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Toxicology and Substance Abuse

DND Primary Care Paramedicine

Module: 07

Section: 03

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Lecture Outline

- Introduction
- Routes of toxic exposure
- Assessment and management
- Ingested toxins
- Inhaled toxins
- Surface-absorbed toxins
- Surface toxins
- Injected toxins
- Substance abuse and overdose

Introduction

- Toxicology
  - Study of toxins (drugs and poisons) and antidotes and their effects on living organisms
- Poisoning
  - Exposure to non-pharmacological substances (for this discussion)
- Overdose
  - Exposure to pharmacologic substances
  - Intentional or unintentional

Epidemiology

- 10% of ED visits and EMS responses involve toxic exposures.
- 70% of accidental poisonings occur in children under 6 years old.
- A child experiencing an accidental ingestion has a 25% chance of similar ingestion within the next year
- 80% of attempted suicides involve a drug overdose.

Poison Control Centers

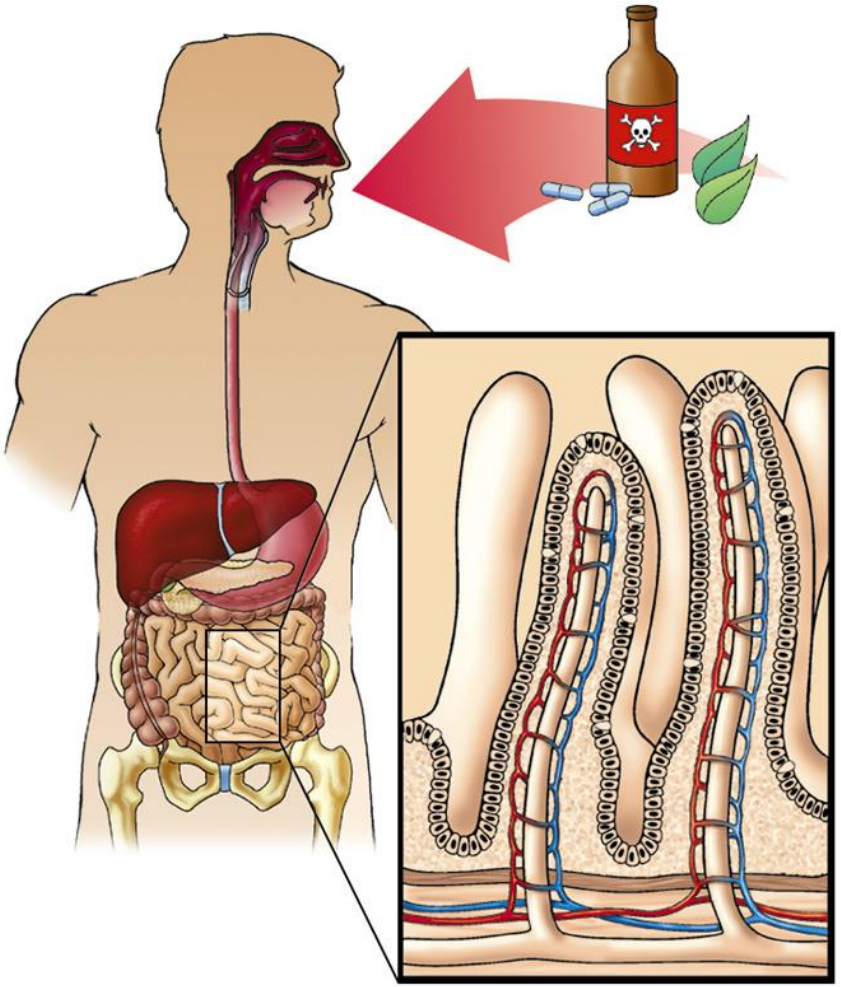
- Setup across Canada and the United States
  - Assist in treatment
  - Provide information on new products
- Accessed by phone
- Advantages
  - Determine potential toxicity
  - Most current definitive treatment can occasionally be started in the field

Routes of Toxic Exposure

- In order to have a destructive effect, poisons must gain entrance into the body
- Effects can be immediate and delayed
  - Ingestion
  - Inhalation
  - Surface absorption
  - Injection

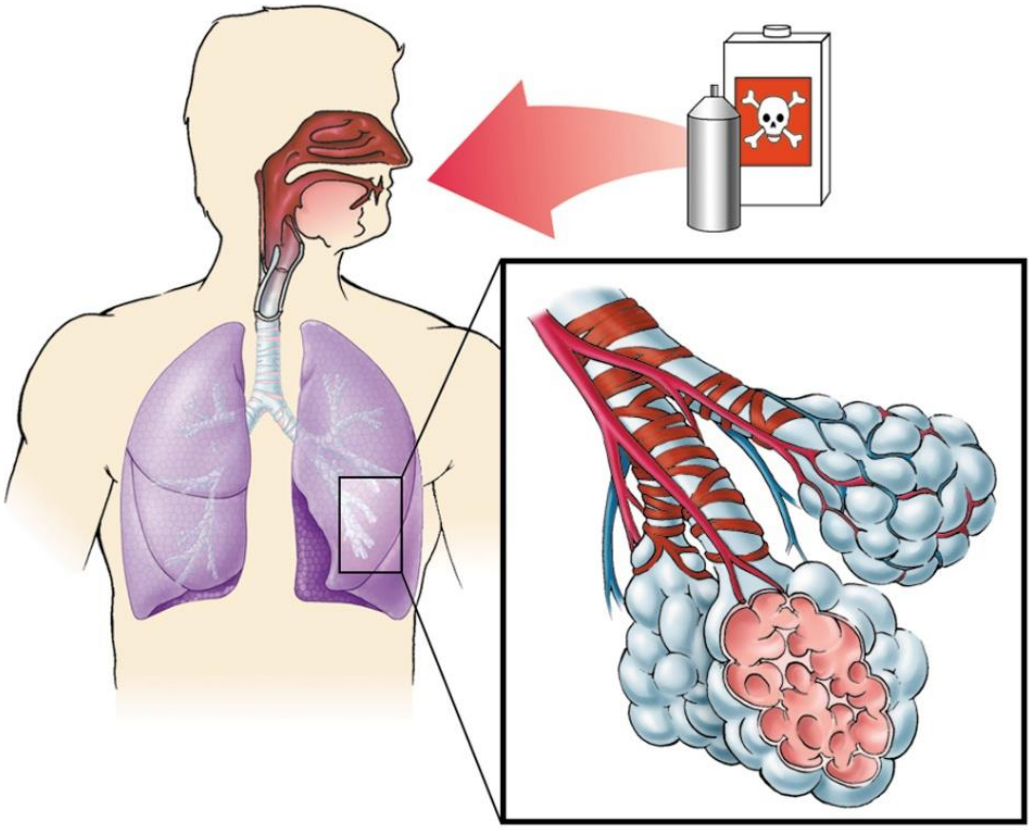
Ingestion

- Most common route of entry
- Absorption occurs in GI tract
  - Household products
  - Petroleum-based agents
  - Cleaning agents
  - Cosmetics
  - Drugs, plants or foods



