TOXICOLOGY

Poisoning, Overdose, and Drugs

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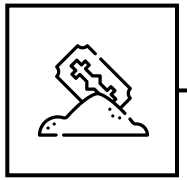
TABLE OF CONTENTS

01

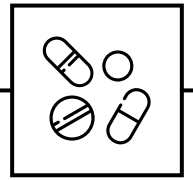
Introduction to Toxicology

What is Toxicology?



Definition

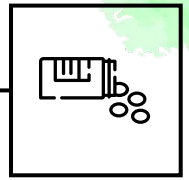
Definition: Study of poisons, their effects, and treatment of poisoning.



Focus

When dealing with drug related calls it's best to focus on:

- Recognize exposure
- Manage life threats
- Prevent complications



Goal

For drug related cases: Identify substance → Stabilize patient → Transport for definitive care

Routes of Exposure

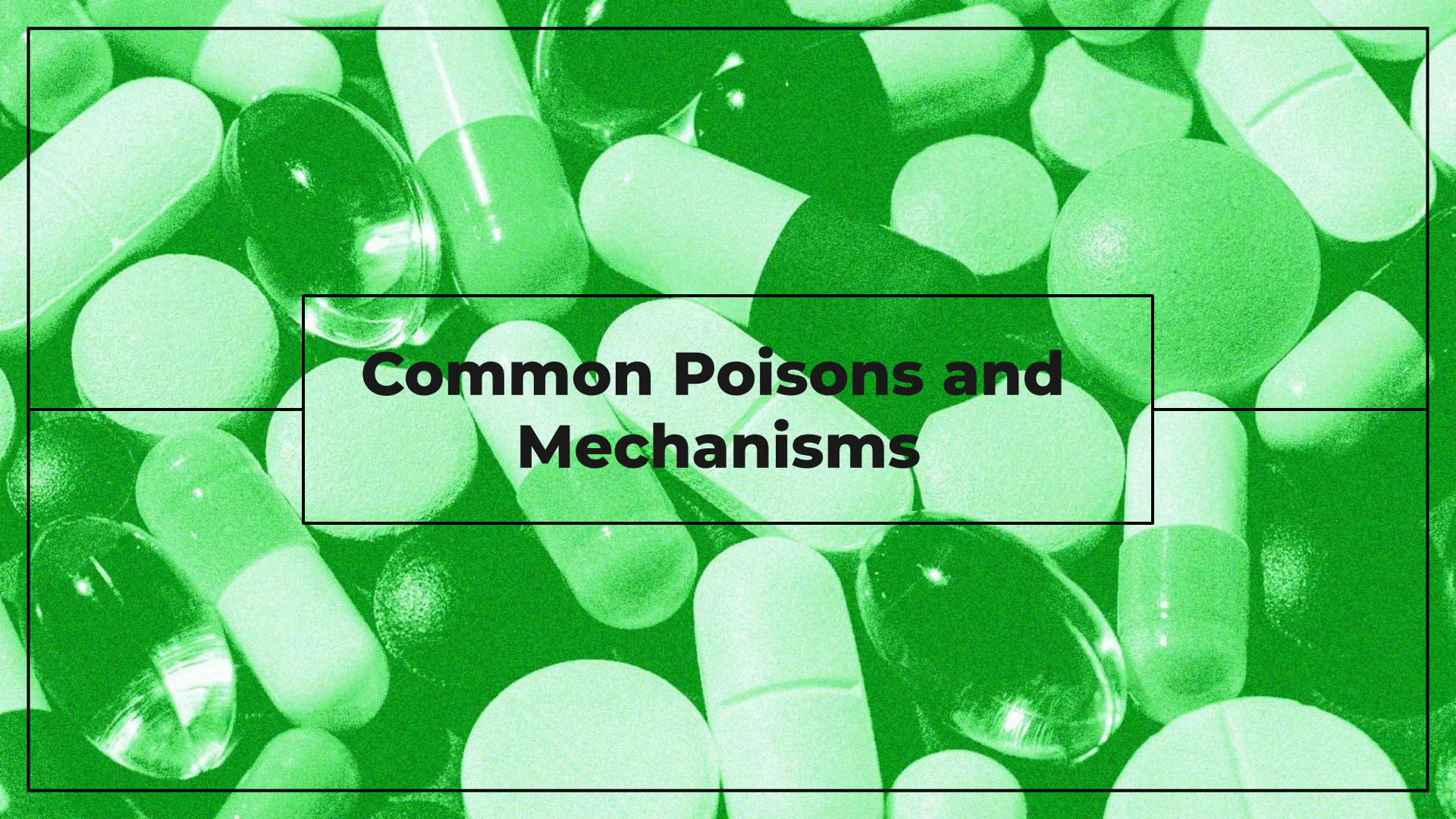
Four Main Routes:

