong>Serotonin syndrome</strong></td>
<td>Confusion, agitation, coma</td>
<td>Mydriasis</td>
<td>Hyperthermia, tachycardia, hypertensio, tachypnea</td>
<td>Seizures, myoclonus, choreoathetosis, cardiac arrhythmias and conduction disturbances</td>
<td>MAOIs alone or with: SSRIs, meperidine, TCAs, L-tryptophan</td>
</tr>
<tr>
<td><strong>Tricyclic antidepressant</strong></td>
<td>Confusion, coma</td>
<td></td>
<td>Hyperthermia, tachycardia, hypertension then hypotension, hypopnea</td>
<td>Seizures, myoclonus, choreoathetosis, cardiac arrhythmias and conduction disturbances</td>
<td>Amitriptyline, nortriptyline, imipramine, clomipramine, desipramine, doxepin</td>
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LSD – Lysergic acid diethylamide; MAOI – Monoamine oxidase inhibitors; SSRI – Selective serotonin reuptake inhibitors; TCA – Tricyclic antidepressants.
Patient management

- Level of consciousness + vital signs + pupils
- agitation (anticholinergics, simpatomimetics, hallucinogenic drugs, withdrawal syndrome)
- depression (sedatives/hypnotics, opiates, alcohol)
- combination (several drugs, tricycle antidepressants, heavy metals, hypoglycemic drugs)
Patient management

Patient smell
- Ketons - ethanol, salicylate

Body temperature
- Hyperthermia - cocaine, amphetamine, ecstasy, LSD, salicylate, anticholinergics
- Hypothermia - opiates, sedative/hypnotics, beta-blockers, CO

Skin
- Red and dry - anticholinergics, disulfiram, glutamate
- Pale and diaphoretic - simpatomimetics, cholinergic, hallucinogenic drugs, salicylate
- Cyanotic - cyanide

Neuromuscular changes
- Convulsions - simpatomimetics, beta-blockers, antidepressants, hypoglycemic drugs
- Tremor - antipsychotics, simpatomimetics, anticholinergics
- Rigidity - antipsychotic (FEPS), metoklopramid, CO, methanol

Respiratory
- Hyperventilation - simpatomimetics, LSD, anticholinergics, salicylate
- Oligopneic - opiates, sedative, alcohol, antidepressants
Fundamentals of poisoning management

I. Supportive care

Airway protection (GCS: Intubate et al 8)
Oxygenation/ventilation
Treatment of arrhythmias
Hemodynamic support - hypotension: IV fluids
hypertension: Ca channel blockers, Na-nitroprusside
Treatment of seizures (diazepam, lorazepam)
Correction of temperature abnormalities
Correction of metabolic derangements
Correction of secondary complications
Fundamentals of poisoning management

II. Gastrointestinal decontamination

- Syrup of ipecac-induced emesis
- Gastric lavage
- Activated charcoal
- Whole bowel irrigation
- Catharsis
- Dilution
- Endoscopic/surgical removal
Gastric lavage decreases absorption by 42% if done 20 min and by 16% if performed at 60 min.

Performed by first aspirating the stomach and then repetitively instilling & aspirating fluid.

Left lateral position better - delays spontaneous absorption.

No evidence that larger tube better.

Choice of fluid is tap water - 5-10 mL/kg BW.
Fundamentals of poisoning management

III. Decontamination of other sites

- Eye decontamination
- Skin decontamination
- Body cavity evacuation
Fundamentals of poisoning management

IV. Enhancement of poison elimination

- Multiple-dose activated charcoal
- Forced diuresis
- Alteration of urinary pH
- Chelation (heavy metal)
- Extracorporeal removal (peritoneal dialysis, hemodialysis, hemoperfusion, hemofiltration, plasmapheresis, exchange transfusion)
- Hyperbaric oxygenation
Fundamentals of poisoning management

V. Administration of antidotes

- Neutralization by antibodies
- Neutralization by chemical binding
- Metabolic antagonism
- Physiologic antagonism
Antidotes

Atropine, Pralidoxim - Organophosphate and carbamate insecticides
Biperiden - Feps
Diazepam - Phenothiazine, Amphetamines,
Ethanol - Methanol, Ethylene glycol
Fitomenadion - Rodenticides
Flumazenil - Benzodiazepines
Oxygen - Carbon monoxide
Naloxon - Opiates
Protamin benzoat - Heparin
Piridoxin - Izoniazid
Poisons

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Antidote therapy