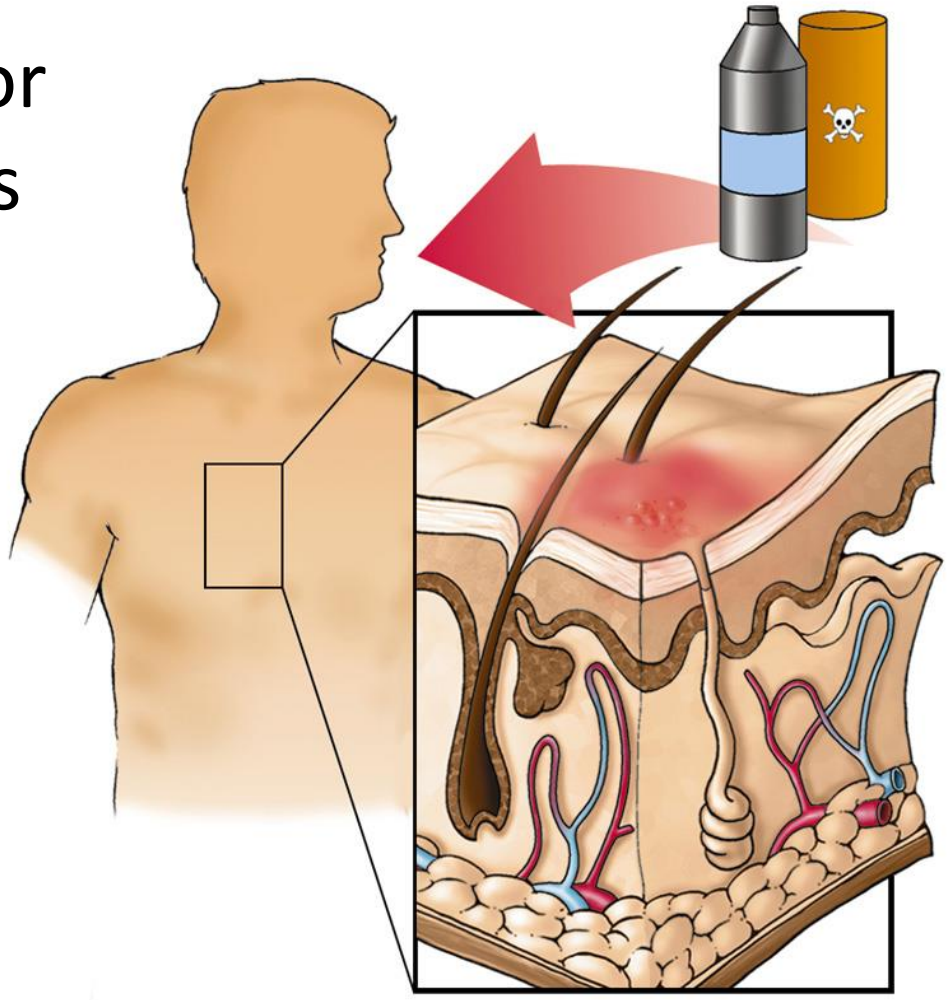
Inhalation

- Absorption through alveolar-capillary membrane
- Inhaled toxins
  - Irritate pulmonary passages
  - Edema
  - Tissue destruction
  - Systemic effects



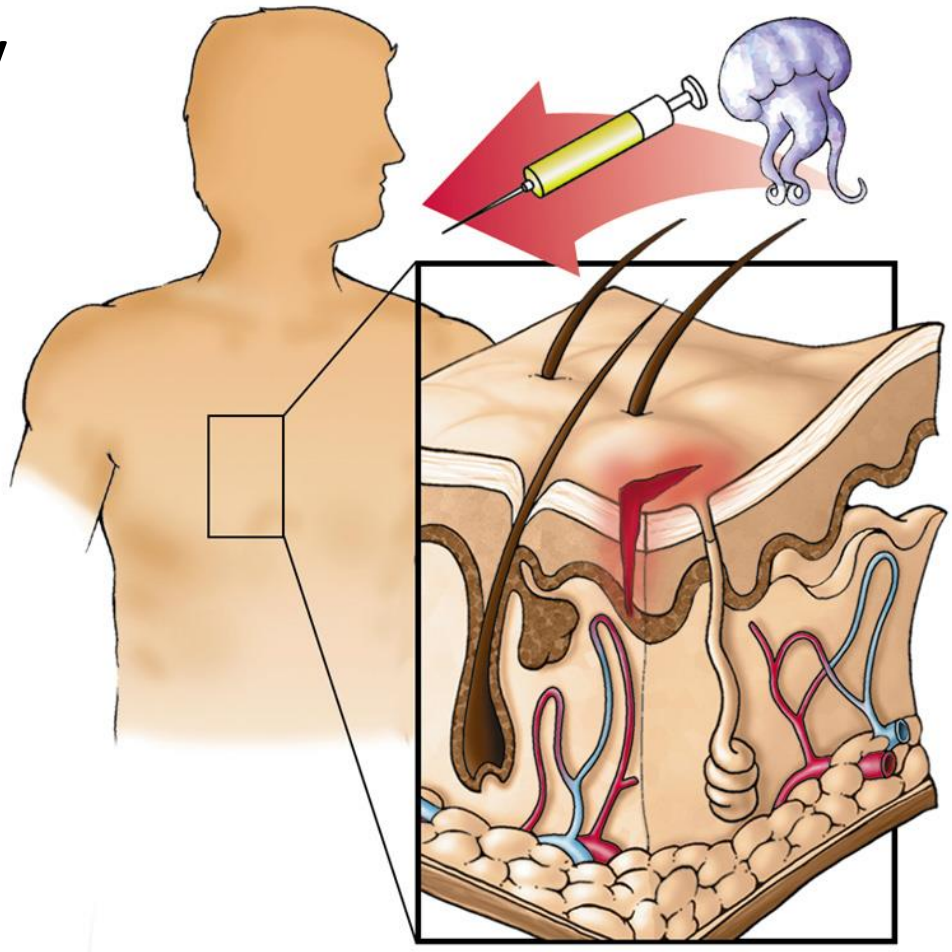
Surface Absorption

- Entry through skin or mucous membranes
- Contact with poisonous plants
- Pesticides
  - Organophosphates



Injection

- Toxins enter directly into body through a break in the skin
- Local and systemic effects
- Animal and insect bites
- Licit and illicit drugs



Toxicokinetics

- What the body does to the poison:
  - Absorption:
    - The process how the chemical enters the body.
    - Speed depends on route, concentration, duration of exposure.
  - Distribution:
    - Once absorbed it passes into the blood and distributes throughout the body.
  - Metabolism:
    - Typically taking place in the liver and involves anabolism (building metabolism) and catabolism (degrading metabolism)
  - Elimination:
    - Many chemicals are not metabolized and are just eliminated.
    - The liver excretes nonpolar metabolites into the bile, kidneys eliminate polar water soluble metabolites into the urine.

Standard Toxicologic Emergency Procedures

- Recognize a poisoning promptly
- Assess the patient thoroughly to
  - Identify the toxin
  - Measures required to control it
- Initiate standard treatment procedures
  - Protect rescuer safety
  - Remove the patient from the toxic environment
  - Support ABCs
  - Decontaminate the patient
  - Administer antidote if one exists

General Assessment

- Scene assessment
  - Be alert to the potential for violence
  - Look for signs of hazardous-material involvement
    - Enter a hazardous-materials scene only if properly trained and equipped to do so
- Primary assessment
  - Airway and respiratory compromise are common
  - Manage life-threatening conditions

General Assessment

- History, physical exam, and ongoing assessment
  - Identify the toxin and length of exposure.
  - Contact poison control and medical direction according to local policy.
  - Complete appropriate physical exams.
  - Monitor vital signs closely.

General Management

- Initiate supportive treatment
- Decontamination
  - Reduce intake of the toxin
    - Remove the individual from the toxic environment
  - Reduce absorption of toxins in the body
    - Use gastric lavage and activated charcoal
  - Enhance elimination of the toxin
    - Use cathartics

Antidotes

- Useful only if the substance is known
- Rarely 100% effective
- Used in conjunction with other therapies to ensure effectiveness

Table 34-1 Antidotes for Toxicological Emergencies

Toxin	Antidote	Adult Dosage (Pediatric Dosage)
Acetaminophen	N-Acetylcysteine	Initial: 140 mg/kg
Arsenic	*see* Mercury, Arsenic, Gold	
Atropine	Physostigmine	Initial: 0.5–2 mg IV
Benzodiazepines	Flumazenil	Initial: 0.2 mg q 1 min to total of 1–3 mg
Carbon Monoxide	Oxygen	
Cyanide	Amyl nitrite	Inhale crushed pearl for 30 seconds, then oxygen for 30 seconds
	then sodium nitrite	10 mL of 3% sol'n over 3 min IV (Pediatric: 0.33 mL/kg)
	then sodium thiosulfate	50 mL of 25% sol'n over 10 min IV (Pediatric: 1.65 mL/kg)
Ethylene glycol	Fomepizole (or as methyl alcohol)	Initial: 15 mg/kg IV
Gold	*see* Mercury, Arsenic, Gold	
Iron	Defroxamine	Initial: 10–15 mg/kg/hr IV
Lead	Edetate calcium disodium	1 amp/250 mL D5W over 1 hr
	or Dimercaptosuccinic acid (DMSA)	250 mg PO
Mercury, Arsenic, Gold	BAL (British anti-Lewisite)	5 mg/kg IM
	DMSA	250 mg PO
Methyl alcohol	Ethyl alcohol +/− dialysis	1 mL/kg of 100% ethanol IV
Nitrates	Methylene blue	0.2 mL/kg of 1% sol'n IV over 5 min
Opiates	Naloxone	0.4–2.0 mg IV
Organophosphates	Atropine	Initial: 2–5 mg IV
	Pralidoxime (Protopam)	Initial: 1 g IV