- **Ingestion** – swallowing substances (meds, alcohol, chemicals)
- **Inhalation** – fumes, smoke, CO
- **Injection** – drugs, venom, medical errors
- **Absorption** – through skin or mucosa

💡 Always wear gloves, mask, and eye protection

Overdose vs. Poisoning

Overdose	Poisoning
Too much of a known drug	Contact with a toxic substance
Often intentional	Usually accidental or environmental
Affects organ systems	May cause systemic failure



Common Poisons and Mechanisms

Stimulants

Depressants

Hallucinogens / Psychedelics

Opioids

Benzodiazepines

Stimulants

Stimulants increase the activity of the central nervous system

Effects: Increased HR, increased blood pressure, faster breathing, dilated pupils

Examples: adderall, methamphetamine, caffeine, cocaine, nicotine

Depressants

Depressants **slow down the function of the central nervous system**

Effects: **Reduced stress, decreased HR, slower breathing, decreased blood pressure**

Examples: alcohol, marijuana

Hallucinogens/Psychedelics

Alter brain function, effects can be unpredictable because patient can be detached from reality

Effects: Disorientation, hallucinations, increased HR, increased blood pressure

Examples: LSD, MDMA/Ecstasy, Magic Mushrooms

Opioids

Bind to pain receptors to reduce pain signals

Effects:Drowsiness, slower breathing, slow HR, constricted pupils

Examples: Heroine, Oxycodone, Fentanyl, Morphine

Benzodiazepines

Typically prescribed to reduce anxiety, depressant like effects

Effects:Slow heart rate, lowered blood pressure, calming effect

Examples: Lorazepam, Clonazepam

Scene Safety

- Be aware of odors, chemicals in sight, and specific placards (Reference Hazmat ERG if necessary)
- Wait for Hazmat to clear the scene and clear patients for treatment

Potential hazardous materials:

CBRNE= Chemical
Biological
Radiological
Nuclear
Explosive

MODES OF ENTRY

Ingestion

Consumption of a substance by way of mouth

Inhalation

Breathing in of a substance

Injection

Usage of sharps (needles) to push substance

Absorption

Substance passes through layer of skin

03

Modes of Entry For Poisons

How do poisons enter the body?

FOUR ROUTES OF ENTRY

INHALATION

Natural gas, sewer gas, certain pesticides, carbon monoxide, and chlorine

ABSORPTION

Acids, alkalis, petroleum (hydrocarbon) products, poison ivy/poison oak

INGESTION

Liquids, household cleaners, contaminated food, plants, drugs

INJECTION

Intravenous (IV) drug abuse, insect/arachnid/reptile envenomation

INHALED POISONS

- Move patient to fresh air; give high-flow oxygen
- Call hazmat if toxic gas suspected; do not approach without proper PPE
- Remove contaminated clothing after decontamination; ensure scene safety before care
- Signs/symptoms: burning eyes, sore throat, cough, chest pain, wheezing, respiratory distress, dizziness, confusion, headache, stridor; possible seizures/AMS
- CO: colorless/odorless → severe hypoxia; chlorine: airway irritation, edema
- Some toxins cause delayed/progressive lung damage
- Transport promptly; be ready for NRB/BVM support; pulse ox may be inaccurate
- Increased CO risk in winter with alternative heating; CO also used in suicide attempts (e.g., car in closed garage)

ABSORBED AND SURFACE CONTACT POISONS

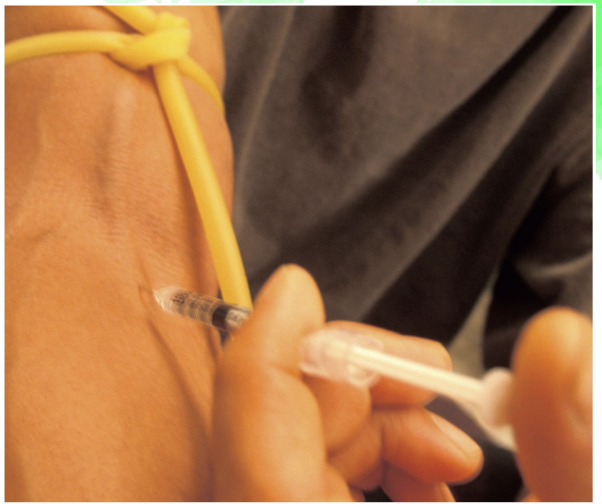
- Corrosive substances damage skin, mucous membranes, and eyes → burns, rashes, lesions
- Some chemicals absorb through skin → systemic effects like medications
- Distinguish contact burns vs contact absorption
- Common signs: exposure history, visible powders/liquids, burns, itching, irritation, redness, characteristic odors
- Emergency care:
  - Avoid contaminating yourself/others
  - Remove/brush off dry chemicals; flush skin 15–20 min; wash with soap/water
  - For liquids: flood area 15–20 min
- Chemical in eyes → irrigate quickly, from nose outward
- Remove contaminated clothing; continue irrigation during transport
- Industrial settings: ensure hazmat support; complete decontamination before transport
- Obtain safety data sheet (SDS) when possible