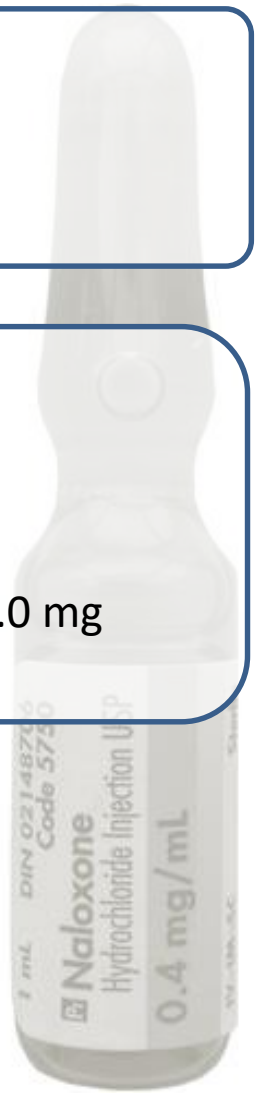
Naloxone (Narcan)

Classification	• Narcotic antagonist
Mechanism of Action	• Displaces opioids from receptors, reversing the effects of narcotic overdose
Indications	• Decrease LOC and/or respiratory depression in a suspected opioid OD (unable to manage A/W with BLS skills)

Naloxone (Narcan)

Contraindications	• Hypersensitivity

Dosage	• Adult
	  • 0.4 – 2.0 mg IV/IN/IM/SC q 2 – 3 min PRN
	• Pediatric
	  • 0.1 mg/kg IV/IN/IM/SC q 2 – 3 min PRN max 2.0 mg



Toxidromes

- A group of signs and symptoms consistently associated with a particular toxin
- Similar toxins typically have similar signs and symptoms
- In some cases it may be difficult to identify a specific toxin

Table 34-2 Toxic Syndromes

Toxidromes	Toxin	Signs and Symptoms
Anticholinergic	Belladonna alkaloids Atropine (hyoscyamine) Belladonna alkaloid mixtures: belladonna leaf, fluid extract, tincture Homatropine Methscopolamine Methylatropine nitrate Plants: *Atropa belladonna, Datura stramonium, Hyoscyamus niger, Amanita muscaria* or *pantherina* Scopolamine (l-hyoscine) Synthetic anticholinergics Adiphenine, Anisotropine, Cyclopentolate, Dicyclomine, Diphemanil, Eucatropine, Glycopyrrolate, Hexocyclium, Isopropamide, Mepenzolate, Methantheline, Methixene, Oxyphenonium, Oxyphencyclimine, Pentapiperide, Pipenzolate, Piperiodolate, Poldine, Propantheline, Thiphenamil, Tridihexethyl, Tropicamide Incidential anticholinergics Antihistamines, Benactyzine, Phenothiazines, Tricyclic antidepressants	Dry skin and mucous membranes Thirst Dysphagia Vision blurred for near objects Fixed dilated pupils Tachycardia Sometimes hypertension Rash, like scarlet fever Hyperthermia, flushing Urinary urgency and retention Lethargy Confusion to restlessness, excitement Delirium, hallucinations Ataxia Seizures Respiratory failure Cardiovascular collapse

Acetylcholinesterase inhibition	Organophosphates TEPP OMPA Dipterex Chlorthion Di-Syston Co-ral Phosdrin Parathion Methylparathion Malathion Systox EPN Diazinon Guthion Trithion	Sweating, constricted pupils, lacrimation, excessive salivation, wheezing, cramps, vomiting, diarrhea, tenesmus, bradycardia *or* tachycardia, hypotension *or* hypertension, blurred vision, urinary incontinence Striated muscle: cramps, weakness, twitching, paralysis, respiratory failure, cyanosis, arrest Sympathetic ganglia: tachycardia, elevated blood pressure CNS effects: anxiety, restlessness ataxia, seizures, insomnia, coma, absent reflexes, Cheyne-Stokes respirations, respiratory and circulation depression

Cholinergic	Acetylcholine *Area catechu* Carbachol *Clitocybe dealbata*	Betel nut Bethanechol Pilocarpine *Pilocarpus species*	Methacholine Muscarine	Sweating, constricted pupils, lacrimation, excessive salivation, wheezing, cramps, vomiting, diarrhea, tenesmus, bradycardia *or* tachycardia, hypotension *or* hypertension, blurred vision, urinary incontinence

Toxidromes	Toxin			Signs and Symptoms
Extrapyramidal	Acetophenazine Butaperazine Carphenazine Chlorpromazine Haloperidol	Mesoridazine Perphenazine Piperacetaxine Promazine	Thioridazine Thiothixene Trifluoperazine Triflupromazine	Parkinsonian Dysphagia, eye muscle spasm, rigidity, tremor, neck spasm, shrieking, jaw spasm, laryngospasm
Hemoglobinopathies	Carbon monoxide Methemoglobin			Headache, nausea, vomiting, dizziness, dyspnea, seizures, coma, death Cutaneous blisters, gastroenteritis Epidemic occurrence with carbon monoxide Cyanosis, chocolate blood with non-functional hemoglobin

Metal fume fever	Fumes of oxides of: Brass Cadmium Copper Zinc	 Iron Magnesium Mercury	 Nickel Titanium Tungsten	Chills, fever, nausea, vomiting, muscular pain, throat dryness, headache, fatigue, weakness, leukocytosis, respiratory disease
Narcotic	Alphaprodine Anileridine Codeine Cyclazocine Dextromethorphan Dextromoramide Diacetylmorphine Dihydrocodeine Dihydrocodeinone Dipipanone Diphenoxylate (Lomotil)	Ethylmorphine Ethoheptazine (meperidene metabolite) Fentanyl Heroin Hydromorphone Levorphanol Meperidine Methadone Metopon Morphine	Normeperidene Opium Oxycodone Oxymorphone Pentazocine Phenazocine Piminodine Propoxyphene Racemorphan	CNS depression Pinpoint pupils Slowed respirations Hypotension Response to naloxone Pupils may be dilated and excitement may predominate Normeperidine: tremor, CNS excitation, seizures

Sympathomimetic	Aminophylline Amphetamines Caffeine *Catha edulus* (Khat) Cocaehylene Cocaine Dopamine	Ephedrine Epinephrine Fenfluramine Levarterenol Metaraminol Methamphetamine Methcathinone	Methylphenidate (Ritalin) Pemoline Phencyclidine Phenmetrazine Phentermine	CNS excitation Seizures Hypertension Hypotension with caffeine Tachycardia
Withdrawal	Alcohol Barbiturates Benzodiazepines Chloral hydrate	Cocaine Ethchlorvynol Glutethimide Meprobamate	Methaqualone Methyprylon Opiods Paraldehyde	Diarrhea, large pupils, piloerection, hypertension, tachycardia, insomnia, lacrimation, muscle cramps, restlessness, yawning, hallucinations Depression with cocaine

Adapted from Done AK. *Poisoning—A Systematic Approach for the Emergency Department Physician.* Presented Aug. 6–9, 1979, at Snowmass Village, CO, Symposium sponsored by Rocky Mountain Poison Center. Used by Permission.