INGESTED POISONS

- 80% of poisonings occur via ingestion
- Common sources: household cleaners, contaminated food, plants, drugs
- Accidental in children; often deliberate in adults
- Symptoms vary by substance/age/time since ingestion
- Key signs: burns around mouth (acids/alkalis), GI pain, vomiting, AMS, dysrhythmias, seizures
- Protect airway—risk of aspiration if vomiting + AMS
- Some EMS systems permit activated charcoal (per ALCO protocol, 1 g/kg (max 50 g) PO)
- Always assess XABCs first; be ready for ventilatory support/CPR
- CNS depressant ingestions (opioids, sedatives, barbiturates) → slow breathing

INJECTED POISONS

- Includes IV drug use + envenomation (insects, arachnids, reptiles)
- Cannot be diluted/removed in field → rapid absorption + possible severe tissue destruction
- Often life-threatening → act quickly
- Symptoms vary by toxin: weakness, dizziness, fever, chills, slow breathing, unresponsiveness, or agitation
- Airway + oxygen for respiratory distress or hypoxia (<94%, cyanosis)
- Watch for nausea/vomiting; prepare for airway protection
- Remove rings/watches near injection site if swelling
- Bring containers/bottles/labels with patient



04

EMT Toolkit for Toxicological Emergencies: Indications, Contraindications

ACTIVATED CHARCOAL

- Activated charcoal binds to specific toxins (e.g. pills that have been ingested) and prevents their absorption by the body. The toxins are then carried out of the body in the stool
- Contraindications:
  - Patients who have ingested alkali poisons, cyanide, ethanol iron, lithium, methanol, mineral acids, or organic solvents
  - Patient has decreased LOC
  - Patient cannot protect his/her airway
- Some common trade names for activated charcoal are InstaChar, Actidose, and LiquiChar
- Usual dose for adult/child is 1 gram per kilogram of body weight (30-100g for adults, 15-30g for children)
- Before giving a patient charcoal, obtain approval from medical control
- Activated charcoal should be used within 1 hour of ingestion of the toxin
- Adverse effects of ingesting activated charcoal include constipation and black stools. If the patient has ingested a poison that causes nausea, they may vomit after taking activated charcoal

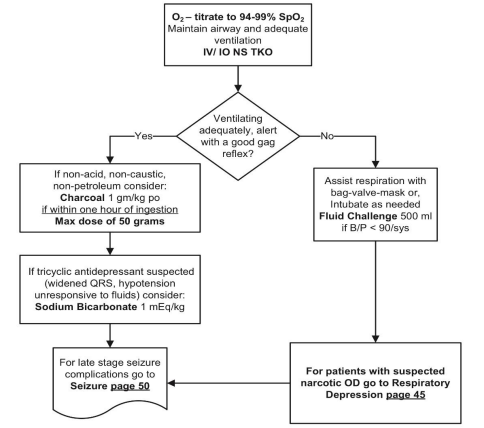
NALOXONE (NARCAN)

- Naloxone (Narcan) is an antidote that reverses the effects of opiate/opioid overdose
- Can be given intravenously (IV), intramuscularly (IM), or intranasally (IN).
- Ideally it is administered IV; however, IV access may be difficult to obtain in chronic IV drug users (e.g. heroin)
    - These patients have venous scarring (“track marks”) from repeated use of needles on peripheral veins
    - In these cases, IN is preferred
- EMTs are permitted to administer prefilled naloxone IM or IN

POISON CONTROL NUMBER (ALCO PROTOCOLS)

POISONING | INGESTION | OVERDOSE

- **Routine Medical Care**
- **Protect Yourself!** - See Hazardous Materials Incidents - EMS Response **page 151**
- **Identify substance** - Bring any containers, labels or a sample (if safe) into the hospital with the patient. Determine type, amount and time of the exposure.
- **Consult the Base Physician:**
  - → If ***organophosphate poisoning*** suspected*
  - → If ***calcium channel*** or ***beta blocker OD*** suspected*
  - → For treatment options for specific exposures
  - * Consider contacting Poison Control for other substances **800-222-1222**
- Remove contaminated clothing. Brush off powders, wash off liquids with copious amounts H_2O



HazMat Emergency Response Guidebook

17.2%

of high school youth have used drugs at some point of their lives