General Management

- Suicidal patients and protective custody
  - Beware of the patient who was “just kidding”
  - Consider medical, legal and ethical ramifications
  - Involve law enforcement

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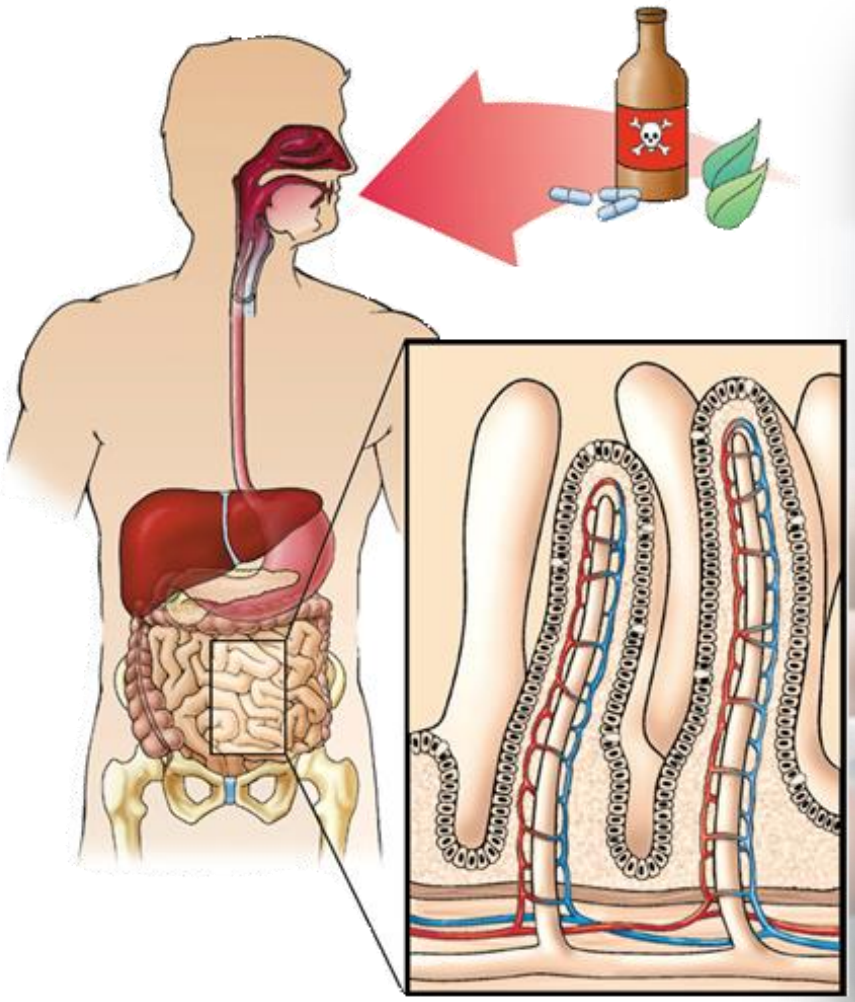
Ingested Toxins



History

- What was ingested?
- When was it ingested?
- How much was ingested?
- Did you drink any alcohol?
- Have you attempted to treat yourself?
- Have you been under psychiatric care? Why?
- What is your weight?

Secondary Assessment

- History often unreliable
  - Physical exam to confirm poisoning
  - Additional underlying illness
- Skin
  - Cyanosis, pallor, wasting, needle marks
- Eyes
  - Pupils, impaired vision, blurring or colouration of vision

Secondary Assessment

- Mouth
  - Caustic ingestion, gag reflex, salivation, odours
- Chest
  - Aspiration, atelectasis, excessive pulmonary secretions
- Circulation
  - Dysrhythmias
- Abdomen
  - Pain pattern

Management

- Supportive ABCs
- Fluid administration
- Cardiac monitoring, vitals
- Medications
  - As indicated, avoid coma cocktails
- Decontamination
- Do not induce vomiting
- Contact poison control and medical direction according to local protocol

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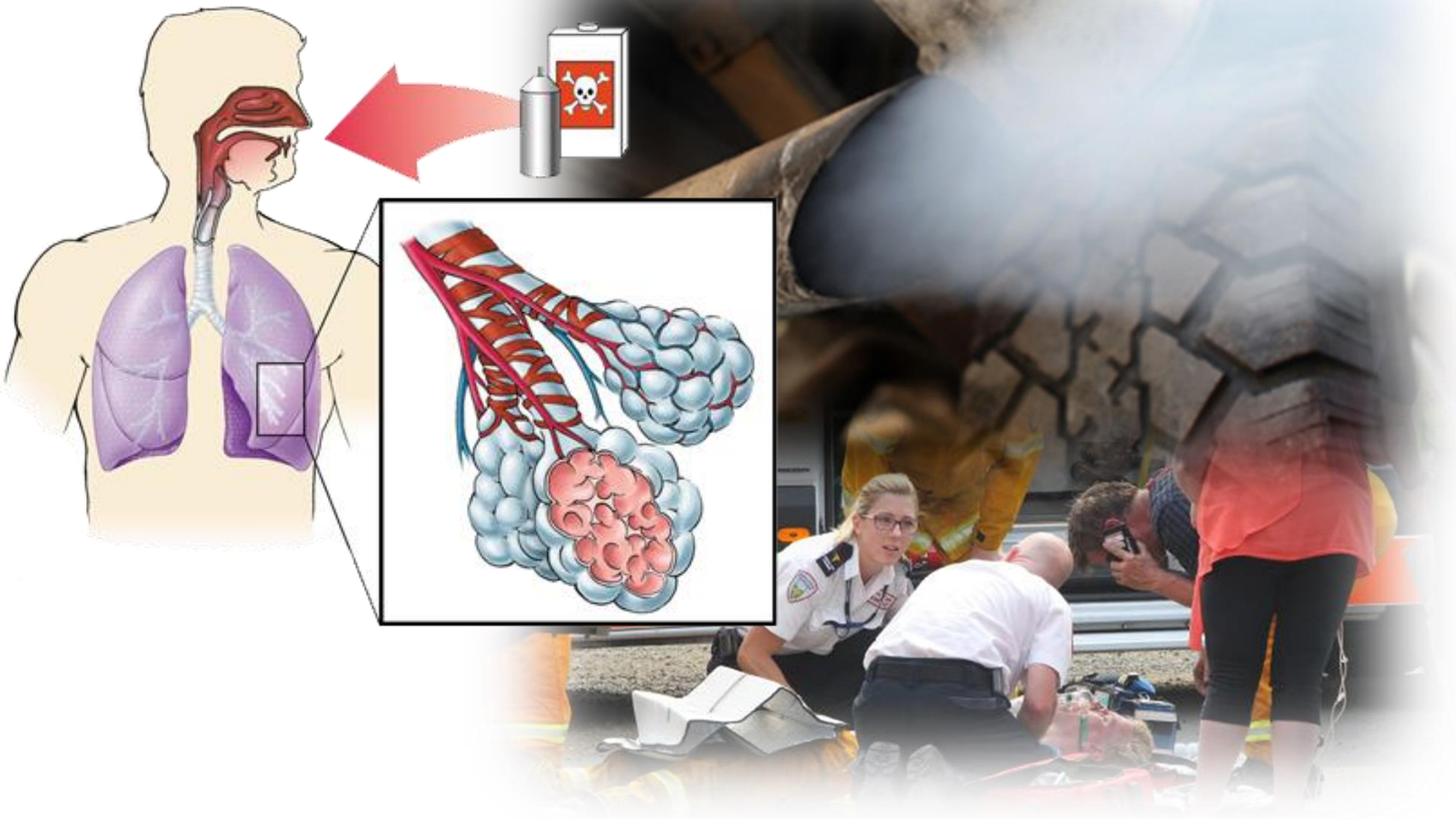
Inhaled Toxins



Assessment

- Evaluate the scene
  - Safety, risk of exposure
  - Exposure produces respiratory symptoms
- Central nervous system
  - Dizziness, headache, confusion, seizure, hallucinations, coma
- Respiratory effects
  - Cough, hoarseness, stridor, dyspnea, retractions, wheezing, chest pain or tightness, rales, rhonchi
- Cardiac
  - Dysrhythmias

Management

- Ensure your personal safety
  - Do not enter a hazardous scene unless properly trained and equipped to do so
- Remove the patient from the environment
- Remove the patient's contaminated clothing
- Initiate supportive measures
- Contact poison control and medical direction according to local protocol

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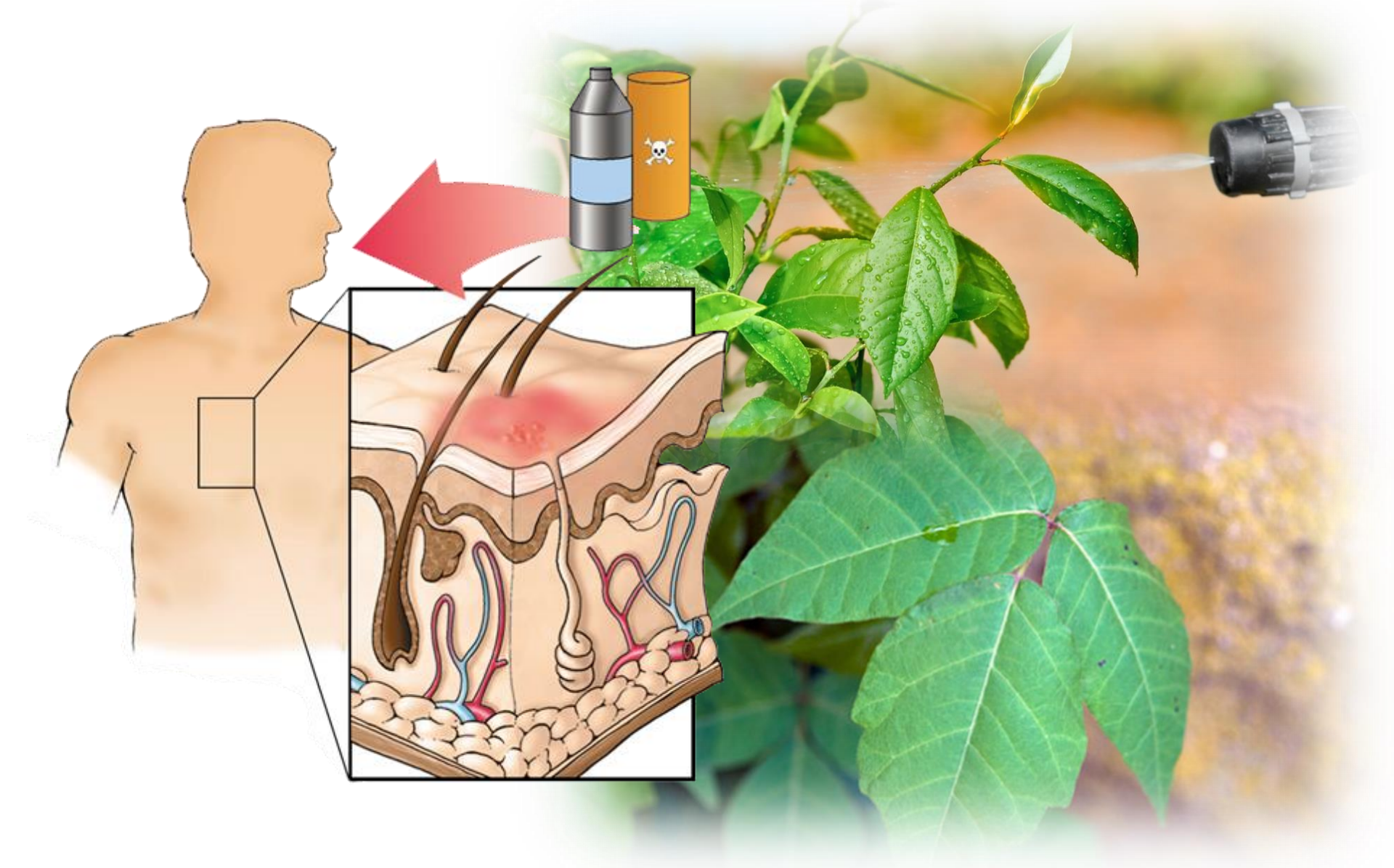
Surface-Absorbed Toxins



Assessment and Management

- Ensure your personal safety
- Remove the patient from the environment
- Remove the patient's contaminated clothing
- Perform the initial assessment, history and physical exam
- Initiate supportive measures
- Contact poison control and medical direction according to local protocol

Pesticides

- Organophosphates and carbamate are commonly used in agriculture.
- Solid or liquid at room temperature and often mixed with xylene or toluene prior to use.
- Exposure typically inhalation, dermal or ingestion
- Both substances bind with acetylcholinesterase

Pesticide Actions

- S—Salivation
- L—Lacrimation
- U—Urination
- D—Diarrhea
- G—Gastrointestinal distress
- E—Emesis
- Involuntary muscle contraction
- Pinpoint pupils

Pesticide Treatment

- Remove all clothing and jewelry.
- Maintain and support ABCs.
- Suction if needed.
- ALS support if available
  - May treat with Atropine for SLUDGE effects
  - May treat seizure, if any, with benzodiazepine

Cyanide

- Extremely fast acting
- Cellular asphyxiant
  - Inhibits enzyme vital to cellular use of oxygen
- Ingested or absorbed
  - Variety of commercial and household items
  - Burning plastics, silks or synthetics
  - Long term sodium nitroprusside therapy

Presentation

- Burning sensation in the mouth and throat
- Headache, confusion, and combativeness
- Hypertension and tachycardia
- Seizures and coma
- Pulmonary edema

Management

- Ensure rescuer safety, initiate supportive care
- Administer antidote
  - Cyanide antidote kit containing amyl nitrite, sodium nitrite and sodium thiosulfate

Carbon Monoxide

- Odourless, colourless, tasteless gas
- More than 200 times affinity for hemoglobin as oxygen
  - Resistant to removal
  - Causes effective hypoxia
- Improperly vented heating systems
- Confined space

Presentation

- Signs of cerebral hypoxia
  - Headache
  - Nausea and vomiting
  - Confusion or other altered mental status
- Tachypnea
- Early signs similar to the flu
  - Often ignored until highly toxic levels are reached
  - Beware of multiple patients who live together complaining of the flu

Management

- Ensure rescuer safety.
- Remove the patient from the contaminated area.
- Initiate supportive measures.
  - High-flow oxygen
- Rapid transport
  - Hyperbaric therapy

Hyperbaric Therapy

- Be aware of the location of facilities with a hyperbaric chamber

Cardiac Medications

- List of medications expanding daily
- Generally regulate heart function by:
  - Decreased heart rate
  - Suppress automaticity
  - Reduce vascular tone
- Overdoses usually accidental

Presentation

- Nausea and vomiting
- Headache, dizziness, confusion
- Profound hypotension
- Cardiac dysrhythmias
  - Especially bradycardias
  - Heart conduction blocks
- Bronchospasm, pulmonary edema
  - Especially beta blockers

Management

- Standard toxicologic emergency procedures
- Presentations may not respond to standard therapies
  - Bradycardia may not respond to Atropine
- Antidotes for some medications

Caustic Substances

- Acids or alkalis found in both home and industrial workplace
- Acid
  - E.g. plumbing liquid
  - Strong acid has a pH<2
- Alkali
  - Solid or liquid form
  - Strong base has a pH>12.5

Acids

- Contact
  - Immediate and severe pain
  - Tissue coagulation and necrosis
  - May produce eschar (prevents deeper burning)
- Ingestion
  - Local burns to mouth and throat
  - Stomach lining injured
  - Pain and spasm
  - Absorption may result in acidemia

Alkali

- Contact
  - Liquifaction necrosis
  - Pain often delayed
  - Longer contact, deeper injury
- Ingestion
  - Solid agents often stick to mouth and esophagus
  - Liquids injure stomach
  - Complete loss of mucosal tissue in 2-3 days

Presentation

- Facial burns
- Pain in the lips, tongue, throat, or gums
- Drooling, trouble swallowing
- Hoarseness, stridor or shortness of breath
- Shock from bleeding, vomiting

Management

- Perform standard toxicologic emergency procedures
- Pay particular attention to airway
  - May require rapid intervention
- Rapid transport
- Avoid oral fluids

Hydrofluoric Acid

- Extremely toxic and lethal
  - Appears only as minor burns
  - Penetrates deeply into tissue
- Inactivated by calcium ions
  - Settles into tissue as a salt
  - Removes calcium from cells and bones
  - Impairs cellular function
- Death reported with exposure <2.5% BSA

Presentation

- Burning at site of contact
- Difficulty breathing
- Confusion
- Palpitations
- Muscle cramps

Management

- Ensure safety of rescue personnel
- Initiate supportive measures
- Remove exposed clothing
- Irrigate affected area thoroughly
- Immerse the affected limb in ice water
- Rapid transport to appropriate facility

Hydrocarbons

- Organic compounds composed mostly of carbon and hydrogen
- Found in many household and industrial products
  - Turpentine
  - Kerosene
  - Lighter fluid
  - Paint
  - Lubricants
- Toxicity can occur from any route

Presentation

- Burns due to local contact
- Respiratory involvement
  - Wheezing, dyspnea, hypoxia, pneumonitis
- CNS involvement
  - Headache, dizziness, slurred speech, ataxia, obtundation
- Cardiac dysrhythmias
- Periphery
  - Foot and wrist drop with numbness and tingling

Management

- Rarely serious if patient is asymptomatic
- Symptomatic patient
  - Standard toxicologic emergency procedures
- Hydrocarbons do not bind to activated charcoal
  - Gastric lavage

Tricyclic Antidepressants

- Once commonly used to treat depression
- Narrow therapeutic index
- Patient that need them, most likely to attempt overdose
- Still used to manage chronic pain and migraine prophylaxis

Presentation

- Toxicity
  - Dry mouth, blurred vision, urinary retention, constipation
- Severe toxicity (overdose)
  - Confusion, hallucinations, hyperthermia
  - Respiratory depression, seizures
  - Tachycardia, hypotension, cardiac dysrhythmias

Management

- Perform standard toxicological emergency procedures.
- ALS Support may be required.
- Monitor and treat cardiac dysrhythmias.
- Monitor and treat respiratory depression

MAO Inhibitors

- Rarely used to treat depression
- Relatively unpopular
  - Narrow therapeutic index
  - Multiple drug and food interactions
  - Inhibit and breakdown neurotransmitters
- Symptoms may not appear for up to 6 hours

Presentation

- Headache, agitation, restlessness, tremor
- Nausea
- Severe hypertension
- Hyperthermia
- Palpitations
- Tachycardia
- Progresses to bradycardia, hypotension, coma, and death.

Management

- Standard toxicologic emergency procedures
- No antidote available
- Symptomatic support
  - Seizures
  - Hypotension
  - Hyperthermia

Newer Antidepressants

- Trazodone and Bupropion
- Selective serotonin reuptake inhibitors (SSRIs)
  - Prevent reuptake of serotonin
  - Theoretically makes it more available
- Higher safety profile
- Virtually replaced tricyclics
- True mechanism of action unclear

Presentation

- Drowsiness
- Tremor
- Nausea and vomiting
- Tachycardia

Serotonin Syndrome

- Triggered by increasing the dose or by adding selected drugs
- Agitation, anxiety, confusion, insomnia
- Headache, drowsiness, coma
- Nausea, salivation, diarrhea, abdominal cramps
- Cutaneous piloerection, flushed skin
- Hyperthermia, rigidity, shivering, incoordination and myoclonic jerks

Management

- Not as life threatening unless other drugs or alcohol are taken
- Supportive measures
- Standard toxicological emergency procedures

Lithium

- Prescribed to treat bipolar disorder
  - Narrow therapeutic index
- Presentation
  - Thirst, dry mouth
  - Tremors, muscle twitching, and increased reflexes
  - Confusion, stupor, seizures, coma
  - Nausea, vomiting, diarrhea
  - Bradycardia and dysrhythmias

Management

- Standard toxicologic emergency procedures
- Activated charcoal is not effective with lithium
- Severe cases require hemodialysis

Salicylates

- Most common drug taken in overdose
- Readily available over the counter
  - Aspirin
  - Oil of Wintergreen
  - Prescription combinations
- Large doses (300 mg/kg)
  - Inhibit energy production and acid buffering
  - Metabolic acidosis

Presentation

- Tachypnea
  - Direct effect of salicylates on brain stem
- Hyperthermia
- Confusion, lethargy, coma
- Cardiac failure, dysrhythmias
- Abdominal pain
- Pulmonary edema, ARDS
- Chronic overdose does not usually include abdominal pain

Management

- Standard toxicological emergency procedures
- Time of overdose necessary
  - Predicts degree of anticipated symptoms
- Fluid resuscitation
- Extreme cases require dialysis

Acetaminophen

- One of the most common drugs in use
- Few side effects in normal doses
- In high doses
  - Detoxification overwhelmed
  - Toxic metabolite left in circulation
  - Hepatic necrosis

Presentation

Stage 1	**½ –24 hours**	**Nausea, vomiting, weakness, and fatigue**
Stage 2	**24–48 hours**	**Abdominal pain, decreased urine, elevated liver enzymes**
Stage 3	**72–96 hours**	**Liver function disruption**
Stage 4	**4–14 days**	**Gradual recovery or progressive liver failure**

Management

- Standard toxicological emergency procedures
- Blood levels can predict potential for injury
- Antidote
  - N-acetylcystiene, mucomyst
  - Available and highly effective
  - Rarely given prehospital

Other Nonprescription Pain Medications

- Non-steroidal Anti-inflammatory Drugs
  - Ibuprofen, ketorolac, naproxen sodium.
- Presentation
  - Headache, tinnitus, nausea, vomiting, abdominal pain, drowsiness
  - Dyspnea, wheezing, pulmonary edema, swelling of extremities, rash, itching
- Treatment
  - Standard toxicological emergency procedures

Theophylline

- Bronchodilator
  - Prescribed for chronic respiratory problems
- Presentation
  - Agitation, tremors, seizures, cardiac dysrhythmias, nausea and vomiting
- Management
  - Standard toxicological emergency procedures

Metals

- Overdoses are rare
  - Exception of iron
- Affect numerous enzyme activities
  - Variety of signs and symptoms
- Direct local effects when ingested and accumulated effects in organs

Iron

- Body only requires small amounts on a daily basis
  - Stored for enzyme and hemoglobin production
- Excess easily obtained
  - Nonprescription supplements
  - Vitamins
- Causes GI injury and hemorrhage
  - Forms lumps

Iron

- Presentation
  - Vomiting (with hematemesis), diarrhea
  - Abdominal pain, shock
  - Liver failure
  - Metabolic acidosis with tachypnea
  - Eventual bowel scarring and obstruction
- Management
  - Standard toxicological emergency procedures

Lead and Mercury

- Overdose often results from chronic environmental exposure
- Presentation
  - Headache, irritability, confusion, coma
  - Memory disturbances
  - Tremors, weakness, agitation
  - Abdominal pain
- Treatment
  - Standard toxicological emergency procedures

Contaminated Food

- Spectrum of factors
  - Bacteria, viruses, toxic chemicals
  - Produce varying level of GI distress
- Bacterial toxins
  - Symptoms worsen with multiple bacteria
- Seafood poisonings
  - Specific toxins found in shellfish
  - Incidence increased with increased consumption

Contaminated Food

- Presentation
  - Nausea, vomiting, diarrhea and abdominal pain
  - Facial flushing and respiratory distress
- Treatment
  - Collect samples of the suspect food source
  - Maintain the airway and support breathing
  - Establish IV access
  - Consider medications
  - Antihistamines, antiemetics

Poisonous Plants and Mushrooms

- Contribute heavily to number of accidental toxic ingestions
  - Children especially
- Vast numbers and variety of names
  - Difficult to categorize
- Mushrooms particularly hard to identify
  - Foraging
  - Accidental ingestion

Poisonous Plants and Mushrooms

- Presentation
  - Excessive salivation, lacrimation, diaphoresis
  - Abdominal cramps, nausea, vomiting, diarrhea
  - Decreased LOC progressing to coma
- Management
  - Call poison control
  - Follow treatment guidelines for contaminated food.

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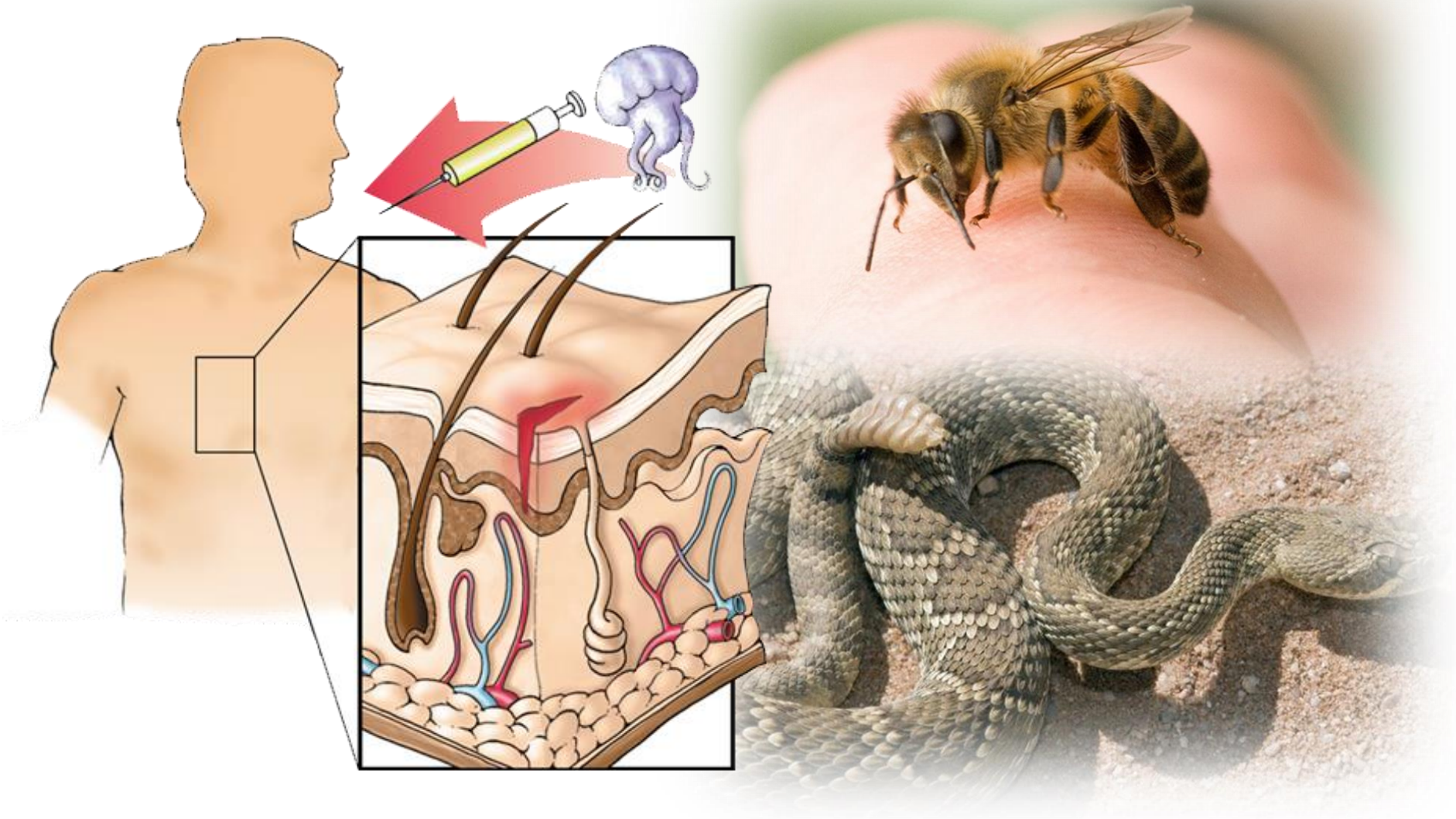
Injected Poisons



General Principles of Management

- Protect rescuers.
- Remove the patient from danger.
- Identify the organism that caused the injury.
- Perform an initial assessment and rapid physical exam.

General Principles of Management

- Prevent or delay absorption of the poison.
- Initiate supportive measures as indicated.
- Watch for anaphylactic reactions.
- Transport the patient rapidly.
- Contact poison control and medical direction

Insect Stings

- In most cases, local treatment is all that is necessary
- Hymenoptera stings
  - Common source of anaphylaxis
  - Only honeybee leaves stinger in
  - Wasps, hornets and fire ants will sting repeatedly

Insect Stings

- Presentation
  - Localized pain
  - Redness
  - Swelling
  - Skin wheal
  - Monitor for signs of anaphylaxis
- Management
  - Wash the area
  - Remove stingers, if possible
  - Apply cool compresses to the injection site
  - Observe for and treat allergic reactions and/or anaphylaxis.

Brown Recluse Spider

- Rare
- Found in imported fruit
- Southern and midwest USA
- Lives in dry, dark locations

Brown Recluse Spider

- Presentation
  - Bite usually painless
  - Localized, white-ringed macule
  - Progresses to localized pain, redness, and swelling over next 8 hours
  - Tissue necrosis occurs over 2-3 days
  - In severe cases, hemorrhage and DIC
- Management
  - No antidote, supportive therapy

Brown Recluse Spider

- 24 hours after bite

- 4 days after bite

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Black Widow Spider Bites

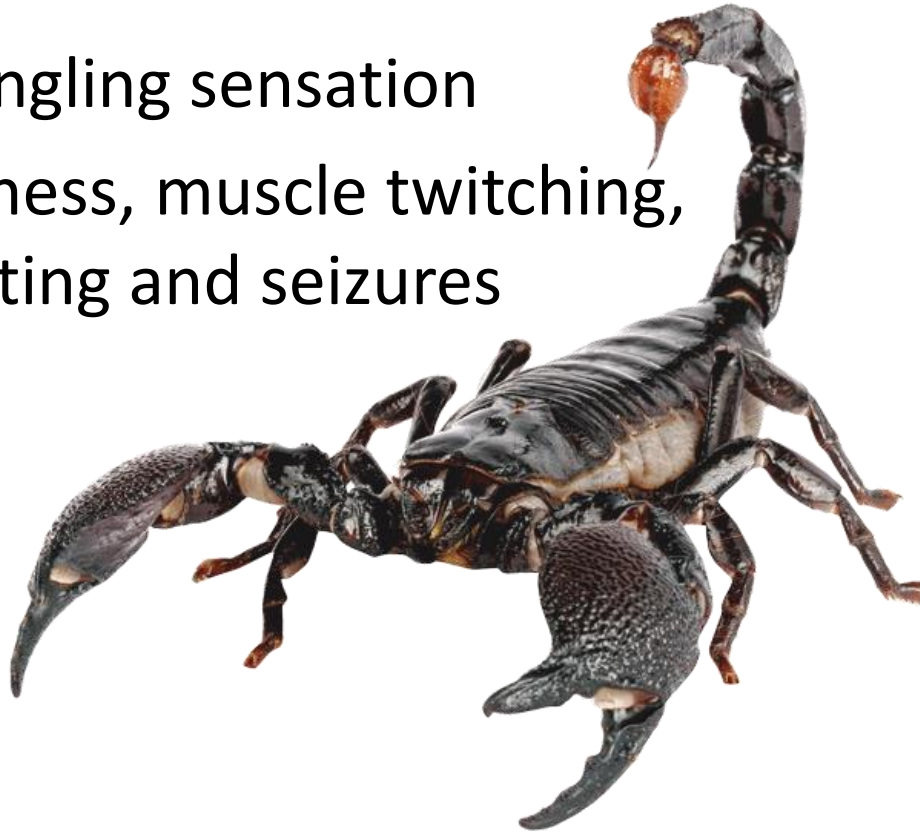
- Live in all parts of North America
- Usually found in woodpiles or brush
- Venom very potent
  - Causes excessive neurotransmitter release at synaptic junctions

Black Widow Spider Bites

- Presentation
  - Immediate pain, redness, and swelling
  - Progressive muscle spasms of all large muscle groups
  - Nausea, vomiting, sweating
  - Seizures, paralysis and altered LOC
- Management
  - Mostly supportive
  - Antivenom available

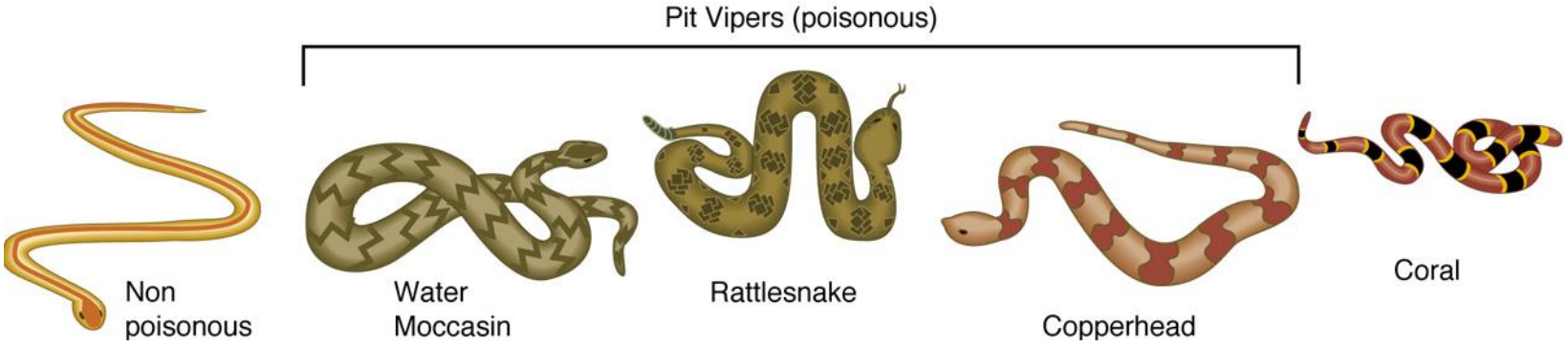
Scorpion Stings

- Presentation
  - Localized burning and tingling sensation
  - Slurred speech, restlessness, muscle twitching, salivation, nausea, vomiting and seizures
- Management
  - Follow general treatment guidelines.
  - Apply constricting band.



Snakebites

- Pit Viper Bites
  - Venom destroys proteins and other tissue components
- Coral Snake Bites
  - Venom is a neurotoxin that results in paralysis
  - Found in southwestern USA



Pit Viper Bites

- Presentation
  - Fang marks
  - Swelling and pain at site
  - Oozing
  - Weakness, dizziness, faintness
  - Sweating, chills, thirst
  - Nausea and vomiting
  - Tachycardia and hypotension
  - Hemorrhage and necrosis
  - Respiratory failure

Pit Viper Bites

- Treatment
  - Keep the patient supine.
  - Immobilize the injured limb and maintain it in a neutral position.
  - Apply high-flow oxygen.
  - Establish IV access.
  - Transport.
  - Do not apply constricting bands, ice, cold packs, tourniquets or electrical stimulation to the wound.

Coral Snake Bites

- Presentation
  - Localized numbness, weakness, drowsiness
  - Ataxia, slurred speech, excessive salivation
  - Paralysis of the tongue and larynx
  - Drooping of the eyelids, double vision, dilated pupils
  - Abdominal pain, nausea, vomiting
  - Loss of consciousness, seizures
  - Respiratory failure
  - Hypotension

Coral Snake Bites

- Management
- Wash the wound with large amounts of water
- Maintain the immobilized extremity at the level of the heart
- IV access
- Rapid transport

Marine Animal Injection

- Presentation
  - Intense local pain and swelling
  - Nausea and vomiting
  - Dyspnea
  - Tachycardia
  - Hypotension or shock in severe cases
- Management
  - Establish and maintain the airway
  - Apply a constricting band above the site
  - Apply heat or hot water
  - Inactivate or remove any stingers

Substance Abuse and Overdose

- Substance abuse
  - Use of pharmacologic substances for purposes other than medical
- Addiction
  - Compulsive overwhelming dependence
  - Physical and psychological

Drugs of Abuse

- Alcohol
  - May require thiamine and dextrose for hypoglycemia
- Cocaine
  - May require benzodiazepines
- Narcotics
  - Naloxone will reverse effects but may initiate withdrawal

Drugs of Abuse

- Amphetamines and hallucinogens
  - May use benzodiazepines for seizures
  - Haloperidol for hyperactivity
- Benzodiazepines
  - Use flumazenil to combat effects
- Barbiturates
  - May require forced diuresis and alkalinization

Common Drugs of Abuse

Table 34-3 Common Drugs of Abuse

Drug	Signs and Symptoms	Routes	Prehospital Management
Alcohol beer whiskey gin vodka wine tequila	CNS depression Slurred speech Disordered thought Impaired judgment Diuresis Stumbling gait Stupor Coma	Oral	ABCs Respiratory support Oxygenate Establish IV access Administer 100 mg thiamine IV ECG monitor Check glucose level Administer $D_{50}W$, if hypoglycemic
Barbiturates thiopental phenobarbital primidone	Lethargy Emotional lability Incoordination Slurred speech Nystagmus Coma Hypotension Respiratory depression	Oral IV	ABCs Respiratory support Oxygenate Establish IV access ECG monitor Contact Poison Control—may order bicarbonate

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Common Drugs of Abuse

Cocaine crack rock	Euphoria Hyperactivity Dilated pupils Psychosis Twitching Anxiety Hypertension Tachycardia Dysrhythmias Seizures Chest pain	Snorting Injection Smoking (freebasing)	ABCs Respiratory support Oxygenate ECG monitor Establish IV access Treat life-threatening dysrhythmias Seizure precautions: diazepam 5–10 mg
Narcotics heroin codeine meperidine morphine hydromorphone pentazocine Darvon Darvocet methadone	CNS depression Constricted pupils Respiratory depression Hypotension Bradycardia Pulmonary edema Coma Death	Oral Injection	ABCs Respiratory support Oxygenate Establish IV access

*With the advent of the opiate antagonist naloxone, narcotic overdosage became easier to manage. It is possible to titrate this effective medication to increase respirations to normal levels without fully awakening the patient. In the case of narcotics addicts, this prevents hostile and confrontational episodes.

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Common Drugs of Abuse

Drug	Signs and Symptoms	Routes	Prehospital Management
Marijuana grass weed hashish	Euphoria Dry mouth Dilated pupils Altered sensation	Smoked Oral	ABCs Reassure the patient Speak in a quiet voice ECG monitor if indicated
Amphetamines Benzedrine Dexedrine Ritalin "speed"	Exhilaration Hyperactivity Dilated pupils Hypertension Psychosis Tremors Seizures	Oral Injection	ABCs Oxygenate ECG monitor Establish IV access Treat life-threatening dysrhythmias Seizure precautions: diazepam 5–10 mg
Hallucinogens LSD STP mescaline psilocybin PCP**	Psychosis Nausea Dilated pupils Rambling speech Headache Dizziness Suggestibility Distortion of sensory perceptions Hallucinations	Oral Smoked	ABCs Reassure the patient "Talk down" the "high" patient Protect the patient from injury Provide a dark, quiet environment Speak in a soft, quiet voice Seizure precautions: diazepam 5–10 mg

**While PCP was originally an animal tranquilizer, it manifests hallucinogenic properties when used by humans. In addition to bizarre delusions, it can cause violent and dangerous outbursts of aggressive behavior. The rescuer is advised to remain safe when attempting to treat this type of overdose. PCP patients have been known to have almost superhuman strength and high pain tolerance.

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Common Drugs of Abuse

Sedatives Seconal Valium Librium Xanax Halcion Restoril Dalmane Phenobarbital	Altered mental status Hypotension Slurred speech Respiratory depression Shock Bradycardia Seizures	Oral	ABCs Respiratory support Oxygenate Establish IV access ECG monitor Medical direction may order naloxone
Benzodiazepines*** Valium Librium Xanax Halcion Restoril Dalmane Centrax Ativan Serax	Altered mental status Slurred speech Dysrhythmias Coma	Oral	ABCs Respiratory support Oxygenate Activated charcoal as ordered by medical Direction Establish IV access ECG monitor Contact poison control

***Deaths due to pure benzodiazepine ingestion are very rare. Minor toxicity ranges are 500–1,500 mg. A benzodiazepine antagonist (Romazicon) is available. IV dosage is 1–10 mg, or an infusion of 0.5 mg/hr. It may cause seizures in a benzodiazepine dependent patient.

Drugs Used for Sexual Purposes

- Ecstasy (MDMA)
  - Signs and symptoms include anxiety, nausea, tachycardia and hypertension, followed by relaxation and euphoria.
  - Provide supportive care.
- Rohypnol (“date rape drug”)
  - Potent benzodiazepine, illegal in Canada.
  - Treat as a benzodiazepine overdose and sexual assault victim.

Alcohol Abuse

- Physiologic Effects
  - CNS depressant
  - Alcoholism
  - Peripheral vasodilation, diuresis
- General Alcoholic Profile
  - Drinks early in the day, alone, or secretly.
  - Binges, blackouts, GI problems, “green tongue syndrome,” chronic flushing of face and palms.
  - Cigarette burns, tremulousness and odor of alcohol.

Consequences of Alcohol Abuse

- Poor nutrition
- Alcohol hepatitis
- Liver cirrhosis, pancreatitis
- Sensory loss in hands/feet
- Loss of balance and coordination
- Upper GI hemorrhage
- Hypoglycemia
- Falls (fractures and subdural hematoma)

Withdrawal Syndrome

- Occurs from abrupt discontinuation after prolonged use
- Can occur hours to days after abstinence
- Lasts 5 to 7 days
- Delerium tremens (DTs)
  - Patients experience visual, tactile and auditory disturbances

Presentation

- Coarse tremor of hands, tongue, eyelids
- Nausea, vomiting
- General weakness
- Anxiety
- Tachycardia, sweating, hypertension
- Orthostatic hypotension
- Hallucinations, irritability or depressed mood, poor sleep

Management

- Establish and maintain the airway.
- Determine if other drugs are involved.
- Intravenous access
- Consider medications.
- Dextrose and possibly thiamine
- Empathy and reassurance
- Transport

Summary

- Routes of toxic exposure
- Assessment and management
- Ingested toxins
- Inhaled toxins
- Surface absorbed toxins
- Specific toxins
- Injected toxins
- Substance abuse and overdose